

BALLARD POWER SYSTEMS INC.
MANAGEMENT'S DISCUSSION AND ANALYSIS
SECOND QUARTER 2019

FUEL CELL POWER
FOR A SUSTAINABLE
PLANET



CAUTION REGARDING FORWARD-LOOKING STATEMENTS

This document contains forward-looking statements about expected events and the financial and operating performance of Ballard Power Systems Inc. ("Ballard", "the Company", "the Corporation", "we", "us" or "our"). Forward-looking statements include any statements that do not refer to historical facts. Forward-looking statements are based on the beliefs of management and reflect our current expectations as contemplated under the safe harbor provisions of Section 21E of the United States Securities Exchange Act of 1934, as amended. Such statements include, but are not limited to, statements with respect to our objectives, goals, liquidity, sources of capital and our outlook including our estimated revenue and gross margins, cash flow from operations, Cash Operating Costs, EBITDA and Adjusted EBITDA (see Non-GAAP Measures), order backlog, order book of expected deliveries over the subsequent 12-months, future product costs and selling prices, future product sales and production volumes, expenses / costs, contributions and cash requirements to and from joint venture operations, as well as statements with respect to our beliefs, plans, objectives, expectations, anticipations, estimates and intentions. Words such as "estimate", "project", "believe", "anticipate", "intend", "expect", "plan", "predict", "may", "should", "will", the negatives of these words or other variations thereof and comparable terminology are intended to identify forward-looking statements. These statements are not guarantees of future performance and involve assumptions, risks and uncertainties that are difficult to predict.

In particular, these forward-looking statements are based on certain factors and assumptions relating to our expectations with respect to new and existing customer and partner relationships, the generation of new sales, producing, delivering and selling the expected product and service volumes at the expected prices and controlling our costs. They are also based on a variety of general factors and assumptions including, but not limited to, our expectations regarding technology and product development efforts, manufacturing capacity and cost, product and service pricing, market demand, and the availability and prices of raw materials, labour and supplies. These assumptions have been derived from information available to the Company including information obtained by the Company from third parties. These assumptions may prove to be incorrect in whole or in part. In addition, actual results may differ materially from those expressed, implied, or forecasted in such forward-looking statements. Factors that could cause our actual results or outcomes to differ materially from the results expressed, implied or forecasted in such forward-looking statements include, but are not limited to: the condition of the global economy including trade and other geopolitical risks; the rate of mass adoption of our products or related ecosystem, including the availability of cost-effective hydrogen; changes in product or service pricing or cost; changes in our customers' requirements, the competitive environment and/or related market conditions; the relative strength of the value proposition that we offer our customers with our products or services; changes in competitive technologies, including battery and fuel cell technologies; product safety, liability or warranty issues; challenges or delays in our technology and product development activities; changes in the availability or price of raw materials, labour and supplies; our ability to attract and retain business partners, suppliers, employees and customers; changing government or environmental regulations, including subsidies or incentives associated with the adoption of clean energy products, including hydrogen and fuel cells; our access to funding and our ability to provide the capital required for product development, operations and marketing efforts, working capital requirements, and joint venture capital contributions; our ability to protect our intellectual property; our ability to extract value from joint venture operations; currency fluctuations, including the magnitude of the rate of change of the Canadian dollar versus the U.S. dollar; potential merger and acquisition activities, including risks related to integration, loss of key personnel, disruptions to operations, costs of integration, and the integration failing to achieve the expected benefits of the transaction; the general assumption that none of the risks identified in the Risks and Uncertainties section of this report or in our most recent Annual Information Form will materialize. Readers should not place undue reliance on Ballard's forward-looking statements.

The forward-looking statements contained in this document speak only as of the date of this Management Discussion and Analysis ("MD&A"). Except as required by applicable legislation, Ballard does not undertake any obligation to release publicly any updates or revisions to these forward-looking statements to reflect events or circumstances after the date of this MD&A including the occurrence of unanticipated events.

MANAGEMENT'S DISCUSSION AND ANALYSIS

July 31, 2019

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1. INTRODUCTION

1.1 Preparation of the MD&A

This discussion and analysis of financial condition and results of operations of Ballard Power Systems Inc. (“Ballard”, “the Company”, “we”, “us” or “our”) is prepared as at July 31, 2019 and should be read in conjunction with our unaudited condensed consolidated interim financial statements and accompanying notes for the three and six months ended June 30, 2019 and with our audited consolidated financial statements and accompanying notes for the year ended December 31, 2018. The results reported herein are presented in U.S. dollars unless otherwise stated and have been prepared in accordance with International Financial Reporting Standards (“IFRS”) as issued by the International Accounting Standards Board. Additional information relating to the Company, including our Annual Information Form, is filed with Canadian (www.sedar.com) and U.S. securities regulatory authorities (www.sec.gov) and is also available on our website at www.ballard.com.

1.2 Disclosure Controls and Procedures and Internal Controls over Financial Reporting

Our disclosure controls and procedures are designed to provide reasonable assurance that relevant information is gathered and reported to senior management, including the Chief Executive Officer and the Chief Financial Officer, on a timely basis so that appropriate decisions can be made regarding public disclosures. We have also designed internal controls over financial reporting to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with IFRS. During the three and six months ended June 30, 2019, there were no changes in internal control over financial reporting that have materially affected, or are reasonably likely to materially affect, the Company’s internal control over financial reporting. Our design of disclosure controls and procedures and internal controls over financial reporting includes controls, policies and procedures covering all of our subsidiaries including Ballard Power Systems Europe A/S, Ballard Unmanned Systems Inc. (re-named from Protonex Technology Corporation as of January 1, 2019), and Guangzhou Ballard Power Systems Co., Ltd.

1.3 Risks and Uncertainties

An investment in our common shares involves risk. Investors should carefully consider the risks and uncertainties described below and in our Annual Information Form. The risks and uncertainties described in our Annual Information Form are not the only ones that we face. Additional risks and uncertainties, including those that we do not know about now or that we currently deem immaterial, may also adversely affect our business. For a more complete discussion of the risks and uncertainties which apply to our business and our operating results, please see our Annual Information Form and other filings with Canadian (www.sedar.com) and U.S. (www.sec.gov) securities regulatory authorities.

2. CORE BUSINESS AND STRATEGY

2.1 Core Business

At Ballard, our vision is to deliver fuel cell power for a sustainable planet. We are recognized as a world leader in proton exchange membrane (“PEM”) fuel cell power system development and commercialization.



Our principal business is the design, development, manufacture, sale and service of PEM fuel cell products for a variety of applications, focusing on our power product markets of Heavy-Duty Motive (consisting of bus, truck, rail and marine applications), Portable Power / UAV, Material Handling and Backup Power, as well as the delivery of Technology Solutions, including engineering services, technology transfer, and the license and sale of our extensive intellectual property portfolio and fundamental knowledge for a variety of fuel cell applications.

A fuel cell is an environmentally clean electrochemical device that combines hydrogen fuel with oxygen (from the air) to produce electricity. The hydrogen fuel can be obtained from natural gas, kerosene, methanol or other hydrocarbon fuels, or from water through electrolysis. Ballard's clean-energy fuel cell products feature high fuel efficiency, relatively low operating temperature, high durability, low noise and vibration, compact size, quick response to changes in electrical demand, and modular design. Embedded in each Ballard fuel cell product lies a stack of unit cells designed with our proprietary PEM technology, which include membrane electrode assemblies, catalysts, plates, and other key components, and draw on intellectual property from our patent portfolio, together with our extensive experience and know-how, in key areas of fuel cell stack design, operation, production processes and systems integration.

We are based in Canada, with head office, research, technology and product development, testing, manufacturing and service facilities in Burnaby, British Columbia. We also have a sales, assembly, service and research and development facility in Hobro, Denmark; and a sales, assembly, research and development facility in Southborough, Massachusetts. We also have an office in Guangzhou, the capital of Guangdong Province, China. This office serves as the Company's initial operations center in China, with China management, sales and business development, technical, quality, supply chain, after-sales and administrative support personnel.

We also have a non-controlling, 49% interest, in the recently established Weichai Ballard Hy-Energy Technologies Co., Ltd. ("Weichai Ballard JV"), located in Shandong Province, China. Weichai Ballard JV is intended to manufacture Ballard's next-generation LCS fuel cell stack and LCS-based power modules for bus, commercial truck and forklift applications with exclusive rights in China.

In addition, we have a non-controlling 10% interest in Guangdong Synergy Ballard Hydrogen Power Co., Ltd. ("Synergy Ballard JVCo"), located in Guangdong Province, China. Synergy Ballard JVCo is intended to manufacture fuel cell stacks utilizing our existing FCvelocity®-9SSL fuel cell stack technology for use primarily in fuel cell engines assembled in China to provide propulsion power for zero-emission fuel cell electric buses and commercial vehicles with exclusive rights in China.

2.2 Strategic Imperatives

We plan to build value for our shareholders by developing, manufacturing, selling and servicing zero-emission, industry-leading PEM fuel cell technology products and services to meet the needs of our customers in select target markets.

We are pursuing a corporate strategy and business model that leverages growth and mitigates risk by diversifying our business across a portfolio of market opportunities that are

enabled by substantially the same core competencies, technology, products and intellectual property. Our business model includes two growth platforms (power products and technology solutions), multiple markets within each of these platforms, geographic diversification and customer diversification.

We are also pursuing a strategy that supports commercialization, revenue and profitability, while also enabling future value based on longer-term market opportunities for our technology, products and intellectual property, such as the global automotive fuel cell market and the unmanned aerial vehicle (“UAV”) or drone market.

Our two-pronged approach is to build shareholder value through the sale and service of power products and the delivery of technology solutions. In power product sales, our focus is on meeting the power needs of our customers by delivering high value, high reliability, high quality and innovative PEM fuel cell products. Through technology solutions, our focus is on enabling our customers to solve their technical and business challenges and accelerate the adoption of fuel cell technology by delivering customized, high value, bundled technology solutions, including specialized engineering services, access to our deep intellectual property portfolio and know-how through licensing or sale, and by providing technology component supply.

Starting in 2015, we increased our efforts on growing our business in China. China represents a potentially unique opportunity for zero and low-emission motive solutions, given the convergence of macro trends that include:

- continued urbanization of China’s population;
- continued infrastructure development and build-out of mass urban transportation;
- the large size of the Chinese vehicle market;
- rapid adoption of electric vehicles in China;
- serious air quality challenges in a number of Chinese cities;
- a Chinese government mandate to address climate change; and
- strong national and local government commitment supporting the adoption and commercialization of fuel cells in new-energy vehicle transportation applications.

As part of our strategy, we have been working to develop a local fuel cell supply chain and related ecosystem to address new-energy bus and commercial vehicle markets in China. We believe this strategy aligns with current and expected local content requirements for government subsidies supporting the adoption of fuel cell electric vehicles (“FCEV”). Key elements of our strategy include adopting a business model in which we seek to mitigate market adoption risk and capital investment by engaging partnerships with local companies.

We have established and are pursuing technology transfer and licensing opportunities with Chinese partners in order to localize the manufacture of Ballard-designed fuel cell modules and fuel cell stacks for heavy-duty motive applications in China, including bus, commercial vehicles, material handling and light-rail applications.

We also structure our business model in China to protect our core intellectual property. For example, we currently do not provide technology transfer and licensing relating to the manufacture of our proprietary membrane electrode assemblies (“MEAs”), a key high value technology component in our fuel cell stacks. We currently plan to continue to manufacture our MEAs in our head office facilities in Burnaby, Canada.



We continue to make significant investment in next generation products and technology, including MEAs, stacks, modules, and systems integration.

3. 2019 BUSINESS OUTLOOK

3.1 2019 Business Outlook

Given the early stage of hydrogen fuel cell market development and adoption and the uncertainty of timing in contract awards and program deliveries for 2019, we are not providing specific financial performance guidance for 2019, consistent with the Company's past approach. However, we continue to expect total revenue in 2019 to be relatively flat compared to 2018, coincident with a strengthening of the underlying business mix for long-term growth prospects.

Our qualitative outlook expectations for 2019 are further detailed in the 2019 Outlook section of our 2018 year-end MD&A. During 2019, we intend to focus on the early stage execution of the collaboration agreement with Weichai Power Co. Ltd. ("Weichai"); make further penetration of the European and California markets in certain Heavy and Medium Duty Motive applications; and make additional investment in talent, technology, products and customer experience. In particular:

- In China, we continue to expect the proportion of total revenue generated in 2019 from the Heavy-Duty Motive market in China to be lower than in 2018. The collaboration agreement with Weichai that closed in the fourth quarter of 2018 represents a critical step in positioning the Company with strong players in China's Heavy-Duty Motive industry and in preparing for the effective delivery of zero-emission fuel cell solutions based on Ballard's next-generation FCgen®-LCS fuel cell stack and FCgen®-LCS-based power modules. The collaboration with Weichai is expected to ultimately increase corporate revenue through the transfer of LCS technology and module designs and the sale of MEAs to Weichai Ballard JV in which Ballard has a 49% minority position.

During 2019, we plan to make additional capital contributions to Weichai Ballard JV of approximately \$21 million, including \$14.5 million which was contributed in February 2019. We anticipate making additional contributions beyond 2019 in order to continue to fund our pro rata ownership share of Weichai Ballard JV's operations. In addition, we expect to record equity in loss of investment in joint venture and associates of approximately (\$15) million in 2019 (including approximately (\$5) million recognized in the first half of 2019) primarily in connection with our investment in the operations of Weichai Ballard JV.

- In Europe, we continue to expect the proportion of total revenue generated from the European market to increase in 2019, relative to 2018, largely offsetting the proportionate decline in Heavy-Duty Motive revenue from China as we continue execution of the automotive program with AUDI AG ("Audi"), and deliver a significant number of modules to support fuel cell electric buses ("FCEBs") for deployment in Germany under the Joint Initiative for Hydrogen Vehicles across Europe ("JIVE") funding program.
- In North America, we continue to expect increased market activity in California for FCEVs, which can be expected to result in additional module purchase orders. In

addition, we now expect a higher volume of fuel cell stack sales in 2019 for Material Handling applications than in 2018. This increase in Material Handling is expected to be more than offset by a significant decline in Portable Power / UAV revenues 2019, relative to 2018, as a result of the disposition by Protonex of the Power Manager assets in October 2018.

- In Technology Solutions, we continue to expect revenue to increase in 2019, supported primarily by ongoing work on the automotive program with Audi and the technology transfer activity in relation to the Weichai Ballard JV. The expected Technology Solutions revenue increase is expected to largely offset the expected overall decline in Heavy Duty Motive revenue.

Our 2019 revenue outlook is supported by our 12-month Order Book of approximately \$127 million which is derived from our Order Backlog of approximately \$212 million as of June 30, 2019. Our Order Backlog represents the estimated aggregate value of orders at a given time for which customers have made contractual commitments and our 12-month Order Book represents the aggregate expected value of that portion of the Order Backlog that the Company expects to deliver in the subsequent 12-month period.

Our outlook for 2019 is based on our internal forecast which reflects an assessment of overall business conditions and takes into account actual sales and financial results in the first seven months of 2019; sales orders received for units and services expected to be delivered in the remainder of 2019; an estimate with respect to the generation of new sales and the timing of deliveries in each of our markets for the balance of 2019; and assumes an average U.S. dollar exchange rate in the mid \$0.70's in relation to the Canadian dollar for 2019.

The primary risk factors to our business outlook expectations for 2019 are customer, production, or program delays in delivering against existing power products and technology solutions orders and delays from forecast in terms of closing and delivering expected sales primarily in our Heavy-Duty Motive market including expected sales to Weichai Ballard JV and the timing of sales of that inventory by Weichai Ballard JV to end-customers in China; adverse macro-economic conditions including trade and other geopolitical risks; changes in government subsidy and incentive programs; inadequate investment in hydrogen infrastructure and / or excessive hydrogen fuel costs, all of which could negatively impact our customers' access to capital and the success of their program plans which could adversely impact our Heavy-Duty market; disruptions in our Heavy-Duty market due to delays of supply of key materials and components from third party suppliers; disruptions in our Technology Solutions market as a result of our significant reliance on a limited number of customers including Audi and Weichai Ballard JV in this platform, which are reliant on their internal commercialization plans and budget requirements; disruptions in our Technology Solutions market as a result of delays in achieving program milestones; disruptions in the Material Handling market as a result of our reliance on a single customer in this market and that customer's internal stack development and commercialization plans; and fluctuations in the Canadian dollar relative to the U.S. dollar, as a significant portion of our Technology Solutions revenues (including the technology development and engineering services agreement with Audi) are priced in Canadian dollars.

Our Order Backlog and our 12-month Order Book are currently comprised of a relatively

limited number of contracts and a relatively limited number of customers. Given the relative immaturity of our industry and customer deployment programs, our Order Backlog and 12-month Order Book are potentially vulnerable to risk of cancellation, deferral or non-performance by our customers for a variety of reasons including: risks related to customer liquidity; credit risks; risks related to changes, reductions or eliminations in government policies, subsidies and incentives; risks related to slower market adoption; risks related to vehicle integration challenges; risks related to the development of effective hydrogen refueling infrastructure; risks related to the ability of our products to meet evolving market requirements; and supplier-related risks.

Furthermore, potential fluctuations in our financial results make financial forecasting difficult. The Company's revenues, cash flows and other operating results can vary significantly from quarter to quarter. Sales and margins may be lower than anticipated due to general economic conditions, market-related factors, operating factors and competitive factors. Cash receipts may also vary from quarter to quarter due to the timing of cash collections from customers. As a result, quarter-to-quarter comparisons of revenues, cash flows and other operating results may not be meaningful; instead, we believe our operating performance should be assessed over a number of quarters and years. In addition, due to the early stage of development of the market for hydrogen fuel cell products, it is difficult to accurately predict future revenues, cash flows or results of operations on a quarterly basis. It is likely that in one or more future quarters, financial results will fall below the expectations of securities analysts and investors. If this occurs, the trading price of the Company's shares may be materially and adversely affected.

4. RECENT DEVELOPMENTS (Including Contractual Updates)

4.1 Corporate

Development of 8th Generation Zero-Emission Fuel Cell Module for Heavy-Duty Motive Market

On June 10, 2019, we unveiled our 8th generation high performance fuel cell module, the FCmove™-HD, at the UITP Global Public Transport Summit in Stockholm, Sweden. The culmination of product development and field experience based on almost 14 million kilometers (9 million miles) of vehicle operation, Ballard's FCmove™-HD fuel cell module is compact, robust and offers a reduction in lifecycle cost. The FCmove™-HD fuel cell module is the first in a family of FCmove™ products expected to be introduced by Ballard and is specifically designed to meet the requirements of transit bus operators. Future FCmove™ products are expected to offer various power outputs to suit a broad range of commercial vehicles including trucks, coaches and trains.

Benefits of FCmove™-HD, compared to the prior generation heavy-duty fuel cell module, are expected to include lower lifecycle cost, high reliability, simplified system integration, improved freeze start capability, and higher temperature operation. Ballard will continue to support the Company's existing customers that are using its current generation FCveloCity® fuel cell modules.

Development of Next Generation Zero-Emission Fuel Cell Stack for Heavy-Duty Motive Applications

On September 18, 2018, we unveiled our next-generation high performance liquid-cooled fuel cell stack, the FCgen®-LCS (“LCS”), at the IAA Commercial Vehicles Trade Fair and Convention in Hannover, Germany. The FCgen®-LCS features important design and performance enhancements, while also offering a reduction in total-cost-of-ownership. This stack will be a core technology component of Ballard’s 8th generation power module portfolio for use in Heavy-Duty Motive applications – including buses, commercial trucks and trains – planned for initial launch in 2019, and other applications such as forklifts.

Benefits of the FCgen®-LCS, compared to the prior generation liquid-cooled fuel cell stack, are expected to include lower cost, improved durability, high power density, improved freeze start capability, higher tolerance to operating conditions, simplified systems integration, and improved sustainability. Ballard will continue to support the Company’s existing customers where current generation FCvelocity®-9SSL fuel cell stack technology is used.

Acquisition of Assets of Automotive Fuel Cell Cooperation Corporation

In July 2018, we acquired certain strategic assets of Automotive Fuel Cell Cooperation Corporation (“AFCC”), a private company owned by Daimler AG (“Daimler”) and Ford Motor Company (“Ford”). Pursuant to the wind-down of AFCC’s operations in Vancouver, which were co-located with Ballard at our headquarters, Daimler and Ford have in-housed and relocated their fuel cell stack development activities to their respective operations in Germany and the United States. As a result, Daimler and Ford agreed to sell certain AFCC assets to Ballard for approximately Canadian \$6 million.

This acquisition supports and accelerates our growth plans in two key respects. First, it provided needed expansion of our product and material testing capabilities that will be used to support new and existing programs and products. In addition, we have acquired key production equipment that supports forecasted growth over the next five years. With these assets already in place and functioning within Ballard’s existing facilities, this transaction accelerated the expansion of our fuel cell testing, production and lab capacity at a lower cost, compared to acquiring new equipment. The acquired assets include testing equipment, prototype production equipment, and lab and quality inspection equipment.

4.2 China

Weichai Power Co., Ltd. and Weichai Ballard Hy-Energy Technologies Co., Ltd.

On November 13, 2018, we announced the closing of a strategic collaboration transaction with Weichai, initially detailed on August 29, 2018. Ballard’s strategic collaboration with Weichai includes the following key elements:

- Equity Investment – an equity investment in Ballard made by Weichai in the amount of \$163.6 million, representing a 19.9% interest in the Company, through the subscription and purchase of 46.1 million shares from treasury at a price of \$3.54, which reflected a 15% premium to the 30-day VWAP of \$3.08 on August 29, 2018.

In addition, Zhongshan Broad-Ocean Motor Co., Ltd. (“Broad-Ocean” – a current Ballard strategic investor and Chinese partner) – invested a further \$20.2 million, through the

subscription and purchase of 5.7 million shares from treasury at the same price of \$3.54 to maintain its 9.9% ownership position in Ballard.

As a result, the Weichai investment and the incremental Broad-Ocean equity investments in Ballard generated total gross proceeds of \$183.8 million. The Weichai investment and the Broad-Ocean incremental investment are subject to 2-year “standstill” and resale restrictions (subject to customary exceptions). For so long as Weichai holds at least 15% of Ballard’s outstanding shares, it will have the right to nominate two directors to Ballard’s board of directors. On January 1, 2019, the Company appointed Mr. Jiang Kui (also known as Mr. Kevin Jiang) and Mr. Sun Shaojun (also known as Mr. Sherman Sun) to the Company’s Board of Directors and expanded Ballard’s Board of Directors from seven members to nine members.

Weichai has also agreed that, in the event of a third-party offer to buy Ballard, Weichai will have the right to make a superior proposal or otherwise must vote its shares in accordance with the Ballard board recommendation.

- China Joint Venture and Technology Transfer Agreement – Weichai and Ballard have established a joint venture company in Shandong Province to support China’s Fuel Cell Electric Vehicle market, with Weichai holding a controlling ownership interest of 51% and Ballard holding a 49% ownership position. The joint venture, Weichai Ballard Hy-Energy Technologies Co., Ltd. (“Weichai Ballard JV”) was established in the fourth quarter of 2018 with Weichai making an initial capital contribution in 2018 of RMB 102 million and Ballard making an initial capital contribution of \$14.3 million (RMB 98 million equivalent). In the first quarter of 2019, Weichai made its planned second capital contribution of RMB 102 million and Ballard made its planned second capital contribution of \$14.5 million (RMB 98 million equivalent). Weichai and Ballard will fund pro rata shares of the Weichai Ballard JV based on an agreed business plan. Weichai holds three of five Weichai Ballard JV board seats and Ballard holds two, with Ballard having certain shareholder protection provisions.

The Weichai Ballard JV will manufacture Ballard’s next-generation LCS fuel cell stack and LCS-based power modules for bus, commercial truck and forklift applications with exclusive rights in China and will pay Ballard \$90 million under a program to develop and transfer technology to the Weichai Ballard JV in order to enable these manufacturing activities. Revenue earned from the \$90 million Weichai Ballard JV technology transfer agreement (\$6.2 million in the second quarter of 2019; \$10.2 million in the first half of 2019; \$1.2 million in fiscal 2018) is recorded as Technology Solutions revenues. During the fourth quarter of 2018, we received an initial 10%, or \$9.0 million prepayment from Weichai Ballard JV for this program with additional amounts payable as program milestones are successfully completed. We retain an exclusive right to the developed technologies outside China, subject to certain restrictions on sublicensing outside China.

The Weichai Ballard JV will purchase MEAs for LCS fuel cell stacks exclusively from Ballard under a long-term supply agreement. Revenue earned from the MEA supply agreement (nil million to date) will be recorded as Heavy-Duty Motive revenues.

- Fuel Cell Sales – Weichai intends to build and supply at least 2,000 fuel cell modules using Ballard technology by 2021 for commercial vehicles in China. Specific terms related to the source and scope of supply, product mix, pricing and timing of shipments are subject to future agreement between the parties and the Weichai Ballard JV.

On May 1, 2019, we announced that we have reached agreement with Weichai Ballard JV for the supply of a mix of certain fuel cell products and components that will be used in the assembly of modules to power zero-emission FCEVs in China. The order has a total value of approximately \$44 million to Ballard. Once assembled by Weichai Ballard JV, final modules will be sold to Weichai to support initial deployments against Weichai's commitment to supply a minimum of 2,000 fuel cell modules for commercial FCEVs in China. All products and components to be supplied by Ballard, as well as related applications engineering support, are planned for delivery in 2019 and 2020, and will be based on Ballard's next-generation LCS stack technology. During the second quarter of 2019, we received initial prepayments of \$7.5 million from Weichai Ballard JV for this order with additional amounts payable as product is delivered. Revenue earned from this agreement (\$0.2 million in the second quarter of 2019 and to date) is recorded as Heavy-Duty Motive revenues.

Zhongshan Broad-Ocean Motor Co., Ltd.

As noted above, on November 13, 2018 Broad-Ocean invested a further \$20.2 million, through the subscription and purchase of 5.7 million shares from treasury at the same price of \$3.54 per share as paid by Weichai to maintain its 9.9% ownership position in Ballard.

On December 6, 2017, we announced that a subsidiary of strategic partner Broad-Ocean called Shanghai Edrive Co. Ltd. ("Shanghai Edrive") has commissioned its fuel cell engine manufacturing facility located in the City of Shanghai, China. Shanghai Edrive plans to primarily assemble Ballard FCveloCity® 30-kilowatt (kW) fuel cell engines at the facility under a technology transfer, licensing and supply arrangement between Ballard and Broad-Ocean that closed earlier in 2017. Broad-Ocean also has plans to assemble Ballard-designed engines at locations in Shandong and Hubei Provinces.

On April 6, 2017, we announced the closing of a transaction (the "Broad-Ocean Program") previously announced on February 16, 2017, relating to technology transfer, licensing and supply arrangements with Broad-Ocean for the assembly and sale of FCveloCity® 30-kilowatt (kW) and 85kW fuel cell engines in China. Under the Broad-Ocean Program, Broad-Ocean can manufacture fuel cell modules in three strategic regions in China, including Shanghai. The Broad-Ocean Program and future amounts payable to Ballard are dependent on the attainment of certain commissioning milestones by Broad-Ocean. In each of the three assembly operation locations, Broad-Ocean will also need to engage with local governments as well as with bus and commercial vehicle OEMs for deployment of fuel cell buses and commercial vehicles incorporating Ballard-designed modules manufactured by Broad-Ocean. Ballard will have the exclusive right to purchase fuel cell engines from any of the Broad-Ocean manufacturing operations for sale outside China. Each Ballard-designed fuel cell engine assembled by Broad-Ocean is required to utilize FCvelocity®-9SSL fuel cell stacks. Stack supply is expected to be provided by Synergy Ballard JVCo with Ballard being the exclusive supplier of MEAs for stacks manufactured by Synergy Ballard JVCo. Revenue earned from these Broad-Ocean technology transfer agreements (nil million in the second quarter and first half of 2019; \$0.2 million in the second quarter of 2018; \$0.5 million in the first half of 2018; \$3.5 million in fiscal 2018; \$2.0 million in fiscal 2017) is recorded as Technology Solutions revenues.

Although Broad-Ocean had previously expressed an interest in acquiring a 10% ownership

position in the Weichai Ballard JV, discussions regarding this investment are no longer ongoing between the parties.

On August 18, 2016, Broad-Ocean purchased 17.25 million Ballard common shares issued from treasury for total proceeds to Ballard of \$28.3 million. The investment represented approximately 9.9% of Ballard's outstanding common shares following the transaction. Broad-Ocean and Ballard also entered into an Investor Rights Agreement under which Ballard granted Broad-Ocean certain anti-dilution rights to maintain its 9.9% ownership interest. Broad-Ocean has no special right to appoint nominees to Ballard's board of directors.

Guangdong Synergy Ballard Hydrogen Power Co., Ltd.

During 2017, the FCvelocity®-9SSL fuel cell stack joint venture operation in the city of Yunfu in China's Guangdong Province commenced operations. Ballard has a non-controlling 10% interest in the joint venture, called Guangdong Synergy Ballard Hydrogen Power Co., Ltd. ("Synergy Ballard JVCo"), together with our partner Guangdong Nation Synergy Hydrogen Power Technology Co., Ltd. (a member of the "Synergy Group") who has a 90% interest. The fuel cell stacks manufactured by Synergy Ballard JVCo are expected to be used primarily in fuel cell engines assembled in China to provide propulsion power for zero-emission fuel cell electric buses and commercial vehicles in China. The Synergy Ballard JVCo operation is designed to achieve an annualized production capacity of approximately 20,000 fuel cell stacks.

The joint venture transaction and related sales agreements, which closed on October 25, 2016 (originally announced on July 18, 2016), contemplated Ballard's exclusive supply of MEAs for each fuel cell stack manufactured by Synergy Ballard JVCo, with minimum annual MEA volume commitments and a contemplated minimum sales value on a "take or pay" basis to Ballard of at least \$150 million over the initial 5-year term from 2017 to 2021. However, as a result of various Chinese market circumstances, including fluctuating new energy vehicle subsidies, slower than anticipated build-out and operation of hydrogen refueling infrastructure and slower than anticipated market adoption, as well as a result of inventory build-up, liquidity and other challenges at Synergy Ballard JVCo, Synergy Ballard JVCo did not meet its "take or pay" purchase commitments under the MEA supply agreement in the third and fourth quarters of 2018, nor did it make the contractual pre-payments required to enable any significant MEA shipments in the first quarter of 2019. As a result, during 2018 we removed all MEA supply agreement "take or pay" purchase commitments from our Order Backlog and 12-month Order Book.

During the second quarter of 2019, we agreed to a new MEA equipment supply agreement with Synergy Ballard JVCo with a contemplated value of \$8 million to Ballard in 2019. Revenue earned from MEA supply agreements with Synergy Ballard JVCo (\$1.1 million in the second quarter and first half of 2019; \$7.7 million in the second quarter of 2018; \$15.7 million in the first half of 2018; \$17.5 million in fiscal 2018; \$14.9 million in fiscal 2017; nil million in fiscal 2016) is recorded as Heavy-Duty Motive revenues.

During the third quarter of 2019, we signed definitive agreements with Synergy Ballard JVCo amending the existing Stack Assembly License Agreement and MEA Long-Term Supply Agreement, which included a mutual release of the remaining purchase commitment under the above noted \$150 million "take or pay" MEA purchase commitment. The definitive

agreements, which were entered into effective July 19, 2019, did not impact any amount recorded in the June 30, 2019 consolidated financial statements.

Synergy Ballard JVCo retains an exclusive right to manufacture and sell FCvelocity®-9SSL stacks in China until September 30, 2026. Exclusivity is subject to Synergy Ballard JVCo maintaining certain performance criteria, including compliance with: a code of ethics; Ballard's quality policies and branding practices; payment terms; certain intellectual property covenants; achievement of certain minimum annual MEA volume commitments through 2026; and certain financing conditions.

Ballard has the exclusive right to purchase FCvelocity®-9SSL fuel cell stacks and sub-components from Synergy Ballard JVCo for sale outside China. Ballard contributed approximately \$1.0 million for our 10% interest in Synergy Ballard JVCo in 2017, currently recognized at nil value. We have no obligation to provide future funding to Synergy Ballard JVCo.

4.3 Europe

Provision of Fuel Cell Modules for Buses in Europe as a Member of New H2 Bus Consortium

On June 3, 2019, we announced that Ballard is a founding member of the new H2Bus Consortium, whose members are working together to deploy 1,000 zero-emission fuel cell electric buses ("FCEBs") and related infrastructure in European cities at commercially competitive rates. An initial 600 FCEBs are being supported by a €40 million grant from the EU's Connecting European Facilities (CEF) program, with 200 buses expected to be deployed in each of Denmark, Latvia and the U.K. by 2023.

In addition to Ballard, H2Bus Consortium members include Everfuel, Wrightbus, Hexagon Composites, Nel Hydrogen, and Ryse Hydrogen, all suppliers in the hydrogen fuel cell electric bus value chain. The H2Bus hydrogen fuel cell electric bus solution is expected to be the most cost effective true zero-emission option available, with a target single-decker bus price below €375,000, target hydrogen cost between €5 and €7 per kilogram and target bus service cost of €0.30 per kilometer. Wrightbus is expected to integrate Ballard's 8th-generation heavy duty power module, the FCmove™ (unveiled on June 8, 2019), into H2Bus Consortium buses.

Wrightbus

On July 24, 2019, we announced a purchase order from Wrightbus, a leading bus OEM and Ballard partner headquartered in Northern Ireland, for 15 FCveloCity®-HD 85-kilowatt fuel cell modules to power buses for deployment in Aberdeen, Scotland under the Joint Initiative For Hydrogen Vehicles Across Europe ("JIVE") funding program. All of the Ballard modules in this order are expected to ship by the end of 2019 and the buses are expected to be deployed by Wrightbus with First Aberdeen transit agency by the end of 2020. This project is funded by Aberdeen City Council, the European Union's Fuel Cells and Hydrogen Joint Undertaking (FCH JU) under the JIVE program, and the Government of Scotland. The JIVE funding program is intended to pave the way to commercialization of FCEBs by coordinating procurement activities to unlock economies-of-scale and reduce costs as well as supporting new hydrogen refueling stations.

On May 13, 2019, we announced a purchase order from Wrightbus for 20 FCveloCity®-HD

85-kilowatt fuel cell modules to power London buses under the JIVE funding program. These initial 20 double-decker buses are expected to be deployed on three routes with Transport for London (“TfL”), the city’s transit agency. All of the Ballard modules in this order are expected to ship by the end of 2019 and all related buses are expected to be deployed with TfL by the end of 2020.

Revenue earned from these and other agreements with Wrightbus (\$1.6 million in the second quarter of 2019; \$1.7 million in the first half of 2019 and to date) is recorded as Heavy-Duty Motive revenues.

Solaris Bus & Coach S.A.

On July 29, 2019, we announced a purchase order from Solaris Bus & Coach S.A. (“Solaris”), a leading European bus and trolleybus manufacturer and Ballard partner headquartered in Bolechowo, Poland, for 12 FCmove™-HD fuel cell modules to power 12 buses to be deployed with SASA Bolzano, the public transport operator in Bolzano, Italy under the JIVE funding program. The 12 FCmove™-HD modules are expected to ship in 2020 and the buses are expected to be deployed with SAS Bolzano by 2021. Revenue earned from this agreement (nil million to date) will be recorded as Heavy-Duty Motive revenues.

Establishment of Fuel Cell Center of Excellence in Europe for Marine Market Applications

On April 4, 2019, we announced that our subsidiary, Ballard Power Systems Europe A/S, is establishing a Marine Center of Excellence (“Marine CoE”) dedicated to fuel cell marine applications at the Company’s engineering, manufacturing and service facility in Hobro, Denmark. The Marine CoE will design and manufacture heavy duty fuel cell modules to address zero-emission powertrain requirements for the marine industry.

A new motive fuel cell system manufacturing hall is planned to be constructed and operational at the Hobro location by year-end 2019, with expected annual production capacity of more than 15 megawatts (MW) of fuel cell modules. Fuel cell module development work at the Marine CoE will be based on Ballard’s new FCgen®-LCS fuel cell stack and next-generation heavy duty power module, which are planned for commercial launch later this year, and will be designed to meet European marine certification requirements.

Norled A/S

On April 9, 2019, we announced that our subsidiary, Ballard Power Systems Europe A/S, has signed an Equipment Supply Agreement (ESA) with Norled A/S, one of Norway’s largest ferry and express boat operators, to provide two of the Company’s next-generation 200 kilowatt (kW) modules that will be used to power a hybrid ferry planned to begin operating in 2021. The Ballard modules will be designed and manufactured at the Company’s new Marine CoE at its facility in Hobro, Denmark. The Norled vessel – which has carrying capacity for up to 299 passengers and 80 cars – is expected to be the first liquid hydrogen fuel cell-powered ferry in commercial operation globally. Revenue earned from this agreement (nil million to date) will be recorded as Heavy-Duty Motive revenues.

Eniig and Fibia A/S

On February 5, 2019, we announced that the Company’s European subsidiary – Ballard



Power Systems Europe A/S – has signed Framework Agreements for the provision of FCgen®-H2PM direct hydrogen backup power systems with Eniig and Fibia A/S, operators of fiber optic broadband networks in Denmark. Ballard also received initial orders for a total of 30 FCgen®-H2PM 5-kilowatt (kW) systems, including installation, hydrogen storage and power management equipment, having a total value of approximately \$1.2 million under these Framework Agreements. This includes 20 systems for Eniig and 10 systems for Fibia. Revenue earned from these agreements (\$0.1 million in the second quarter of 2019; \$0.2 million in the first half of 2019 and to date) is recorded as Backup Power revenues.

Audi AG

On June 11, 2018, we announced the signing of a 3.5 year extension to our technology solutions contract with AUDI AG (“Audi”), part of the Volkswagen Group, extending the program to August 2022. The aggregate value of the contract extension is expected to be Canadian \$80 to \$130 million (approximately \$62 to \$100 million). The program, through a series of technical milestone awards, will support Audi through its small series production launch and encompasses automotive fuel cell stack development as well as system design support activities. Ballard is focused on the design and manufacture of world-leading, next-generation fuel cell stacks for use in Audi’s demonstration car program. Ballard engineers are leading critical areas of fuel cell product design – including the MEA, plate and stack components – along with certain testing and integration work.

Ballard signed an initial 4 year contract with Volkswagen AG in March 2013, followed by a 2 year extension in February 2015. Audi assumed leadership of the program in 2016. Revenue earned from this and other agreements with Audi (\$5.8 million in the second quarter of 2019; \$10.3 million in the first half of 2019; \$6.7 million in the second quarter of 2018; \$12.5 million in the first half of 2018; \$26.6 million in fiscal 2018; \$18.0 million in fiscal 2017; \$13.9 million in fiscal 2016) is recorded as Technology Solutions revenues.

ABB Marine & Ports

On May 22, 2019, we announced a collaboration with ABB and other consortium partners in the Flagships project to develop and launch a zero-emission river push boat, planned for deployment in France in 2021 to push river barges. Ballard is planning to deliver two of its next-generation 200-kilowatt fuel cell modules in 2020, which will provide propulsion power for the vessel. The river push boat will be owned and operated by Sogestran Group subsidiary Compagnie Fluviale de Transport (CFT) on the Rhône river in France, with the objective of demonstrating that fuel cell-powered propulsion offers a cost-effective and practical zero-emission solution for owners and builders of mid-sized vessels carrying more than 100 passengers or the equivalent freight volumes inland or coastally.

Van Hool NV

On May 1, 2018, we announced the receipt of a purchase order from Van Hool NV (“Van Hool”), a bus OEM in Belgium, for 40 FCveloCity®-HD fuel cell modules to power buses under the Joint Initiative for Hydrogen Vehicles across Europe (“JIVE”) funding programs. The purchase order is further to Ballard’s announcement of a Letter of Intent, which was issued on February 28, 2018. Ballard continues to make shipments of FCveloCity®-HD 85 kilowatt modules against this purchase order with initial deliveries of buses by Van Hool to follow. Van Hool plans to deploy 30 buses with the Regionalverkehr Köln GmbH transit

agency in Cologne, Germany, and the remaining 10 buses with WSW mobil GmbH transit agency in Wuppertal, Germany.

On September 13, 2017, we announced the acceptance of a Letter of Intent to provide FCveloCity®-HD 100-kilowatt fuel cell engines to power ExquiCity tram-buses to be built by Van Hool for delivery in Pau, France to the SMTU-PPP (Syndicat Mixte de Transports urbains – Pau Portes des Pyrénées) and the STAP (Société de Transport de l'Agglomération Paloise). During the second quarter of 2018, we finalized contracting for this order and have now delivered the fuel cell engines to Van Hool.

Revenue earned from these and other agreements with Van Hool (\$2.6 million in the second quarter of 2019; \$3.4 million in the first half of 2019; \$1.1 million in the second quarter of 2018 and first half of 2018; \$3.5 million in fiscal 2018) is recorded as Heavy-Duty Motive revenues.

Siemens AG

On November 14, 2017, we announced the signing of a multi-year Development Agreement with Siemens AG (“Siemens”) for the development of a zero-emission fuel cell engine to power Siemens’ Mireo light rail train. The Development Agreement has a contemplated value of approximately \$9.0 million to Ballard over 3 years. Under the terms of the Development Agreement, Ballard will develop a 200 kilowatt fuel cell engine for integration into Siemens’ new Mireo train platform. Initial deployments of the fuel cell-powered Mireo train are planned for 2021. Revenue earned from this agreement (\$0.7 million in the second quarter of 2019; \$1.3 million in the first half of 2019; \$0.6 million in the second quarter of 2018; \$1.0 million in the first half of 2018; \$1.8 million in fiscal 2018; \$0.7 million in fiscal 2017) is recorded as Technology Solutions revenue.

4.4 North America

Protonex Technology Corporation – Divestiture of Power Manager assets

On October 5, 2018, we closed the previously announced (on August 31, 2018) transaction to divest certain assets of the Company’s subsidiary, Ballard Unmanned Systems Inc., formerly named Protonex Technology Corporation (“Protonex”), related to the Power Manager business to Revision Military Ltd. (“Revision”), a private U.S. based company. At closing, Ballard received initial consideration of approximately \$4.1 million, paid in \$2.0 million cash and a \$2.1 million note receivable payable in the third quarter of 2019, and may receive up to a further \$11.25 million, based on achievement of specific sales objectives during a 12-month earn-out period. Ballard has retained certain Protonex assets related to fuel cell propulsion systems for unmanned vehicles, under the Ballard brand. We decided to divest assets of the Protonex Power Manager assets as they were considered to be no longer aligned with Ballard’s strategic fuel cell focus, while retaining Protonex assets related to the unmanned systems market.

During the fourth quarter of 2018, we recorded a loss on sale of assets of (\$4.0) million on the divestiture of the Power Manager assets after estimating the amount of variable consideration included in the transaction price that is constrained to be \$2.0 million, as opposed to the above noted maximum possible earn-out amount of \$11.25 million. During the first quarter of 2019, we recorded an additional loss on sale of assets of (\$2.0) million after adjusting the estimated amount of variable consideration from \$2.0 million to nil. The

estimate of the ultimate transaction price, including the estimate of the final amount of earn-out variable consideration that is considered constrained will be reassessed each quarter-end during 2019. Any change in the estimated transaction price will result in an adjustment to the above noted loss on sale of assets which will be recognized on a prospective basis.

New Flyer Industries Inc.

On February 13, 2017, we announced the Company's membership in the "Fuel Cell Electric Bus Commercialization Consortium" (FCEBCC), a large-scale project for which funding has now been committed to support deployment of 20 zero-emission hydrogen fuel cell electric buses at two California transit agencies. Ten buses are to be deployed with Alameda Contra-Costa Transit District (AC Transit) and 10 buses are to be deployed with the Orange County Transportation Authority (OCTA). In support, Ballard has provided its FCveloCity®-HD 85-kilowatt fuel cell engines to New Flyer of America Inc., a subsidiary of New Flyer Industries Inc. ("New Flyer"), the largest transit bus and motor coach manufacturer and parts distributor in North America. Ballard's engines are to power New Flyer 40-foot Xcelisior XHE40 fuel cell buses, which are planned to be delivered by New Flyer and in-service with AC Transit and OCTA starting in late 2018 and into 2019. The buses are to be supported by advanced hydrogen fueling infrastructure provided by The Linde Group. Revenue earned from this and other agreements with New Flyer (\$0.1 million in the first half of 2019; \$1.2 million in the second quarter and first half of 2018; \$6.9 million in fiscal 2018) is recorded as Heavy-Duty Motive revenues.

4.5 Other

Nisshinbo Holdings

On February 21, 2018, we announced the receipt of a follow-on purchase order from Nisshinbo Holdings ("Nisshinbo") to progress a Technology Solutions program to the next stage that was initially announced on September 17, 2017. On September 17, 2017, we received a purchase order from Nisshinbo to engage in a multi-year Technology Solutions program to assess the potential development of fuel cell stacks using a Non Precious Metal Catalyst ("NPMC") for use in commercial material handling applications. With successful completion of this initial assessment, this next stage will focus on certain performance and power density enhancements to support development of low cost NPMC-based fuel cell stacks again for material handling applications. Revenue earned from this order and other related agreements with Nisshinbo (\$0.3 million in the second quarter and first half of 2019; \$0.3 million in the second quarter of 2018; \$0.6 million in the first half of 2018; \$1.3 million in fiscal 2018; \$1.6 million in fiscal 2017), is recorded as Technology Solutions revenues.

This followed an announcement that Nisshinbo and Ballard had successfully collaborated on development of the world's first NPMC-based PEM fuel cell product – the FCgen®-1040 – which is a new 30-watt air-cooled fuel cell stack incorporating NPMC with possible uses in ultralight-weight applications such as laptop and cell phone chargers, and military soldier power devices. The NPMC is an innovative technology enabling a reduction in product cost through the use of significantly lower amounts of platinum.

Nisshinbo has been a strategic supplier of compression molded bipolar flow field carbon plates to Ballard for over 20 years. In November 2015, Nisshinbo also became a strategic

equity investor in Ballard.

Other

On February 14, 2018, we announced that the signing of a Technology Solutions program with an unnamed strategic customer to develop a next generation air-cooled fuel cell stack. The multi-year program has an initial value to Ballard of approximately \$4.2 million. A key objective of the Technology Solutions program is to design and validate an ultra-high durability, high performance air-cooled fuel cell stack for uses in a number of target market applications, including certain material handling applications, with a target operating lifetime of 20,000 hours. A key market opportunity will be the integration of the next generation stacks into fuel cell systems for class 3 lift trucks, such as pallet jacks, deployed in high throughput distribution centers and warehouse operations. Other potential applications include systems for stationary continuous and backup power. Revenue earned from this agreement (\$0.6 million in the second quarter and first half of 2019; \$0.3 million in the second quarter of 2018; \$0.6 million in the first half of 2018; \$1.9 million in fiscal 2018; \$1.6 million fiscal 2017) is recorded as Technology Solutions revenues.

5. RESULTS OF OPERATIONS

5.1 Operating Segments

We report our results in the single operating segment of Fuel Cell Products and Services. Our Fuel Cell Products and Services segment consists of the sale and service of PEM fuel cell products for our power product markets of Heavy-Duty Motive (consisting of bus, truck, rail and marine applications), Portable Power / UAV, Material Handling and Backup Power, as well as the delivery of Technology Solutions, including engineering services, technology transfer and the license and sale of our extensive intellectual property portfolio and fundamental knowledge for a variety of fuel cell applications.

As a result of our sale of the Power Manager assets in the fourth quarter of 2018, we renamed the former Portable Power market as the Portable Power / UAV market. As the sale of the Power Manager assets is not presented as a discontinued operation, the Portable Power / UAV market includes revenues associated with our power manager business prior to its sale in October 2018, and product and service revenues generated from the retained Protonex assets related primarily to fuel cell propulsion systems for unmanned systems.

5.2 Summary of Key Financial Metrics – Three Months Ended June 30, 2019

Revenue and gross margin

<i>(Expressed in thousands of U.S. dollars)</i>		Three months ended June 30,			
Fuel Cell Products and Services	2019	2018	\$ Change	% Change	
Heavy-Duty Motive	\$ 6,455	\$ 13,345	\$ (6,890)	(52%)	
Portable Power / UAV	233	2,390	(2,157)	(90%)	
Material Handling	2,799	1,734	1,065	61%	
Backup Power	377	411	(34)	(8%)	
Technology Solutions	13,787	8,565	5,222	61%	
Revenues	23,651	26,445	(2,794)	(11%)	
Cost of goods sold	18,101	17,035	1,066	6%	
Gross Margin	\$ 5,550	\$ 9,410	\$ (3,860)	(41%)	
Gross Margin %	23%	36%	n/a	(13 pts)	

Fuel Cell Products and Services Revenues of \$23.7 million for the second quarter of 2019 declined (11%), or (\$2.8) million, compared to the second quarter of 2018. The (11%) decline was driven by significantly lower Heavy-Duty Motive and Portable Power / UAV revenues, which was partially offset by increases in Technology Solutions and Material Handling Power revenues.

Technology Solutions revenues of \$13.8 million increased by \$5.2 million, or 61%, due primarily to amounts earned on the Weichai Ballard JV technology transfer program, which more than offset minor declines in other programs in the period. Amounts earned of \$13.8 million in the second quarter of 2019 were from a variety of customer programs including amounts earned from the Weichai Ballard JV technology transfer program of \$6.2 million; Audi program of \$5.8 million; the Siemens development program of \$0.7 million; the Nisshinbo program of \$0.3 million; and the program with the unnamed strategic customer of \$0.6 million. Amounts earned in the second quarter of 2018 were also from a variety of customer programs including amounts earned from the Audi program of \$6.7 million; the Siemens development program of \$0.6 million; the technology transfer arrangements with Broad-Ocean of \$0.2 million; the Nisshinbo program of \$0.3 million, and the program with the unnamed strategic customer of \$0.3 million. Audi program revenues were also negatively impacted by approximately (\$0.2) million in the second quarter of 2019, as compared to the second quarter of 2018, as a result of an approximate (4%) lower Canadian dollar, relative to the U.S. dollar, as the Audi Agreement is priced in Canadian dollars. The underlying costs to satisfy the Audi Agreement are primarily denominated in Canadian dollars.

Heavy-Duty Motive revenues of \$6.5 million decreased (\$6.9) million, or (52%), due primarily to lower MEA shipments to Synergy Ballard JVCo of (\$6.6) million. Heavy-Duty Motive revenues on a quarter to quarter basis are also impacted by product mix due to varying customer requirements and various fuel cell products, including numerous power configurations required by our customers (and the resulting impact on selling price) of our fuel cell modules, fuel cell stacks, MEAs, and related component and parts kits. Heavy-Duty Motive revenues of \$6.5 million in the second quarter of 2019 include \$1.1 million for shipments of MEAs to Synergy Ballard JVCo for use in their manufacture and assembly of FCveloCity® fuel cell stacks in China; \$2.6 million to Van Hool and \$1.6 million to Wright

Bus for shipments of FCveloCity®-HD7 85&100-kilowatt fuel cell modules for their respective bus programs; and \$1.2 million for a variety of fuel cell products primarily to customers in China and Europe. Heavy-Duty Motive revenues of \$13.3 million in the first half of 2018 include \$7.7 million for shipments of MEAs to Synergy Ballard JVCo; \$1.2 million to New Flyer and \$1.1 million to Van Hool for shipments of FCveloCity®-HD7 85&100-kilowatt fuel cell modules for their respective bus programs; \$2.3 million for shipments of FCveloCity®-HD7 200-kilowatt fuel cell modules to CRRC Sifang for their tram project; and \$1.0 million for a variety of fuel cell products primarily to customers in China.

Material Handling revenues of \$2.8 million increased \$1.1 million, or 61%, primarily as a result of higher stack shipments to Plug Power combined with the impact of a higher average selling price due to product mix.

Backup Power revenues of \$0.4 million decreased nominally, or (8%), due primarily to a minor decline in hydrogen-based backup power product and service revenues in Europe and Japan for backup power applications.

Portable Power / UAV revenues of \$0.2 million decreased (\$2.2) million, or (90%), as a result of lower revenues generated by Protonex primarily as a result of the disposition of the Power Manager assets in October 2018.

Fuel Cell Products and Services gross margins were \$5.6 million, or 23% of revenues, for the first half of 2019, compared to \$9.4 million, or 36% of revenues, for the first half of 2018. The decline in gross margin of (\$3.9) million, or (41%), was driven primarily by the (11%) decrease in total revenues, combined with a shift to lower overall margin product and service revenue mix resulting in a (13) percentage point decrease in gross margin as a percent of revenues.

Gross margin the second quarter of 2019 was negatively impacted by significantly lower shipments of higher margin MEAs to Synergy Ballard JVCo, and by significantly lower higher margin revenues generated by Protonex as a result of the disposition of the Power Manager assets in the fourth quarter of 2018. Gross margin in the second quarter of 2018 benefited from an increase in higher margin Heavy-Duty Motive revenues, and by improved manufacturing overhead and related cost absorption as a result of improved scale and efficiency.

Gross margin in the second quarter of 2019 was also negatively impacted by net inventory adjustments of (\$0.5) million related primarily to excess and impaired inventory; whereas gross margin in the second quarter of 2018 was negatively impacted by net inventory adjustments of (\$0.3) million related primarily to excess and impaired inventory, and by net warranty adjustments of (\$0.2) million.

Cash Operating Costs

<i>(Expressed in thousands of U.S. dollars)</i>		Three months ended June 30,			
	2019	2018	\$ Change	% Change	
Research and Product Development (cash operating cost)	\$ 4,133	\$ 5,992	\$ (1,859)	(31%)	
General and Administrative (cash operating cost)	2,606	2,594	12	-%	
Sales and Marketing (cash operating cost)	1,664	1,892	(228)	(12%)	
Cash Operating Costs	\$ 8,403	\$ 10,478	\$ (2,075)	(20%)	

Cash Operating Costs and its components of Research and Product Development (cash operating cost), General and Administrative (cash operating cost), and Sales and Marketing (cash operating cost) are non-GAAP measures. We use certain Non-GAAP measures to assist in assessing our financial performance. Non-GAAP measures do not have any standardized meaning prescribed by GAAP and are therefore unlikely to be comparable to similar measures presented by other companies. See the reconciliation of Cash Operating Costs to GAAP in the Supplemental Non-GAAP Measures and Reconciliations section and the reconciliation of Research and Product Development (cash operating cost), General and Administrative (cash operating cost), and Sales and Marketing (cash operating cost) to GAAP in the Operating Expense section. Cash Operating Costs adjusts operating expenses for stock-based compensation expense, depreciation and amortization, impairment losses on trade receivables, restructuring charges, the impact of unrealized gains or losses on foreign exchange contracts, acquisition costs and financing charges.

Cash Operating Costs (see Supplemental Non-GAAP Measures and Reconciliations) for the second quarter of 2019 were \$8.4 million, a decrease of (\$2.1) million, or (20%), compared to the second quarter of 2018. The (\$2.1) million, or (20%), decrease was driven by lower research and product development cash operating costs of (\$1.9) million combined with decreases in sales and marketing cash operating costs of (\$0.2) million, as general and administrative cash operating costs were relatively flat.

The (\$2.1) million, or (20%) decrease in cash operating costs in the second quarter of 2019 was driven primarily by lower expenses in Protonex as a result of the disposition of our Power Manager assets and associated personnel in October 2018, combined with lower labour costs in Canada as a result of an approximate (4%) lower Canadian dollar, relative to the U.S. dollar, and the resulting positive impact on our Canadian operating cost base.

Although we have increased our gross investment and expenditure on research and product development activities primarily in Canada related to the ongoing improvement of all of our fuel cell products and the design and development of our next generation fuel cell products, including our new 8th generation high performance fuel cell module, the FCmove™-HD, and our new high performance liquid-cooled fuel cell stack, the FCgen®-LCS, this higher investment has been offset by increased allocation of the gross research and product development expense to cost of goods sold as a result of increased work performed on revenue producing Technology Solutions projects.

Adjusted EBITDA

<i>(Expressed in thousands of U.S. dollars)</i>		Three months ended June 30,			
	2019	2018	\$ Change	% Change	
Adjusted EBITDA	\$ (5,028)	\$ (803)	\$ (4,225)	(526%)	

EBITDA and Adjusted EBITDA are non-GAAP measures. We use certain Non-GAAP measures to assist in assessing our financial performance. Non-GAAP measures do not have any standardized meaning prescribed by GAAP and are therefore unlikely to be comparable to similar measures presented by other companies. See reconciliation of Adjusted EBITDA to GAAP in the Supplemental Non-GAAP Measures and Reconciliations section. Adjusted EBITDA adjusts EBITDA for stock-based compensation expense, transactional gains and losses, asset impairment charges, unrealized gains or losses on foreign exchange contracts, finance and other income, and acquisition costs.

Adjusted EBITDA (see Supplemental Non-GAAP Measures and Reconciliations) for the second quarter of 2019 was (\$5.0) million, compared to (\$0.8) million for the second quarter of 2018. The (\$4.2) million decline in Adjusted EBITDA was driven primarily by the (\$3.9) million decrease in gross margin as a result of the (11%) decline in overall revenues combined with the (13) point reduction in gross margin as a percent of revenues, partially offset by the decrease in Cash Operating Costs of \$2.1 million. In addition, Adjusted EBITDA

in the second quarter of 2019 was negatively impacted by higher equity in loss of investment in joint venture and associates of (\$2.9) million primarily attributed to the establishment of operations of Weichai Ballard JV.

In addition and as noted above, operating costs in the second quarter of 2019 were impacted by the positive impact of a weaker Canadian dollar, relative to the U.S. dollar, as compared to the first quarter of 2018. As a significant amount of our net operating costs (primarily labour) are denominated in Canadian dollars, gross margin, operating expenses and Adjusted EBITDA are impacted by changes in the Canadian dollar relative to the U.S. dollar. As the Canadian dollar relative to the U.S. dollar was approximately (4%), or (5) basis points, lower in the second quarter of 2019 as compared to the second quarter of 2018, positive foreign exchange impacts on our Canadian operating cost base and Adjusted EBITDA were approximately \$0.6 million. A \$0.01 decrease in the Canadian dollar, relative to the U.S. dollar, positively impacts annual Adjusted EBITDA by approximately \$0.5 million.

Net income (loss)

<i>(Expressed in thousands of U.S. dollars)</i>		Three months ended June 30,		
	2019	2018	\$ Change	% Change
Net income (loss)	\$ (6,971)	\$ (4,323)	\$ (2,648)	(61%)

Net loss for the second quarter of 2019 was (\$7.0) million, or (\$0.03) per share, compared to a net loss of (\$4.3) million, or (\$0.02) per share, in the second quarter of 2018. The (\$2.6) million increase in net loss in the second quarter of 2019 was driven primarily by the increase in Adjusted EBITDA loss of (\$4.2) million including higher equity in loss of investment in joint venture and associates of (\$2.9) million, partially offset by higher finance and other income of \$1.9 million in 2019 due primarily to higher interest income earned on our increased cash balances and by lower foreign exchange losses on our net monetary assets.

Cash provided by (used in) operating activities

<i>(Expressed in thousands of U.S. dollars)</i>		Three months ended June 30,		
	2019	2018	\$ Change	% Change
Cash provided by (used in) operating activities	\$ 1,715	\$ (16,936)	\$ 18,651	110%

Cash provided by operating activities in the second quarter of 2019 was \$1.7 million, consisting of net working capital inflows of \$2.8 million, partially offset by cash operating losses of (\$1.1) million. Cash used in operating activities in the second quarter of 2018 was (\$16.9) million, consisting of cash operating losses of (\$1.6) million and net working capital outflows of (\$15.3) million. The \$18.7 million increase in cash provided by (used in) operating activities in the second quarter of 2019, as compared to the second quarter of 2018, was driven by the relative improvement in cash operating losses of \$0.5 million and by the relative improvement in working capital requirements of \$18.1 million. The relative \$0.5 million improvement in cash operating losses in the second quarter of 2019 was due primarily to higher equity investment losses in joint venture and associates of \$2.9 million which are included in Adjusted EBITDA but excluded from cash operating losses, and by higher finance and other income of \$1.9 million due primarily to increased investment

income and lower foreign exchange gains (losses). These increases were partially offset by the increase in Adjusted EBITDA loss of (\$4.2) million.

The total change in working capital of \$2.8 million in the second quarter of 2019 was driven primarily by higher accounts payable and accrued liabilities of \$5.7 million as a result of the timing of supplier payments for property, plant and equipment and inventory purchases, and by higher deferred revenue of \$4.8 million as we collected net pre-payments on certain Heavy-Duty Motive and Technology Solutions contracts in advance of work performed. These second quarter of 2019 inflows were partially offset by higher accounts receivable of (\$5.9) million primarily as a result of the timing of revenues and the related customer collections, and by higher prepaid expenses of (\$1.9) million as we made initial supplier payment deposits primarily for purpose built property, plant and equipment.

This compares to a total change in working capital of (\$15.3) million in the second quarter of 2018 which was driven by higher accounts receivable of (\$11.9) million primarily as a result of the timing of revenues and the related customer collections, and by higher inventory of (\$4.1) million primarily to support expected Heavy-Duty Motive shipments in the second half of 2018. These second quarter of 2018 outflows were partially offset by higher accrued warranty obligations of \$1.2 million due to increased Heavy-Duty Motive product shipments.

5.3 Summary of Key Financial Metrics – Six Months Ended June 30, 2019

Revenue and gross margin

<i>(Expressed in thousands of U.S. dollars)</i>		Six months ended June 30,			
Fuel Cell Products and Services	2019	2018	\$ Change	% Change	
Heavy-Duty Motive	\$ 9,015	\$ 22,598	\$ (13,583)	(60%)	
Portable Power / UAV	372	4,800	(4,428)	(92%)	
Material Handling	6,015	2,148	3,867	180%	
Backup Power	820	721	99	14%	
Technology Solutions	23,437	16,268	7,169	44%	
Revenues	39,659	46,535	(6,876)	(15%)	
Cost of goods sold	31,906	30,501	1,405	5%	
Gross Margin	\$ 7,753	\$ 16,034	\$ (8,281)	(52%)	
Gross Margin %	20%	34%	n/a	(14 pts)	

Fuel Cell Products and Services Revenues of \$39.7 million for the first half of 2019 declined (15%), or (\$6.9) million, compared to the first half of 2018. The (15%) decline was driven by significantly lower Heavy-Duty Motive and Portable Power / UAV revenues, which was partially offset by increases in Technology Solutions, Material Handling and Backup Power revenues.

Technology Solutions revenues of \$23.4 million increased by \$7.2 million, or 44%, due primarily to amounts earned on the Weichai Ballard JV technology transfer program, which more than offset minor declines in other programs in the period. Amounts earned of \$23.4 million in the first half of 2019 were from a variety of customer programs including amounts earned from the Audi program of \$10.3 million; the Weichai Ballard JV technology transfer program of \$10.2 million; the Siemens development program of \$1.3 million; the Nisshinbo program of \$0.3 million; and the program with the unnamed strategic customer of \$0.6

million. Amounts earned in the first half of 2018 were also from a variety of customer programs including amounts earned from the Audi program of \$12.5 million; the Siemens development program of \$1.0 million; the Nisshinbo program of \$0.6 million; the Broad-Ocean technology transfer program of \$0.5 million; and the program with the unnamed strategic customer of \$0.6 million. Audi program revenues were also negatively impacted by approximately (\$0.5) million in the first half of 2019, as compared to the first half of 2018, as a result of an approximate (4%) lower Canadian dollar, relative to the U.S. dollar, as the Audi Agreement is priced in Canadian dollars. The underlying costs to satisfy the Audi Agreement are primarily denominated in Canadian dollars.

Heavy-Duty Motive revenues of \$9.0 million decreased (\$13.6) million, or (60%), due primarily to lower MEA shipments to Synergy Ballard JVCo of (\$14.5) million, partially offset by higher shipments of heavy-duty fuel cell modules. Heavy-Duty Motive revenues on a quarter to quarter basis are also impacted by product mix due to varying customer requirements and various fuel cell products, including numerous power configurations required by our customers (and the resulting impact on selling price) of our fuel cell modules, fuel cell stacks, MEAs, and related component and parts kits. Heavy-Duty Motive revenues of \$9.0 million in the first half of 2019 include \$1.1million for shipments of MEAs to Synergy Ballard JVCo for use in their manufacture and assembly of FCveloCity® fuel cell stacks in China; \$3.4 million to Van Hool and \$1.7 million to Wright Bus for shipments of FCveloCity®-HD7 85&100-kilowatt fuel cell modules for their respective bus programs; and \$2.8 million for a variety of fuel cell products primarily to customers in North America, China and Europe. Heavy-Duty Motive revenues of \$22.6 million in the first half of 2018 include \$15.6 million for shipments of MEAs to Synergy Ballard JVCo; \$1.2 million to New Flyer and \$1.1 million to Van Hool for shipments of FCveloCity®-HD7 85&100-kilowatt fuel cell modules for their respective bus programs; \$2.3 million for shipments of FCveloCity®-HD7 200-kilowatt fuel cell modules to CRRC Sifang for their tram project; \$0.7 million for shipments of FCveloCity®-MD 30-kilowatt fuel cell products primarily to customers in China; and \$1.7 million for a variety of fuel cell products primarily to customers in China, Europe and North America.

Material Handling revenues of \$6.0 million increased \$3.9 million, or 180%, primarily as a result of higher stack shipments to Plug Power combined with the impact of a higher average selling price due to product mix.

Backup Power revenues of \$0.8 million increased \$0.1 million, or 14%, due primarily to a minor increase in hydrogen-based backup power product and service revenues in Europe and Japan for backup power applications.

Portable Power / UAV revenues of \$0.4 million decreased (\$4.4) million, or (92%), as a result of lower revenues generated by Protonex primarily as a result of the disposition of the Power Manager assets in October 2018.

Fuel Cell Products and Services gross margins were \$7.8 million, or 20% of revenues, for the first half of 2019, compared to \$16.0 million, or 34% of revenues, for the first half of 2018. The decline in gross margin of (\$8.3) million, or (52%), was driven primarily by the (15%) decrease in total revenues, combined with a shift to lower overall margin product and service revenue mix resulting in a (14) percentage point decrease in gross margin as a percent of revenues.

Gross margin the first half of 2019 was also negatively impacted by significantly lower shipments of higher margin MEAs to Synergy Ballard JVCo, by significantly lower high margin revenues generated by Protonex as a result of the disposition of the Power Manager assets in the fourth quarter of 2018, and by increased costs in the period on milestone attainment on certain technology solutions contracts. Gross margin in the first half of 2018 also benefited from an increase in higher margin Heavy-Duty Motive revenues, and by improved manufacturing overhead and related cost absorption as a result of improved scale and efficiency.

Gross margin in the first half of 2019 was also negatively impacted by net inventory adjustments of (\$0.6) million related primarily to excess and impaired inventory; whereas gross margin in the first half of 2018 was negatively impacted by net inventory adjustments of (\$0.3) million related primarily to excess and impaired inventory, and by net warranty adjustments of (\$0.2) million.

Cash Operating Costs

<i>(Expressed in thousands of U.S. dollars)</i>		Six months ended June 30,			
	2019	2018	\$ Change	% Change	
Research and Product Development (cash operating cost)	\$ 9,174	\$ 12,096	\$ (2,922)	(24%)	
General and Administrative (cash operating cost)	5,341	5,389	(48)	(1%)	
Sales and Marketing (cash operating cost)	3,194	3,720	(526)	(14%)	
Cash Operating Costs	\$ 17,709	\$ 21,205	\$ (3,496)	(16%)	

Cash Operating Costs and its components of Research and Product Development (cash operating cost), General and Administrative (cash operating cost), and Sales and Marketing (cash operating cost) are non-GAAP measures. We use certain Non-GAAP measures to assist in assessing our financial performance. Non-GAAP measures do not have any standardized meaning prescribed by GAAP and are therefore unlikely to be comparable to similar measures presented by other companies. See the reconciliation of Cash Operating Costs to GAAP in the Supplemental Non-GAAP Measures and Reconciliations section and the reconciliation of Research and Product Development (cash operating cost), General and Administrative (cash operating cost), and Sales and Marketing (cash operating cost) to GAAP in the Operating Expense section. Cash Operating Costs adjusts operating expenses for stock-based compensation expense, depreciation and amortization, impairment losses on trade receivables, restructuring charges, the impact of unrealized gains or losses on foreign exchange contracts, acquisition costs and financing charges.

Cash Operating Costs (see Supplemental Non-GAAP Measures and Reconciliations) for the first half of 2019 were \$17.7 million, a decrease of (\$3.5) million, or (16%), compared to the first half of 2018. The (\$3.5) million, or (16%), decrease was driven by lower research and product development cash operating costs of (\$2.9) million combined with decreases in sales and marketing cash operating costs of (\$0.5) million, as general and administrative cash operating costs were relatively flat.

The (\$3.5) million, or (16%) decrease in cash operating costs in the first half of 2019 was driven primarily by lower expenses in Protonex as a result of the disposition of our Power Manager assets and associated personnel in October 2018, combined with lower labour costs in Canada as a result of an approximate (4%) lower Canadian dollar, relative to the U.S. dollar, and the resulting positive impact on our Canadian operating cost base.

Although we have increased our gross investment and expenditure on research and product development activities primarily in Canada related to the ongoing improvement of all of our fuel cell products and the design and development of our next generation fuel cell products, including our new 8th generation high performance fuel cell module, the FCmove™-HD, and our new high performance liquid-cooled fuel cell stack, the FCgen®-LCS, this higher investment has been offset by increased allocation of the gross research and product

development expense to cost of goods sold as a result of increased work performed on revenue producing Technology Solutions projects.

Adjusted EBITDA

(Expressed in thousands of U.S. dollars)

	Six months ended June 30,			
	2019	2018	\$ Change	% Change
Adjusted EBITDA	\$ (13,585)	\$ (4,640)	\$ (8,945)	(193%)

EBITDA and Adjusted EBITDA are non-GAAP measures. We use certain Non-GAAP measures to assist in assessing our financial performance. Non-GAAP measures do not have any standardized meaning prescribed by GAAP and are therefore unlikely to be comparable to similar measures presented by other companies. See reconciliation of Adjusted EBITDA to GAAP in the Supplemental Non-GAAP Measures and Reconciliations section. Adjusted EBITDA adjusts EBITDA for stock-based compensation expense, transactional gains and losses, asset impairment charges, unrealized gains or losses on foreign exchange contracts, finance and other income, and acquisition costs.

Adjusted EBITDA (see Supplemental Non-GAAP Measures and Reconciliations) for the first half of 2019 was (\$13.6) million, compared to (\$4.6) million for the first half of 2018. The (\$8.9) million decline in Adjusted EBITDA was driven primarily by the (\$8.3) million decrease in gross margin as a result of the (15%) decline in overall revenues combined with the (14) point reduction in gross margin as a percent of revenues, partially offset by the decrease in Cash Operating Costs of \$3.5 million. In addition, Adjusted EBITDA in the first half of 2019 was negatively impacted by higher equity in loss of investment in joint venture and associates of (\$4.8) million primarily attributed to the establishment of operations of Weichai Ballard JV.

In addition and as noted above, operating costs in the first half of 2019 were impacted by the positive impact of a weaker Canadian dollar, relative to the U.S. dollar, as compared to the first half of 2018. As a significant amount of our net operating costs (primarily labour) are denominated in Canadian dollars, gross margin, operating expenses and Adjusted EBITDA are impacted by changes in the Canadian dollar relative to the U.S. dollar. As the Canadian dollar relative to the U.S. dollar was approximately (4%), or (6) basis points, lower in the first half of 2019 as compared to the first half of 2018, positive foreign exchange impacts on our Canadian operating cost base and Adjusted EBITDA were approximately \$1.5 million. A \$0.01 decrease in the Canadian dollar, relative to the U.S. dollar, positively impacts annual Adjusted EBITDA by approximately \$0.5 million.

Net income (loss)

(Expressed in thousands of U.S. dollars)

	Six months ended June 30,			
	2019	2018	\$ Change	% Change
Net income (loss)	\$ (18,995)	\$ (9,823)	\$ (9,172)	(93%)

Net loss for the first half of 2019 was (\$19.0) million, or (\$0.08) per share, compared to a net loss of (\$9.8) million, or (\$0.06) per share, in the first half of 2018. The (\$9.2) million increase in net loss in the first half of 2019 was driven primarily by the increase in Adjusted EBITDA loss of (\$8.9) million including higher equity in loss of investment in joint venture and associates of (\$4.8) million, as an increase in loss on sale of assets of (\$2.0) million in 2019 was offset by higher finance and other income of \$2.0 million in 2019 primarily as a result of higher interest income earned on our increased cash balances.

As noted above, net loss in the first half of 2019 was negatively impacted by a loss on sale of assets of (\$2.0) million related to an additional impairment charge arising from the divestiture by Protonex of its Power Manager assets to Revision in October 2017. Excluding the impact of asset impairment charges, transactional gains and losses, and acquisition

costs, Adjusted Net Loss (see Supplemental Non-GAAP Measures and Reconciliations) in the first half of 2019 was (\$17.0) million, or (\$0.07) per share, compared to (\$9.8) million, or (\$0.06) per share, for the first half of 2018.

Cash provided by (used in) operating activities

(Expressed in thousands of U.S. dollars)

	Six months ended June 30,			
	2019	2018	\$ Change	% Change
Cash provided by (used in) operating activities	\$ (8,747)	\$ (24,144)	\$ 15,397	64%

Cash used in operating activities in the first half of 2019 was (\$8.7) million, consisting of cash operating losses of (\$6.7) million and net working capital outflows of (\$2.0) million. Cash used in operating activities in the first half of 2018 was (\$24.1) million, consisting of cash operating losses of (\$4.4) million and net working capital outflows of (\$19.7) million. The \$15.4 million decline in cash used in operating activities in the first half of 2019, as compared to the first half of 2018, was driven by relative decline in working capital requirements of \$17.7 million, partially offset by the relative increase in cash operating losses of (\$2.3) million. The relative (\$2.3) million increase in cash operating losses in the first half of 2019 was due primarily to the increase in Adjusted EBITDA loss of (\$8.9) million. This net (loss) increase in 2019 was partially offset by higher equity investment losses in joint venture and associates of \$4.9 million which are included in Adjusted EBITDA but excluded from cash operating losses, and by increased finance and other income of \$2.0 million due primarily to higher investment income.

The total change in working capital of (\$2.0) million in the first half of 2019 was driven by higher accounts receivable of (\$4.0) million primarily as a result of the timing of revenues and the related customer collections, by higher prepaid expenses of (\$2.2) million as we made initial supplier payment deposits primarily for purpose built property, plant and equipment, and by higher inventory of (\$0.6) million primarily to support expected Heavy-Duty Motive shipments in the last half of 2019. These first half of 2019 outflows were partially offset by higher deferred revenue of \$4.6 million as we collected net pre-payments on certain Heavy-Duty Motive and Technology Solutions contracts in advance of work performed, and by higher accrued warranty obligations of \$0.7 million primarily on Heavy-Duty Motive product shipments.

This compares to a total change in working capital of (\$19.7) million in the first half of 2018 which was driven by higher inventory of (\$10.9) million primarily to support expected Heavy-Duty Motive shipments in the second half of 2018, by lower accounts payable and accrued liabilities of (\$7.6) million as a result of the timing of supplier payments and annual compensation awards, and by higher accounts receivable of (\$2.7) million primarily as a result of the timing of revenues and the related customer collections. These first half of 2018 outflows were partially offset by higher accrued warranty obligations of \$1.0 million due to increased Heavy-Duty Motive product shipments and by higher deferred revenue of \$0.5 million as we collected net pre-payments on certain Heavy-Duty Motive and Technology Solutions contracts in advance of work performed.

5.4 Operating Expenses and Other Items – Three and Six Months ended June 30, 2019

Research and product development expenses

(Expressed in thousands of U.S. dollars)

Research and product development	2019	Three months ended June 30,		
		2018	\$ Change	% Change
Research and product development expense	\$ 5,332	\$ 6,902	\$ (1,570)	(23%)
Less: Depreciation and amortization expense	\$ (823)	\$ (602)	\$ (221)	(37%)
Less: Stock-based compensation expense	\$ (376)	\$ (308)	\$ (68)	(22%)
Research and Product Development (cash operating cost)	\$ 4,133	\$ 5,992	\$ (1,859)	(31%)

(Expressed in thousands of U.S. dollars)

Research and product development	2019	Six months ended June 30,		
		2018	\$ Change	% Change
Research and product development expense	\$ 11,366	\$ 13,846	\$ (2,480)	(18%)
Less: Depreciation and amortization expense	\$ (1,491)	\$ (1,204)	\$ (287)	(24%)
Less: Stock-based compensation expense	\$ (701)	\$ (546)	\$ (155)	(28%)
Research and Product Development (cash operating cost)	\$ 9,174	\$ 12,096	\$ (2,922)	(24%)

Research and Product Development (cash operating cost) is a non-GAAP measure. We use certain Non-GAAP measures to assist in assessing our financial performance. Non-GAAP measures do not have any standardized meaning prescribed by GAAP and are therefore unlikely to be comparable to similar measures presented by other companies. Research and Product Development (cash operating cost) adjusts Research and product development expense for depreciation and amortization expense and stock-based compensation expense. See the reconciliation of the adjustments to Research and product development expense in the Non-GAAP Measures and Reconciliations section.

Research and product development expenses for the three months ended June 30, 2019 were \$5.3 million, a decrease of (\$1.6) million, or (23%), compared to the corresponding period of 2018. Excluding depreciation and amortization expense of (\$0.8) million and (\$0.6) million, respectively, in each of the periods, and excluding stock-based compensation expense of (\$0.4) million and (\$0.3) million, respectively, in each of the periods, research and product development cash operating costs (see Supplemental Non-GAAP Measures and Reconciliations) were \$4.1 million in the second quarter of 2019, a decrease of (\$1.9) million, or (31%), compared to the second quarter of 2018.

Research and product development expenses for the six months ended June 30, 2019 were \$11.4 million, a decrease of (\$2.5) million, or (18%), compared to the corresponding period of 2018. Excluding depreciation and amortization expense of (\$1.5) million and (\$1.2) million, respectively, in each of the periods, and excluding stock-based compensation expense of (\$0.7) million and (\$0.5) million, respectively, in each of the periods, research and product development cash operating costs (see Supplemental Non-GAAP Measures and Reconciliations) were \$9.2 million in the first half of 2019, a decrease of (\$2.9) million, or (24%), compared to the first half of 2018.

The respective (\$1.9) million, or (31%), and the (\$2.9) million, or (24%), declines in research and development cash operating costs (see Supplemental Non-GAAP Measures and Reconciliations) in the second quarter and first half of 2019, as compared to the second quarter and first half of 2018, were driven primarily by lower program development and engineering expenses in Protonex as a result of the disposition of our Power Manager assets and associated personnel in October 2018, combined with lower labour costs in Canada as a result of an approximate (4%) lower Canadian dollar, relative to the U.S. dollar, and the resulting positive impact on our Canadian operating cost base.

Although we have increased our gross investment and expenditure on research and product development activities primarily in Canada related to the ongoing improvement of all of our fuel cell products and the design and development of our next generation fuel cell products, including our new 8th generation high performance fuel cell module, the FCmove™-HD, and our new high performance liquid-cooled fuel cell stack, the FCgen®-LCS, this higher investment has been offset by increased allocation of the gross research and product development expense to cost of goods sold as a result of increased work performed on revenue producing Technology Solutions projects.

Government funding recoveries were also higher in 2019, as compared to 2018, and are attributable primarily to government funding recoveries earned in Denmark by Ballard Power Systems Europe A/S for work performed a variety of European programs. Government research funding, and development costs capitalized as fuel cell technology intangible assets, are reflected as cost offsets to research and product development expenses, whereas labour and material costs incurred on revenue producing engineering services projects are reallocated from research and product development expenses to cost of goods sold.

Depreciation and amortization expense included in research and product development expense for the three and six months ended June 30, 2019 was \$0.8 million and \$1.5 million, respectively, compared to \$0.6 million and \$1.2 million, respectively, for the corresponding periods of 2018. Depreciation and amortization expense relates primarily to amortization expense on our intangible assets and depreciation expense on our research and product development facilities and equipment. Depreciation and amortization expense has increased in 2019 primarily as a result of increased investment in testing, lab and quality inspection equipment including the acquisition of certain strategic assets of AFCC in July 2018.

Stock-based compensation expense included in research and product development expense for the three and six months ended June 30, 2019 was \$0.4 million and \$0.7 million, respectively, up slightly from the amounts recognized in the corresponding periods of 2018 of \$0.3 million and \$0.5 million, respectively.

General and administrative expenses

		Three months ended June 30,			
<i>(Expressed in thousands of U.S. dollars)</i>					
General and administrative	2019	2018	\$ Change	% Change	
General and administrative expense	\$ 2,909	\$ 3,558	\$ (649)	(18%)	
Less: Depreciation and amortization expense	\$ (279)	\$ (319)	\$ 40	13%	
Less: Stock-based compensation expense	\$ (355)	\$ (378)	\$ 23	6%	
Add: Impact of unrealized gains (losses) on foreign exchange contracts	\$ 331	\$ (267)	\$ 598	224%	
General and Administrative (cash operating cost)	\$ 2,606	\$ 2,594	\$ 12	-%	

<i>(Expressed in thousands of U.S. dollars)</i>		Six months ended June 30,			
General and administrative	2019	2018	\$ Change	% Change	
General and administrative expense	\$ 5,842	\$ 7,245	\$ (1,403)	(19%)	
Less: Depreciation and amortization expense	\$ (568)	\$ (635)	\$ 67	11%	
Less: Stock-based compensation expense	\$ (681)	\$ (650)	\$ (31)	(5%)	
Add: Impact of unrealized gains (losses) on foreign exchange contracts	\$ 748	\$ (571)	\$ 1,319	231%	
General and Administrative (cash operating cost)	\$ 5,341	\$ 5,389	\$ (48)	(1%)	

General and Administrative (cash operating cost) is a non-GAAP measure. We use certain Non-GAAP measures to assist in assessing our financial performance. Non-GAAP measures do not have any standardized meaning prescribed by GAAP and are therefore unlikely to be comparable to similar measures presented by other companies. General and Administrative (cash operating cost) adjusts General and administrative expense for depreciation and amortization expense, stock-based compensation expense and the impact of unrealized gains or losses on foreign exchange contracts. See the reconciliation of the adjustments to General and administrative expense in the Non-GAAP Measures and Reconciliations section.

General and administrative expenses for the three months ended June 30, 2019 were \$2.9 million, a decrease of (\$0.6) million, or (18%), compared to the corresponding period of 2018. Excluding depreciation and amortization expense of (\$0.3) million in each of the periods, excluding stock-based compensation expense of (\$0.4) million in each of the periods, and excluding unrealized gains (losses) on foreign exchange contracts of \$0.3 and (\$0.3) million, respectively, in each of the periods, general and administrative cash operating costs (see Supplemental Non-GAAP Measures and Reconciliations) were \$2.6 million in the second quarter of 2019, consistent with the second quarter of 2018.

General and administrative expenses for the six months ended June 30, 2019 were \$5.8 million, a decrease of (\$1.4) million, or (19%), compared to the corresponding period of 2018. Excluding depreciation and amortization expense of (\$0.6) million in each of the periods, excluding stock-based compensation expense of (\$0.7) million in each of the periods, and excluding unrealized gains (losses) on foreign exchange contracts of \$0.7 and (\$0.6) million, respectively, in each of the periods, general and administrative cash operating costs (see Supplemental Non-GAAP Measures and Reconciliations) were \$5.3 million in the first half of 2019, consistent with the first half of 2018.

Reductions in general and administrative cash operating costs (see Supplemental Non-GAAP Measures and Reconciliations) were realized in the second quarter and first half of 2019, as compared to the corresponding periods of 2018, primarily as a result of the disposition of our Power Manager assets and associated personnel in October 2018, and by lower labour costs in Canada as a result of an approximate (4%) lower Canadian dollar, relative to the U.S. dollar, and the resulting positive impact on our Canadian operating cost base. These cost reductions in 2019 were effectively offset by higher realized losses on our foreign exchange contracts which are designed as a hedge against our Canadian dollar labour costs, and by increased contract administration costs in Denmark by Ballard Power Systems Europe A/S.

Depreciation and amortization expense included in general and administrative expense for the three and six months ended June 30, 2019 was \$0.3 million and \$0.6 million, consistent with the corresponding periods of 2018. Depreciation and amortization expense relates primarily to our office and information technology intangible assets including our recent investment in a new ERP system.

Stock-based compensation expense included in general and administrative expense for the three and six months ended June 30, 2019 was \$0.4 million and \$0.7 million, respectively, consistent with the corresponding periods of 2018.

The impact of unrealized gains (losses) on foreign exchange contracts included in general and administrative expense for the three and six months ended June 30, 2019 was \$0.3 million and \$0.7 million, respectively, compared to (\$0.3) million and (\$0.6) million, respectively, for the corresponding periods of 2018. We use forward foreign exchange contracts to manage our exposure to currency rate fluctuations. We record these contracts at their fair value as of the balance sheet date as either assets or liabilities with any changes in fair value in the period recorded in profit or loss (general and administrative expense) as these contracts are not designated or qualified under hedge accounting criteria. At June 30, 2019, we had outstanding foreign exchange currency contracts to purchase a total of Canadian \$16.3 million at an average rate of 1.3254 Canadian per U.S. dollar, resulting in an unrealized gain of Canadian \$0.2 million at June 30, 2019. This compares to outstanding foreign exchange currency contracts to purchase a total of Canadian \$17.4 million at December 31, 2018, resulting in an unrealized loss of Canadian (\$0.8) million at December 31, 2018.

Sales and marketing expenses

(Expressed in thousands of U.S. dollars)

Sales and marketing	2019	Three months ended June 30,		
		2018	\$ Change	% Change
Sales and marketing expense	\$ 1,840	\$ 2,058	\$ (218)	(11%)
Less: Depreciation and amortization expense	\$ (9)	\$ -	\$ (9)	(100%)
Less: Stock-based compensation expense	\$ (167)	\$ (166)	\$ (1)	(1%)
Sales and Marketing (cash operating cost)	\$ 1,664	\$ 1,892	\$ (228)	(12%)

(Expressed in thousands of U.S. dollars)

Sales and marketing	2019	Six months ended June 30,		
		2018	\$ Change	% Change
Sales and marketing expense	\$ 3,519	\$ 4,036	\$ (517)	(13%)
Less: Depreciation and amortization expense	\$ (16)	\$ -	\$ (16)	(100%)
Less: Stock-based compensation expense	\$ (309)	\$ (316)	\$ 7	2%
Sales and Marketing (cash operating cost)	\$ 3,194	\$ 3,720	\$ (526)	(14%)

Sales and Marketing (cash operating cost) is a non-GAAP measure. We use certain Non-GAAP measures to assist in assessing our financial performance. Non-GAAP measures do not have any standardized meaning prescribed by GAAP and are therefore unlikely to be comparable to similar measures presented by other companies. Sales and Marketing (cash operating cost) adjusts Sales and marketing expense for depreciation and amortization expense and stock-based compensation expense. See the reconciliation of the adjustments to Sales and marketing expense in the Non-GAAP Measures and Reconciliations section.

Sales and marketing expenses for the three months ended June 30, 2019 were \$1.8 million, a decrease of (\$0.2) million, or (11%), compared to the corresponding period of 2018. Excluding stock-based compensation expense of (\$0.2) million in each of the periods, sales and marketing cash operating costs (see Supplemental Non-GAAP Measures and Reconciliations) were \$1.7 million in the second quarter of 2019, a decrease of (\$0.2) million, or (12%), compared to the second quarter of 2018.

Sales and marketing expenses for the six months ended June 30, 2019 were \$3.5 million, a decrease of (\$0.5) million, or (13%), compared to the corresponding period of 2018. Excluding stock-based compensation expense of (\$0.3) million in each of the periods, sales and marketing cash operating costs (see Supplemental Non-GAAP Measures and

Reconciliations) were \$3.2 million in the first half of 2019, a decrease of (\$0.5) million, or (14%), compared to the first half of 2018.

The respective (\$0.2) million, or (12%), and the (\$0.5) million, or (14%), declines in sales and marketing cash operating costs (see Supplemental Non-GAAP Measures and Reconciliations) in the second quarter and first half of 2019, as compared to the second quarter and first half of 2018, were driven primarily by lower sales and marketing expenses in Protonex as a result of the disposition of our Power Manager assets and associated personnel in October 2018, combined with lower labour costs in Canada as a result of an approximate (4%) lower Canadian dollar, relative to the U.S. dollar, and the resulting positive impact on our Canadian operating cost base.

Stock-based compensation expense included in sales and marketing expense for the three and six months ended June 30, 2019 was \$0.2 million and \$0.3 million, respectively, consistent with the corresponding periods of 2018.

Other expense for the three and six months ended June 30, 2019 was \$0.1 million in each of the periods, compared to nil million and \$0.1 million, respectively, for the corresponding periods of 2018. The following table provides a breakdown of other expense for the reported periods:

<i>(Expressed in thousands of U.S. dollars)</i>		Three months ended June 30,			
	2019	2018	\$ Change	% Change	
Impairment loss (recovery) on trade receivables	\$ -	\$ 30	\$ (30)	(100%)	
Restructuring expense (recovery)	68	-	68	100%	
Acquisition charges	-	-	-	-	
Other expenses (recovery)	\$ 68	\$ 30	\$ 38	127%	

<i>(Expressed in thousands of U.S. dollars)</i>		Six months ended June 30,			
	2019	2018	\$ Change	% Change	
Impairment loss (recovery) on trade receivables	\$ -	\$ 30	\$ (30)	(100%)	
Restructuring expense	149	66	83	126%	
Acquisition charges	-	-	-	-	
Other expenses (recovery)	\$ 149	\$ 96	\$ 53	55%	

Restructuring expenses of \$0.1 million for the six months ended June 30, 2019 and 2018 relate primarily to cost reduction initiatives.

Net impairment loss (recovery) on trade receivables for the three and six months ended June 30, 2019 and 2018 were nominal. In the event that we are able to recover on an impaired trade receivable through legal or other means, the recovered amount is recognized in the period of recovery as a reversal of the impairment loss.

Finance income (loss) and other for the three and six months and year ended June 30, 2019 was \$0.9 million and \$1.8 million, respectively, compared to (\$1.0) million and (\$0.2) million, respectively, for the corresponding periods of 2018. The following tables provide a breakdown of finance and other income (loss) for the reported periods:

<i>(Expressed in thousands of U.S. dollars)</i>		Three months ended June 30,		
	2019	2018	\$ Change	% Change
Employee future benefit plan expense	\$ (56)	\$ (56)	\$ -	-%
Pension administration expense	(1)	(1)	-	-%
Investment and other income (loss)	1,006	177	829	468%
Foreign exchange gain (loss)	(4)	(1,089)	1,085	100%
Finance income (loss) and other	\$ 945	\$ (969)	\$ 1,914	197%

<i>(Expressed in thousands of U.S. dollars)</i>		Six months ended June 30,		
	2019	2018	\$ Change	% Change
Employee future benefit plan expense	\$ (112)	\$ (112)	\$ -	-%
Pension administration expense	(13)	(13)	-	-%
Investment and other income (loss)	2,104	272	1,832	674%
Foreign exchange gain (loss)	(201)	(391)	190	49%
Finance income (loss) and other	\$ 1,778	\$ (244)	\$ 2,022	828%

Employee future benefit plan expense for the three and six months ended June 30, 2019 were (\$0.1) million in each of the periods, consistent with the corresponding periods of 2018. Employee future benefit plan expense primarily represents the excess of expected interest cost on plan obligations in excess of the expected return on plan assets related to a curtailed defined benefit pension plan for certain former United States employees. Pension administration expense for the three and six months ended June 30, 2019 and 2018 were nominal in each of the periods and represent administrative costs incurred in managing the plan.

Investment and other income for the three and six months ended June 30, 2019 were \$1.0 million and \$2.1 million, respectively, compared to \$0.2 million and \$0.3 million, respectively, for the corresponding periods of 2018. Amounts were earned primarily on our cash and cash equivalents and have increased relatively proportionately with the increase in our overall cash balances.

Foreign exchange gains (losses) for the three and six months ended June 30, 2019 were nil million and (\$0.2) million, respectively, compared to (\$1.1) million and (\$0.4) million, respectively, for the corresponding periods of 2018. Foreign exchange gains and losses are attributable primarily to the effect of the changes in the value of the Canadian dollar, relative to the U.S. dollar, on our Canadian dollar-denominated net monetary position. Foreign exchange gains and losses impacted by the conversion of Ballard Power Systems Europe A/S' assets and liabilities from the Danish Kroner to the U.S. dollar at exchange rates in effect at each reporting date are recorded in other comprehensive income (loss).

Finance expense for the three and six months ended June 30, 2019 was (\$0.4) million and (\$0.7) million, respectively, compared to (\$0.1) million and (\$0.3) million, respectively, for the corresponding periods of 2018. As a result of the adoption of *IFRS 16 Leases* on January 1, 2019, Finance expense for 2019 represents the interest expense incurred on all of our right-of-use assets with a lease term of greater than 12-months, including our head office building, manufacturing facility, and related storage facilities in Burnaby, British Columbia, as well as similar right-of-use assets in all of our subsidiaries.

Finance expense for 2018 was limited primarily to the lease expense on our head office building in Burnaby, British Columbia.

IFRS 16 Leases replaces *IAS 17 Leases* introduces a single lessee accounting model and requires a lessee to recognize assets and liabilities for all leases with a term of more than 12 months, unless the underlying asset is of low value. A lessee is required to recognize a right-of-use asset representing its right to use the underlying asset and a lease liability representing its obligation to make lease payments. The most significant effect of the new standard is the lessee's recognition of the initial present value of unavoidable future lease payments as right-of-use lease assets and lease liabilities on the statement of financial position, including those for most leases that would currently be accounted for as operating leases.

Equity in income (loss) of investment in joint venture and associates for the three and six months ended June 30, 2019 was (\$2.9) million and (\$4.9) million, respectively, compared to (\$0.1) million in each of the corresponding periods of 2018. Equity in loss of investment in joint venture and associates relates to the pickup of 49% of the net income (loss) of Weichai Ballard JV as a result of our 49% ownership position, and 10% of the net income (loss) of Synergy Ballard JVCo as a result of our 10% ownership position. Both of these investments in China are accounted for using the equity method of accounting. The significant increase in the loss of investment in joint venture and associates in 2019 is due primarily to the increase in net loss in Weichai Ballard JV as they expense as incurred the ongoing \$90 million technology transfer agreement with Ballard as research and product development expense as they commence the establishment of operations. Weichai Ballard JV will manufacture Ballard's next-generation LCS fuel cell stack and LCS-based power modules for bus, commercial truck and forklift applications with exclusive rights in China.

Loss on sale of assets for the six months ended June 30, 2019 were (\$2.0) million. During the three months ended December 31, 2018, we recorded a loss on sale of assets of (\$4.0) million on the divestiture by Protonex of its Power Manager assets after estimating the amount of variable consideration included in the transaction price that is constrained to be \$2.0 million, as opposed to the maximum possible earn-out amount of \$11.25 million. During the three months ended March 31, 2019, we recorded an additional loss on sale of assets of (\$2.0) million after adjusting the estimated amount of variable consideration from \$2.0 million to nil. The estimate of the ultimate transaction price, including the estimate of the final amount of earn-out variable consideration that is considered constrained, will be reassessed each quarter-end during 2019. There was no change to this assessment in the three months ended June 30, 2019. Any change in the estimated transaction price will result in an adjustment to the above noted loss on sale of assets which will be recognized on a prospective basis.

Income tax expense for the three and six months ended June 30, 2019 and 2018 was nominal. Income tax expense relates primarily to withholding taxes in China deducted from proceeds earned on certain Chinese commercial contracts.

5.4 Summary of Quarterly Results

The following table provides summary financial data for our last eight quarters:

	Quarter ended,			
	Jun 30, 2019	Mar 31, 2019	Dec 31, 2018	Sep 30, 2018
<i>(Expressed in thousands of U.S. dollars, except per share amounts and weighted average shares outstanding which are expressed in thousands)</i>				
Revenues	\$ 23,651	\$ 16,008	\$ 28,477	\$ 21,574
Net income (loss) attributable to Ballard	\$ (6,971)	\$ (12,024)	\$ (11,475)	\$ (6,024)
Net income (loss) per share attributable to Ballard, basic and diluted	\$ (0.03)	\$ (0.05)	\$ (0.06)	\$ (0.03)
Weighted average common shares outstanding	232,469	232,012	207,047	179,153
	Jun 30, 2018	Mar 31, 2018	Dec 31, 2017	Sep 30, 2017
Revenues	\$ 26,445	\$ 20,090	\$ 40,257	\$ 31,854
Net income (loss) attributable to Ballard	\$ (4,323)	\$ (5,500)	\$ (2,887)	\$ (1,027)
Net income (loss) per share attributable to Ballard, basic and diluted	\$ (0.02)	\$ (0.03)	\$ (0.02)	\$ (0.01)
Weighted average common shares outstanding	178,727	178,186	177,803	176,438

Summary of Quarterly Results: There were no significant seasonal variations in our quarterly results. Variations in our net loss for the above periods were affected primarily by the following factors:

- **Revenues:** Variations in fuel cell product and service revenues reflect the demand and timing of our customers' fuel cell vehicle, bus and fuel cell product deployments as well as the demand and timing of their engineering services projects. Variations in fuel cell product and service revenues also reflect the timing of work performed and the achievements of milestones under long-term fixed price contracts. Revenues were positively impacted in the fourth quarter of 2017 as we fulfilled an \$18 million supply contract (announced on June 5, 2017) for 400 FCveloCity® fuel cell engines and consisting primarily of shipments of FCveloCity®-MD 30-kilowatt fuel cell products and MEAs.
- **Operating expenditures:** Operating expenses were negatively impacted in the fourth quarter of 2018 by restructuring expenses of (\$0.4) million related to a change in operations leadership combined with severance obligations paid to departed employees at Protonex as a result of the disposition of the Power Manager assets and associated personnel. Operating expenses also include the impact of changes in the value of the Canadian dollar, versus the U.S. dollar, on our Canadian dollar denominated expenditures.
- **Net income (loss):** Net income (loss) for the first quarter of 2019 and the fourth quarter of 2018 was negatively impacted by a loss on sale of assets of (\$2.0) million and (\$4.0) million, respectively, as a result of the divestiture of our Power Manager assets to Revision on October 5, 2018. Net income (loss) for the fourth quarter of 2017 was negatively impacted by a loss on sale of assets of (\$0.5) million as we sold certain SOFC fuel cell inventory to Upstart for nominal proceeds. Net loss in the fourth quarter of 2017 was also negatively impacted by impairment charges of (\$1.5) million consisting of a (\$1.2) million impairment charge on intangible assets and a (\$0.3) million impairment

charge on property, plant and equipment as we wrote-down certain SOFC fuel cell assets to their estimated net realizable value of \$0.05 million.

6. CASH FLOWS, LIQUIDITY AND CAPITAL RESOURCES

6.1 Summary of Cash Flows

Cash and cash equivalents were \$163.7 million at June 30, 2019, compared to \$192.2 million at December 31, 2018. The (\$28.6) million decrease in cash and cash equivalents in 2019 was driven by net losses (excluding non-cash items) of (\$6.7) million, net working capital outflows of (\$2.0) million, an equity investment in Weichai Ballard JV of (\$14.5) million, purchases of property, plant and equipment of (\$4.9) million, and by finance lease repayments of (\$1.0) million. These 2019 outflows were partially offset by net proceeds received from share purchase option exercises of \$0.6 million.

6.2 Cash Provided by (Used by) Operating Activities

For the three months ended June 30, 2019, cash provided by (used in) operating activities was \$1.7 million, consisting net working capital inflows of \$2.8 million, partially offset by cash operating losses of (\$1.1) million. For the three months ended June 30, 2018, cash provided by (used in) operating activities was (\$16.9) million, consisting of cash operating losses of (\$1.6) million and net working capital outflows of (\$15.3) million. The \$18.7 million increase in cash provided by (used in) operating activities in the second quarter of 2019, as compared to the second quarter of 2018, was driven by the relative improvement in cash operating losses of \$0.5 million and by the relative improvement in working capital requirements of \$18.1 million. The relative \$0.5 million improvement in cash operating losses in the second quarter of 2019 was due primarily to higher equity investment losses in joint venture and associates of \$2.9 million which are included in Adjusted EBITDA but excluded from cash operating losses, and by higher finance and other income of \$1.9 million due primarily to increased investment income and lower foreign exchange gains (losses). These increases were partially offset by the increase in Adjusted EBITDA loss of (\$4.2) million.

In the second quarter of 2019, net working capital inflows of \$2.8 million were driven primarily by higher accounts payable and accrued liabilities of \$5.7 million as a result of the timing of supplier payments for property, plant and equipment and inventory purchases, and by higher deferred revenue of \$4.8 million as we collected net pre-payments on certain Heavy-Duty Motive and Technology Solutions contracts in advance of work performed. These second quarter of 2019 inflows were partially offset by higher accounts receivable of (\$5.9) million primarily as a result of the timing of revenues and the related customer collections, and by higher prepaid expenses of (\$1.9) million as we made initial supplier payment deposits primarily for purpose built property, plant and equipment.

In the second quarter of 2018, net working capital outflows of (\$15.3) million were driven by higher accounts receivable of (\$11.9) million primarily as a result of the timing of revenues and the related customer collections, and by higher inventory of (\$4.1) million primarily to support expected Heavy-Duty Motive shipments in the second half of 2018. These second quarter of 2018 outflows were partially offset by higher accrued warranty obligations of \$1.2 million due to increased Heavy-Duty Motive product shipments.

For the six months ended June 30, 2019, cash used in operating activities was (\$8.7) million, consisting of cash operating losses of (\$6.7) million and net working capital outflows of (\$2.0) million. For the six months ended June 30, 2018, cash used in operating activities was (\$24.1) million, consisting of cash operating losses of (\$4.4) million and net working capital outflows of (\$19.7) million. The \$15.4 million decline in cash used in operating activities in the first half of 2019, as compared to the first half of 2018, was driven by relative decline in working capital requirements of \$17.7 million, partially offset by the relative increase in cash operating losses of (\$2.3) million. The relative (\$2.3) million increase in cash operating losses in the first half of 2019 was due primarily to the increase in Adjusted EBITDA loss of (\$8.9) million. This net (loss) increase in 2019 was partially offset by higher equity investment losses in joint venture and associates of \$4.9 million which are included in Adjusted EBITDA but excluded from cash operating losses, and by increased finance and other income of \$2.0 million due primarily to higher investment income.

In the first half of 2019, net working capital outflows of (\$2.0) million were driven by higher accounts receivable of (\$4.0) million primarily as a result of the timing of revenues and the related customer collections, by higher prepaid expenses of (\$2.2) million as we made initial supplier payment deposits primarily for purpose built property, plant and equipment, and by higher inventory of (\$0.6) million primarily to support expected Heavy-Duty Motive shipments in the last half of 2019. These first half of 2019 outflows were partially offset by higher deferred revenue of \$4.6 million as we collected net pre-payments on certain Heavy-Duty Motive and Technology Solutions contracts in advance of work performed, and by higher accrued warranty obligations of \$0.7 million primarily on Heavy-Duty Motive product shipments.

In the first half of 2018, net working capital outflows of (\$19.7) million were driven by higher inventory of (\$10.9) million primarily to support expected Heavy-Duty Motive shipments in the second half of 2018, by lower accounts payable and accrued liabilities of (\$7.6) million as a result of the timing of supplier payments and annual compensation awards, and by higher accounts receivable of (\$2.7) million primarily as a result of the timing of revenues and the related customer collections. These first half of 2018 outflows were partially offset by higher accrued warranty obligations of \$1.0 million due to increased Heavy-Duty Motive product shipments and by higher deferred revenue of \$0.5 million as we collected net pre-payments on certain Heavy-Duty Motive and Technology Solutions contracts in advance of work performed.

6.3 Cash Provided by (Used by) Investing Activities

Investing activities resulted in net cash outflows of (\$3.0) million and (\$19.4) million, respectively, for the three and six months ended June 30, 2019, compared to net cash outflows of (\$1.2) million and (\$2.0) million, respectively for the corresponding periods of 2018.

Investing activities in the first half of 2019 of (\$19.4) million consist primarily of investments in associated companies of (\$14.5) million paid as planned for the second equity contribution in our 49% investment in Weichai Ballard JV, and capital expenditures of (\$4.9) million incurred primarily for production and test equipment.

Investing activities in the first half of 2018 of (\$2.0) million consist of capital expenditures of (\$0.8) million primarily for production and test equipment.

6.4 Cash Provided by (Used by) Financing Activities

Financing activities resulted in net cash inflows (outflows) of nil million and (\$0.4) million, respectively, for the three and six months ended June 30, 2019, compared to net cash inflows (outflows) of \$0.1 million and \$0.7 million, respectively, for the corresponding periods of 2018.

Financing activities in the first half of 2019 of (\$0.4) million consist of finance lease payments of (\$1.0) million, partially offset by proceeds from share purchase options of \$0.6 million.

Financing activities in the first half of 2018 of \$0.7 million consist of proceeds from share purchase warrant exercises of \$0.2 million, proceeds from share purchase option exercises of \$0.8 million, partially offset by finance lease payments of (\$0.3) million.

6.5 Liquidity and Capital Resources

At June 30, 2019, we had total liquidity of \$163.7 million. We measure liquidity as our net cash position, consisting of the sum of our cash, cash equivalents and short-term investments of \$165.0 million, net of amounts drawn on our \$7 million Canadian demand revolving facility ("Operating Facility") of nil. The Operating Facility is available to be used in helping to finance our short term working capital requirements and is secured by a hypothecation of our cash, cash equivalents and short-term investments.

We also have a \$1.8 million Canadian capital leasing facility ("Leasing Facility") which is available to be used to finance the acquisition and / or lease of operating equipment and is secured by a hypothecation of our cash, cash equivalents and short-term investments. As of March 31, 2019, nothing was outstanding on the Leasing Facility.

Our liquidity objective is to maintain cash balances sufficient to fund at least six quarters of forecasted cash used by operating activities and expected joint venture capital contributions at all times. Our strategy to attain this objective is to continue our drive to attain profitable operations that are sustainable by executing a business plan that continues to focus on Fuel Cell Products and Services revenue growth, improving overall gross margins, maintaining discipline over Cash Operating Costs, managing working capital requirements, and securing additional financing to fund our operations as needed until we do achieve profitable operations that are sustainable. We believe that we currently have adequate liquidity in cash and working capital to achieve our liquidity objective.

Failure to achieve or maintain this liquidity objective could have a material adverse effect on our financial condition and results of operations including our ability to continue as a going concern. There are also various risks and uncertainties affecting our ability to achieve this liquidity objective including, but not limited to, the market acceptance and rate of commercialization of our products, the ability to successfully execute our business plan, and general global economic conditions, certain of which are beyond our control. While we continue to make significant investments in product development and market development activities necessary to commercialize our products, make increased investments in working capital as we grow our business, and make ongoing capital contributions in support of our

investment in Weichai Ballard JV, our actual liquidity requirements will also vary and will be impacted by our relationships with our lead customers and strategic partners including their ability to successfully finance and fund their operations and programs and agreements with us, our success in developing new channels to market and relationships with customers, our success in generating revenue growth from near-term product, service and licensing opportunities, our success in managing our operating expense and working capital requirements, foreign exchange fluctuations, and the progress and results of our research, development and demonstration programs.

We may also choose to pursue additional liquidity through the issuance of debt or equity in private or public market financings. To enable the timely issuance of equity securities in the public market, Ballard has a shelf prospectus on file with the securities regulators in Canada and the United States, expiring in July 2020. The Prospectus was filed in each of the provinces and territories of Canada, except Quebec, and a corresponding shelf registration statement on Form F-10 (Registration Statement) was also filed with the United States Securities and Exchange Commission ("SEC"). These filings enable offerings of securities up to an aggregate initial offering price of \$150 million at any time during the 25-month period that the Prospectus remains effective.

No assurance can be given that any such additional liquidity will be available or that, if available, it can be obtained on terms favorable to the Company. If any securities are offered under the Prospectus and/or Registration Statement, the terms of any such securities and the intended use of the net proceeds resulting from such offering would be established at the time of any offering and would be described in a Prospectus supplement filed with applicable Canadian securities regulators and/or the SEC, respectively, at the time of such an offering.

7. OTHER FINANCIAL MATTERS

7.1 Off-Balance Sheet Arrangements and Contractual Obligations

Periodically, we use forward foreign exchange and forward platinum purchase contracts to manage our exposure to currency rate fluctuations and platinum price fluctuations. We record these contracts at their fair value as either assets or liabilities on our balance sheet. Any changes in fair value are either (i) recorded in other comprehensive income if formally designated and qualified under hedge accounting criteria; or (ii) recorded in profit or loss (general and administrative expense) if either not designated, or not qualified, under hedge accounting criteria. At June 30, 2019, we had outstanding foreign exchange currency contracts to purchase a total of Canadian \$16.3 million at an average rate of 1.3254 Canadian per U.S dollar, resulting in an unrealized gain of Canadian \$0.2 million at June 30, 2019. The outstanding foreign exchange currency contracts have not been designated under hedge accounting.

At June 30, 2019, we did not have any other material obligations under guarantee contracts, retained or contingent interests in transferred assets, outstanding derivative instruments or non-consolidated variable interests.

At June 30, 2019, we had the following contractual obligations and commercial commitments (including capital contribution commitments to Weichai Ballard JV):

Contractual Obligations	Total	Payments due by period,			
		Less than one year	1-3 years	4-5 years	After 5 years
Operating leases	\$ -	\$ -	\$ -	\$ -	\$ -
Finance leases	26,429	3,592	7,380	7,306	8,151
Asset retirement obligations	1,901	-	-	-	1,901
Capital contributions to Weichai Ballard JV	49,941	19,798	27,111	3,032	-
Total contractual obligations	\$ 78,271	\$ 23,390	\$ 34,491	\$ 10,338	\$ 10,052

In addition, we have outstanding commitments of \$7.6 million at June 30, 2019 related primarily to purchases of property, plant and equipment. Capital expenditures and expenditures on other intangible assets pertain to our regular operations and are expected to be funded through cash on hand.

In connection with the acquisition of intellectual property from UTC in 2014, we have a royalty obligation in certain circumstances to pay UTC a portion of any future intellectual property sale and licensing income generated from certain of our intellectual property portfolio for a period of 15-years expiring in April 2029. No royalties were paid to UTC in the six months ended June 30, 2019 and in the years ended December 31, 2018 and 2017.

As of June 30, 2019, we retain a previous funding obligation to pay royalties of 2% of revenues (to a maximum of Canadian \$5.4 million) on sales of certain fuel cell products for commercial distributed utility applications. No royalties have been incurred to date as a result of this agreement. We also retain a previous funding obligation to pay royalties of 2% of revenues (to a maximum of Canadian \$2.2 million) on sales of certain fuel cell products for commercial transit applications. No royalties have been incurred to date as a result of this agreement.

In the ordinary course of business or as required by certain acquisition or disposition agreements, we are periodically required to provide certain indemnities to other parties. At June 30, 2019, we have not accrued any significant amount owing, or receivable, as a result of any indemnity agreements undertaken in the ordinary course of business.

7.2 Related Party Transactions

Related parties include our 49% owned equity accounted investee, Weichai Ballard JV, and our 10% owned equity accounted investee, Synergy Ballard JVCo. Transactions between us and our subsidiaries are eliminated on consolidation. For the three and six months ended June 30, 2019 and 2018, related party transactions and balances with Weichai Ballard JV and Synergy Ballard JVCo total as follows:

Transactions with related parties	Three Months Ended June 30,	
	2019	2018
Revenues	\$ 7,494	\$ 7,703
Cost of goods sold and operating expense	\$ -	\$ -

<i>(Expressed in thousands of U.S. dollars)</i>	Six months Ended June 30,	
Transactions with related parties	2019	2018
Revenues	\$ 11,498	\$ 15,693
Cost of goods sold and operating expense	\$ -	\$ -

<i>(Expressed in thousands of U.S. dollars)</i>	As at June 30,	As at December 31,
Balances with related parties	2019	2018
Accounts receivable	\$ 6,859	\$ 1,604
Investments	\$ 23,628	\$ 13,989
Deferred revenue	\$ (15,215)	\$ (10,896)

We also provide key management personnel, being board directors and executive officers, certain benefits, in addition to their salaries. Key management personnel also participate in the Company's share-based compensation plans. Key management personnel compensation is summarized in note 31 to our annual consolidated financial statements for the year ended December 31, 2018.

7.3 Outstanding Share and Equity Information

As at July 31, 2019	
Common share outstanding	232,639,778
Warrants outstanding	-
Options outstanding	5,965,901
DSU's outstanding	787,203
RSU's / PSU's outstanding (subject to vesting and performance criteria)	1,308,155

8. ACCOUNTING MATTERS

8.1 Overview

Our consolidated financial statements are prepared in accordance with IFRS, which require us to make estimates and assumptions that affect the application of accounting policies and the reported amounts of assets, liabilities, income and expenses. Actual results may differ from those estimates. Estimates and underlying assumptions are reviewed on an ongoing basis. Revisions to accounting estimates are recognized in the period in which the estimates are revised and in any future periods affected.

8.2 Critical Judgments in Applying Accounting Policies

Critical judgments that we have made in the process of applying our accounting policies and that have the most significant effect on the amounts recognized in the consolidated financial statements is limited to our assessment of our ability to continue as a going concern (See Note 2 (e) to our condensed consolidated interim financial statements).

Our significant accounting policies are detailed in note 4 to our annual consolidated financial statements for the year ended December 31, 2018 except as described below. These changes in accounting policies are also expected to be reflected in the Company's consolidated financial statements as at and for the year ending December 31, 2019.

Effective January 1, 2019, we have initially adopted *IFRS 16 Leases* and *IFRIC Interpretation 23 Uncertainty over Income Tax Treatments*. The effect of initially applying *IFRS 16 Leases* had a significant impact on our financial statements which is detailed below, whereas the adoption of *IFRIC Interpretation 23 Uncertainty over Income Tax Treatments* did not have a material impact on our financial statements. A number of other new standards and interpretations are also effective from January 1, 2019 but they did not have a material impact on our financial statements. Changes to significant accounting policies are detailed below and in note 4 to our condensed consolidated interim financial statements.

8.3 Key Sources of Estimation Uncertainty

The following are key assumptions concerning the future and other key sources of estimation uncertainty that have a significant risk of resulting in a material adjustment to the reported amount of assets, liabilities, income and expenses within the next financial year.

REVENUE RECOGNITION

Revenues are generated primarily from product sales, the license and sale of intellectual property and fundamental knowledge, and the provision of engineering services and technology transfer services. Product revenues are derived primarily from standard product sales contracts and from long-term fixed price contracts. Intellectual property and fundamental knowledge license revenues are derived primarily from standard licensing and technology transfer agreements. Engineering service and technology transfer service revenues are derived primarily from cost-plus reimbursable contracts and from long-term fixed price contracts.

Revenue is recognized when a customer obtains control of the goods or services. Determining the timing of the transfer of control, at a point in time or over time, requires judgment.

On standard product sales contracts, revenues are recognized when customers obtain control of the product, that is when transfer of title and risks and rewards of ownership of goods have passed, and when obligation to pay is considered certain. Revenue is recognized at that point in time. Provisions for warranties are made at the time of sale. Revenue recognition for standard product sales contracts does not usually involve significant estimates.

On standard licensing and technology transfer agreements, revenues are recognized on the transfer of rights to a licensee, when it is determined to be distinct from other performance obligations, and if the customer can direct the use of, and obtain substantially all of the remaining benefits from the license as it exists at the time of transfer. In other cases, the proceeds are considered to relate to the right to use the asset over the license period and the revenue is recognized over that period. If it is determined that the license is not distinct from other performance obligations, revenue is recognized over time as the customer simultaneously receives and consumes the benefit. Revenue recognition for standard license and sale agreements does not usually involve significant estimates.

On cost-plus reimbursable contracts, revenues are recognized as costs are incurred, and include applicable fees earned as services are provided. Revenue recognition for cost-plus

reimbursable contracts does not usually involve significant estimates.

On long-term fixed price contracts, the customer controls all of the work in progress as the services are being provided. This is because under these contracts, the deliverables are made to a customer's specification, and if a contract is terminated by the customer, then the Company is entitled to reimbursement of the costs incurred to date plus the applicable gross margin. Therefore, revenue from these contracts and the associated costs are recognized as the costs are incurred over time.

On long-term fixed price contracts, revenues are recognized over time typically on a percentage-of-completion basis, which consists of recognizing revenue for a performance obligation on a given contract proportionately with its percentage of completion at any given time. The percentage of completion is determined by dividing the cumulative costs incurred as at the balance sheet date by the sum of incurred and anticipated costs for completing a contract. The cumulative effect of changes to anticipated revenues and anticipated costs for completing a contract are recognized in the period in which the revisions are identified. If the anticipated costs exceed the anticipated revenues on a contract, such loss is recognized in its entirety in the period it becomes known.

- The determination of anticipated costs for completing a contract is based on estimates that can be affected by a variety of factors such as variances in the timeline to completion, the cost of materials, the availability and cost of labour, as well as productivity.
- The determination of potential revenues includes the contractually agreed amount and may be adjusted based on the estimate of our attainment on achieving certain defined contractual milestones. Management's estimation is required in determining the amount of consideration for which the Company is expected to be entitled and in determining when a performance obligation has been met.

Estimates used to determine revenues and costs of long-term fixed price contracts involve uncertainties that ultimately depend on the outcome of future events and are periodically revised as projects progress. There is a risk that a customer may ultimately disagree with our assessment of the progress achieved against milestones, or that our estimates of the work required completing a contract may change.

During the three and six months ended June 30, 2019 and 2018, there were no material adjustments to revenues relating to revenue recognized in a prior period.

ASSET IMPAIRMENT

The carrying amounts of our non-financial assets other than inventories are reviewed at each reporting date to determine whether there is any indication of impairment. If any such indication exists, then the asset's recoverable amount is estimated. For goodwill and intangible assets that have indefinite useful lives, the recoverable amount is estimated at least annually.

The recoverable amount of an asset or cash-generating unit is the greater of its value in use and its fair value less costs to sell. In assessing value in use, the estimated future cash flows are discounted to their present value using a pre-tax discount rate that reflects current market assessments of the time value of money and the risks specific to the asset.

In assessing fair value less costs to sell, the price that would be received on the sale of an asset in an orderly transaction between market participants at the measurement date is estimated. For the purposes of impairment testing, assets that cannot be tested individually are grouped together into the smallest group of assets that generates cash inflows from continuing use that are largely independent of the cash inflows of other groups of assets. The allocation of goodwill to cash-generating units reflects the lowest level at which goodwill is monitored for internal reporting purposes. Many of the factors used in assessing fair value are outside the control of management and it is reasonably likely that assumptions and estimates will change from period to period. These changes may result in future impairments. For example, our revenue growth rate could be lower than projected due to economic, industry or competitive factors, or the discount rate used in our value in use model could increase due to a change in market interest rates. In addition, future goodwill impairment charges may be necessary if our market capitalization decreased due to a decline in the trading price of our common stock, which could negatively impact the fair value of our business.

An impairment loss is recognized if the carrying amount of an asset or its cash-generating unit exceeds its estimated recoverable amount. Impairment losses are recognized in net loss. Impairment losses recognized in respect of the cash-generating units are allocated first to reduce the carrying amount of any goodwill allocated to the units, and then to reduce the carrying amounts of the other assets in the unit on a pro-rata basis.

An impairment loss in respect of goodwill is not reversed. In respect of other assets, impairment losses recognized in prior periods are assessed at each reporting date for any indications that the cumulative loss has decreased or no longer exists. An impairment loss is reversed only to the extent that the asset's carrying amount does not exceed the carrying amount that would have been determined, net of depreciation or amortization, if no impairment loss had been recognized.

We perform the annual review of goodwill as at December 31 of each year, more often if events or changes in circumstances indicate that it might be impaired. Based on the impairment test performed as at December 31, 2018 and our assessment of current events and circumstances, we have concluded that no goodwill impairment test was required for the three and six months ended June 30, 2019.

In addition to the above goodwill impairment test, we perform a quarterly assessment of the carrying amounts of our non-financial assets (other than inventories) to determine whether there is any indication of impairment. During the three months ended December 31, 2018, we recorded a loss on sale of assets of (\$4.0) million on the divestiture by Protonex of its Power Manager assets after estimating the amount of variable consideration included in the transaction price that is constrained to be \$2.0 million, as opposed to the maximum possible earn-out amount of \$11.25 million. During the three months ended March 31, 2019, we recorded an additional loss on sale of assets of (\$2.0) million after adjusting the estimated amount of variable consideration from \$2.0 million to nil. The estimate of the ultimate transaction price, including the estimate of the final amount of earn-out variable consideration that is considered constrained, will be reassessed each quarter-end during 2019. Any change in the estimated transaction price will result in an adjustment to the above noted loss on sale of assets which will be recognized on a

prospective basis.

WARRANTY PROVISION

A provision for warranty costs is recorded on product sales at the time of shipment. In establishing the accrued warranty liabilities, we estimate the likelihood that products sold will experience warranty claims and the cost to resolve claims received.

In making such determinations, we use estimates based on the nature of the contract and past and projected experience with the products. Should these estimates prove to be incorrect, we may incur costs different from those provided for in our warranty provisions. During the three and six months ended June 30, 2019, we recorded provisions to accrued warranty liabilities of \$0.9 million and \$1.3 million, respectively, for new product sales, compared to \$1.3 million and \$1.5 million for the three and six months ended June 30, 2018.

We review our warranty assumptions and make adjustments to accrued warranty liabilities quarterly based on the latest information available and to reflect the expiry of contractual obligations. Adjustments to accrued warranty liabilities are recorded in cost of product and service revenues. As a result of these reviews and the resulting adjustments, our warranty provision and cost of revenues were adjusted by nominal amounts for the three and six months ended June 30, 2019, compared to an upwards adjustment of (\$0.2) million for the three and six months ended June 30, 2018.

INVENTORY PROVISION

In determining the lower of cost and net realizable value of our inventory and establishing the appropriate provision for inventory obsolescence, we estimate the likelihood that inventory carrying values will be affected by changes in market pricing or demand for our products and by changes in technology or design which could make inventory on hand obsolete or recoverable at less than cost. We perform regular reviews to assess the impact of changes in technology and design, sales trends and other changes on the carrying value of inventory. Where we determine that such changes have occurred and will have a negative impact on the value of inventory on hand, appropriate provisions are made. If there is a subsequent increase in the value of inventory on hand, reversals of previous write-downs to net realizable value are made. Unforeseen changes in these factors could result in additional inventory provisions, or reversals of previous provisions, being required. During the three and six months ended June 30, 2019, net negative inventory adjustments of (\$0.5) million and (\$0.6) million, respectively, were recorded as a recovery (charge) to cost of product and service revenues, compared to net negative inventory adjustments of (\$0.3) million for the three and six months ended June 30, 2018.

FINANCIAL ASSETS INCLUDING IMPAIRMENT OF TRADE RECEIVABLES

A financial asset is classified as measured at: amortized cost; fair value through other comprehensive income ("FVOCI") or fair value through profit or loss ("FVTPL"). The classification of financial assets is generally based on the business model in which a financial asset is managed and its contractual cash flow characteristics. Derivatives embedded in contracts where the host is a financial asset in the scope of the standard are never separated. Instead, the hybrid financial instrument as a whole is assessed for classification.

The Company's financial assets which consist primarily of cash and cash equivalents, trade and other receivables, and contract assets, are classified at amortized cost.

An 'expected credit loss' ("ECL") model applies to financial assets measured at amortized cost and debt investments at FVOCI, but not to investments in equity instruments. The Company's financial assets measured at amortized cost and subject to the ECL model consist primarily of trade receivables and contract assets.

In applying the ECL model, loss allowances are measured on either of the following bases:

- 12-month ECLs: these are ECLs that result from possible default events within the 12 months after the reporting date; and
- Lifetime ECLs: these are ECLs that result from all possible default events over the expected life of a financial instrument.

We have elected to measure loss allowances for trade receivables and contract assets at an amount equal to lifetime ECLs.

When determining whether the credit risk of a financial asset has increased significantly since initial recognition and when estimating ECLs, we consider reasonable and supportable information that is relevant and available without undue cost or effort. This includes both quantitative and qualitative information and analysis, based on our historical experience and informed credit assessment and including forward-looking information.

ECLs are a probability-weighted estimate of credit losses. Credit losses are measured as the present value of all cash shortfalls (i.e. the difference between the cash flows due to the entity in accordance with the contract and the cash flows that we expect to receive). ECLs are discounted at the effective interest rate of the financial asset. At each reporting date, we assess whether financial assets carried at amortized cost are credit-impaired. A financial asset is 'credit-impaired' when one or more events that have a detrimental impact on the estimated future cash flows of the financial asset have occurred. Loss allowances for financial assets measured at amortized cost are deducted from the gross carrying amount of the assets. Impairment (losses) recoveries related to trade receivables and contract assets are presented separately in the statement of profit or loss. During the three and six months ended June 30, 2019 and 2018, nominal net impairment (charges) on trade receivables and contract assets were recorded in other operating income.

LEASES

We apply judgment in determining whether a contract contains an identified asset. The identified asset should be physically distinct or represent substantially all of the capacity of the asset, and should provide the right to substantially all of the economic benefits from the use of the asset. We also apply judgment in determining whether or not we have the right to control the use of the identified asset. We have that right when we have the decision-making rights that are most relevant to changing how and for what purpose the asset is used. In rare cases where the decisions about how and for what purpose the asset is used are predetermined, we have the right to direct the use of the asset if we have the right to operate the asset or if the asset is designed in a way that predetermines how and for what purpose the asset will be used.

We apply judgment in determining the incremental borrowing rate used to measure our

lease liability for each lease contract, including an estimate of the asset-specific security impact. The incremental borrowing rate should reflect the interest that would have to be paid to borrow at a similar term and with a similar security.

The lease liability is subsequently increased by the interest cost on the lease liability and decreased by lease payments made. It is re-measured when there is a change in future lease payments arising from a change in an index or rate, a change in the estimate of the amount expected to be payable under a residual value guarantee, or as appropriate, changes in the assessment of whether a purchase or extension option is reasonably certain to be exercised or a termination option is reasonably certain not to be exercised.

We have applied judgment to determine the lease term for some lease contracts in which we are a lessee that include renewal options. At lease commencement, we assess whether it is reasonably certain to exercise any of the extension options based on the expected economic return from the lease. We periodically reassess whether we are reasonably certain to exercise the options and account for any changes at the date of the reassessment. The assessment of whether we are reasonably certain to exercise such options impacts the lease term which significantly affects the amount of lease liabilities and right-of-use assets recognized. We estimate the lease term by considering the facts and circumstances that can create an economic incentive to exercise an extension option, or not exercise a termination option. Certain qualitative and quantitative assumptions are made when deriving the value of the economic incentive.

EMPLOYEE FUTURE BENEFITS

The present value of our defined benefit obligation is determined by discounting the estimated future cash outflows using interest rates of high-quality corporate bonds that have terms to maturity approximating the terms of the related pension liability. Determination of benefit expense requires assumptions such as the discount rate to measure obligations, expected plan investment performance, expected healthcare cost trend rate, and retirement ages of employees. Actual results will differ from the recorded amounts based on these estimates and assumptions.

INCOME TAXES

We use the asset and liability method of accounting for income taxes. Under this method, deferred income taxes are recognized for the deferred income tax consequences attributable to differences between the financial statement carrying values of assets and liabilities and their respective income tax bases (temporary differences) and for loss carry-forwards. The resulting changes in the net deferred tax asset or liability are included in income.

Deferred tax assets and liabilities are measured using enacted, or substantively enacted, tax rates expected to apply to taxable income in the years in which temporary differences are expected to be recovered or settled. The effect on deferred income tax assets and liabilities, of a change in tax rates, is included in income in the period that includes the substantive enactment date. Deferred income tax assets are reviewed at each reporting period and are reduced to the extent that it is no longer probable that the related tax benefit will be realized. In circumstances in which there is uncertainty over income tax treatments for current and / or deferred tax liabilities and asset, we contemplate whether uncertain tax treatments should be considered separately, or together as a group, based on which

approach provides better predictions of the resolution. We then determine if it is probable that the tax authorities will accept the uncertain tax treatment; and if it is not probable that the uncertain tax treatment will be accepted, we measure the tax uncertainty based on the most likely amount of expected value, depending on whichever method better predicts the resolution of the uncertainty.

As of June 30, 2019, we have not recorded any deferred income tax assets on our consolidated statement of financial position.

8.4 Recently Adopted Accounting Policy Changes

Effective January 1, 2019, we have initially adopted *IFRS 16 Leases* and *IFRIC Interpretation 23 Uncertainty over Income Tax Treatments*. The effect of initially applying *IFRS 16 Leases* had a significant impact on our financial statements which is detailed below, whereas the adoption of *IFRIC Interpretation 23 Uncertainty over Income Tax Treatments* did not have a material impact on our financial statements. A number of other new standards and interpretations were also effective from January 1, 2019 but they did not have a material impact on our financial statements.

IFRS 16 – LEASES

IFRS 16 Leases replaces *IAS 17 Leases and the related interpretations* and introduces a single lessee accounting model and requires a lessee to recognize assets and liabilities for all leases with a term of more than 12 months, unless the underlying asset is of low value. A lessee is required to recognize a right-of-use asset representing its right to use the underlying asset and a lease liability representing its obligation to make lease payments. This standard substantially carried forward the lessor accounting requirements of *IAS 17 Leases*, while requiring enhanced disclosures to be provided by lessors. Other areas of the lease accounting model have been impacted, including the definition of a lease.

The most significant effect of the new standard is the lessee's recognition of the initial present value of unavoidable future lease payments as right-of-use lease assets and lease liabilities on the statement of financial position, including those for most leases that would currently be accounted for as operating leases. Both leases with durations of 12 months or less and leases for low-value assets may be exempted.

The presentation on the statement of income and other comprehensive income required by the new standard results in the presentation of most lease expenses as depreciation of right-of-use lease assets and financing costs arising from lease liabilities, rather than as a part of operating expenses; reported results from operating activities would thus be higher under the new standard. Relative to the results of applying the current standard, although actual cash flows will be unaffected, the lessee's statement of cash flows will reflect increases in cash flows from operating activities offset equally by decreases in cash flows from financing activities. This is the result of the presentation of the payments of the "principal" component of leases that would currently be accounted for as operating leases as a cash flow use within financing activities under the new standard.

We have adopted *IFRS 16 Leases* using the modified retrospective approach from January 1, 2019, and therefore have not restated comparatives for the 2018 reporting period, as permitted under the specific transitional provisions in the standard. The reclassifications and

the adjustments arising from the new leasing rules are therefore recognized in retained earnings at January 1, 2019.

We have also elected not to reassess whether a contract is, or contains a lease at the date of initial application on January 1, 2019. Instead, for contracts entered into before January 1, 2019, we have relied on our assessment made applying *IAS 17 Leases and IFRIC 4 Determining whether an Arrangement contains a Lease*. The definition of a lease under *IFRS 16 Leases* was applied only to contracts entered into or changed on or after January 1, 2019. On adoption of IFRS 16, we recognized lease liabilities in relation to leases which had previously been classified as 'operating leases' under the principles of *IAS 17 Leases*. These liabilities were measured at the present value of the remaining lease payments, discounted using the Corporation's incremental borrowing rate as of January 1, 2019. Right-of-use assets are measured at an amount equal to the lease liability, adjusted by the amount of any prepaid or accrued lease payments.

We also used the following practical expedients when applying *IFRS 16 Leases* to leases previously classified as operating leases under *IAS 17 Leases*:

- Applied a single discount rate to a portfolio of leases with reasonably similar characteristics;
- Reliance on previous assessments on whether leases are onerous;
- Applied the exemption not to recognize right-of-use assets and liabilities for leases with less than 12 months of lease term;
- The exclusion of initial direct costs for the measurement of the right-of-use asset at the date of initial application; and
- The use of hindsight in determining the lease term where the contract contains options to extend or terminate the lease.

For leases previously classified as finance leases, we recognized the carrying amount of the lease asset and lease liability immediately before transition as the carrying amount of the right of use asset and the lease liability at the date of initial application. The measurement principles of *IFRS 16 Leases* are only applied after that date.

Under *IFRS 16 Leases*, we are required to assess the classification of a sub-lease with reference to the right-of-use asset, not the underlying asset. On transition, we concluded that sub-lease contracts previously classified as operating leases under *IAS 17 Leases* are also operating leases under *IFRS 16 Leases*.

Under IFRS 16 Leases, we continue to account for the sale-and-leaseback transaction for the manufacturing, research and office facility in Burnaby, BC completed in 2010 as a sale-and-leaseback transaction. At the time of the transaction, it was concluded that the building component of the sale-and-leaseback qualified as a finance lease and the land component was bifurcated and treated as an operating lease. As such, there is no adjustment to the right-of-use asset and the related lease liability of the building component upon transition. However, as the land component now meets the definition of a right-of-use asset under IFRS 16, the land component of the sale-and-leaseback transaction has now been accounted for as a finance lease with the land component now recognized as a right-of-use asset with a related lease liability recognized.

As a result of applying *IFRS 16 Leases*, in relation to the leases that were previously classified as operating leases, we recognized \$11.4 million of additional right-of-use assets, net of deferred lease inducements of \$2.3 million and trade and other payables of \$0.3 million, and \$14.0 million of additional lease liabilities as at January 1, 2019.

IFRIC 23 – UNCERTAINTY OVER INCOME TAX TREATMENTS

IFRIC Interpretation 23 Uncertainty over Income Tax Treatments provides guidance on the accounting for current and deferred tax liabilities and assets in circumstances in which there is uncertainty over income tax treatments. The Interpretation requires:

- An entity to contemplate whether uncertain tax treatments should be considered separately, or together as a group, based on which approach provides better predictions of the resolution;
- An entity to determine if it is probable that the tax authorities will accept the uncertain tax treatment; and
- If it is not probable that the uncertain tax treatment will be accepted, measure the tax uncertainty based on the most likely amount of expected value, depending on whichever method better predicts the resolution of the uncertainty.

The adoption of *IFRIC Interpretation 23 Uncertainty over Income Tax Treatments* did not have a material impact on the Company's financial statements.

8.5 Future Accounting Policy Changes

The following is an overview of accounting standard changes that we will be required to adopt in future years. We do not expect to adopt any of these standards before their effective dates and we continue to evaluate the impact of these standards on our consolidated financial statements.

AMENDMENTS TO REFERENCES TO THE CONCEPTUAL FRAMEWORK IN IFRS STANDARDS

On March 29, 2018, the IASB issued a revised version of its *Conceptual Framework for Financial Reporting* ("the Framework") that underpins IFRS Standards. The IASB also issued *Amendments to References to the Conceptual Framework in IFRS Standards* ("the Amendments") to update references in IFRS Standards to previous versions of the Conceptual Framework.

Some Standards include references to the 1989 and 2010 versions of the Framework. The IASB has published a separate document which contains consequential amendments to affected Standards so that they refer to the new Framework, with the exception of IFRS 3 Business Combinations which continues to refer to both the 1989 and 2010 Frameworks.

Both documents are effective from January 1, 2020 with earlier application permitted. The Company does not intend to adopt the Amendments in its financial statements before the annual period beginning on January 1, 2020. The extent of the impact of the change has not yet been determined.

DEFINITION OF A BUSINESS (AMENDMENTS TO IFRS 3)

On October 22, 2018, the IASB issued amendments to *IFRS 3 Business Combinations* that seek to clarify whether a transaction results in an asset or a business acquisition.

The amendments include an election to use a concentration test. This is a simplified assessment that results in an asset acquisition if substantially all of the fair value of the gross assets is concentrated in a single identifiable asset or a group of similar identifiable assets. If a preparer chooses not to apply the concentration test, or the test is failed, then the assessment focuses on the existence of a substantive process.

The amendments apply to businesses acquired in annual reporting periods beginning on or after January 1, 2020 with earlier adoption permitted. The Company does not intend to adopt the amendments in its financial statements before the annual reporting period beginning on January 1, 2020. The extent of the impact of adoption of the amendments has not yet been determined.

DEFINITION OF MATERIAL (AMENDMENTS TO IAS 1 and IAS 8)

On October 31, 2018 the IASB refined its definition of material and removed the definition of material omissions or misstatements from *IAS 8*.

The definition of material has been aligned across *IFRS Standards and the Conceptual Framework for Financial Reporting*. The amendments provide a definition and explanatory paragraphs in one place. Pursuant to the amendments, information is material if omitting, misstating or obscuring it could reasonably be expected to influence decisions that the primary users of general purpose financial statements make on the basis of those financial statements, which provide financial information about a specific reporting entity.

The amendments are effective for annual periods beginning on or after January 1, 2020 with earlier adoption permitted. The Company does not intend to adopt the amendments in its financial statements before the annual reporting period beginning on January 1, 2020. The extent of the impact of adoption of the amendments has not yet been determined.

9. SUPPLEMENTAL NON-GAAP MEASURES AND RECONCILIATIONS

9.1 Overview

In addition to providing measures prepared in accordance with GAAP, we present certain supplemental non-GAAP measures. These measures are Cash Operating Costs (including its components of research and product development (operating cost), general and administrative (operating cost) and sales and marketing (operating cost)), EBITDA and Adjusted EBITDA, and Adjusted Net Loss. These non-GAAP measures do not have any standardized meaning prescribed by GAAP and therefore are unlikely to be comparable to similar measures presented by other companies. We believe these measures are useful in evaluating the operating performance of the Company's ongoing business. These measures should be considered in addition to, and not as a substitute for, net income, cash flows and other measures of financial performance and liquidity reported in accordance with GAAP. The calculation of these non-GAAP measures have been made on a consistent basis for all periods presented.

9.2 Cash Operating Costs

This supplemental non-GAAP measure is provided to assist readers in determining our operating costs on an ongoing cash basis. We believe this measure is useful in assessing performance and highlighting trends on an overall basis.

We also believe Cash Operating Costs is frequently used by securities analysts and investors

when comparing our results with those of other companies. Cash Operating Costs differs from the most comparable GAAP measure, operating expenses, primarily because it does not include stock-based compensation expense, depreciation and amortization, impairment losses or recoveries on trade receivables, restructuring charges, acquisition costs, the impact of unrealized gains and losses on foreign exchange contracts, and financing charges. The following tables show a reconciliation of operating expenses to Cash Operating Costs for the three and six months ended June 30, 2019 and 2018:

<i>(Expressed in thousands of U.S. dollars)</i>		Three months ended June 30,	
Cash Operating Costs	2019	2018	\$ Change
Total Operating Expenses	\$ 10,149	\$ 12,548	\$ (2,399)
Stock-based compensation expense	(898)	(852)	(46)
Impairment recovery (losses) on trade receivables	-	(30)	30
Acquisition and integration costs	-	-	-
Restructuring (charges) recovery	(68)	-	(68)
Impact of unrealized gains (losses) on foreign exchange contracts	331	(267)	598
Depreciation and amortization	(1,111)	(921)	(190)
Cash Operating Costs	\$ 8,403	\$ 10,478	\$ (2,075)

<i>(Expressed in thousands of U.S. dollars)</i>		Six months ended June 30,	
Cash Operating Costs	2019	2018	\$ Change
Total Operating Expenses	\$ 20,876	\$ 25,223	\$ (4,347)
Stock-based compensation expense	(1,691)	(1,512)	(179)
Impairment recovery (losses) on trade receivables	-	(30)	30
Acquisition and integration costs	-	-	-
Restructuring (charges) recovery	(149)	(66)	(83)
Impact of unrealized gains (losses) on foreign exchange contracts	748	(571)	1,319
Depreciation and amortization	(2,075)	(1,839)	(236)
Cash Operating Costs	\$ 17,709	\$ 21,205	\$ (3,496)

The components of Cash Operating Costs of research and product development (cash operating cost), general and administrative (cash operating cost), and sales and marketing (cash operating cost) differ from their respective most comparable GAAP measure of research and product development expense, general and administrative expense, and sales and marketing expense, primarily because they do not include stock-based compensation expense and depreciation and amortization expense. A reconciliation of these respective operating expenses to the respective components of Cash Operating Costs for the three and six months ended June 30, 2019 and 2018 is included in Operating Expense and Other Items.

A breakdown of total stock-based compensation expense for the three and six months ended June 30, 2019 and 2018 are as follows:

<i>(Expressed in thousands of U.S. dollars)</i>		Three months ended June 30,	
Stock-based compensation expense	2019	2018	\$ Change
Total stock-based compensation expense recorded as follows:			
Cost of goods sold	\$ -	\$ -	\$ -
Research and product development expense	376	308	68
General and administrative expense	355	378	(23)
Sales and marketing expense (recovery)	167	166	1
Stock-based compensation expense	\$ 898	\$ 852	\$ 46

<i>(Expressed in thousands of U.S. dollars)</i>		Six months ended June 30,	
Stock-based compensation expense	2019	2018	\$ Change
Total stock-based compensation expense recorded as follows:			
Cost of goods sold	\$ -	\$ -	\$ -
Research and product development expense	701	546	155
General and administrative expense	681	650	31
Sales and marketing expense (recovery)	309	316	(7)
Stock-based compensation expense	\$ 1,691	\$ 1,512	\$ 179

A breakdown of total depreciation and amortization expense for the three and six months ended June 30, 2019 and 2018 are as follows:

<i>(Expressed in thousands of U.S. dollars)</i>		Three months ended June 30,	
Depreciation and amortization expense	2019	2018	\$ Change
Total depreciation and amortization expense recorded as follows:			
Cost of goods sold	\$ 842	\$ 379	\$ 463
Research and product development expense	823	602	221
General and administrative expense	279	319	(40)
Sales and marketing expense	9	-	9
Depreciation and amortization expense	\$ 1,953	\$ 1,300	\$ 653

<i>(Expressed in thousands of U.S. dollars)</i>		Six months ended June 30,	
Depreciation and amortization expense	2019	2018	\$ Change
Total depreciation and amortization expense recorded as follows:			
Cost of goods sold	\$ 1,445	\$ 757	\$ 688
Research and product development expense	1,491	1,204	287
General and administrative expense	568	635	(67)
Sales and marketing expense	16	-	16
Depreciation and amortization expense	\$ 3,520	\$ 2,596	\$ 924

9.3 EBITDA and Adjusted EBITDA

These supplemental non-GAAP measures are provided to assist readers in determining our operating performance. We believe this measure is useful in assessing performance and highlighting trends on an overall basis. We also believe EBITDA and Adjusted EBITDA are frequently used by securities analysts and investors when comparing our results with those of other companies. EBITDA differs from the most comparable GAAP measure, net loss, primarily because it does not include finance expense, income taxes, depreciation of property, plant and equipment, and amortization of intangible assets. Adjusted EBITDA adjusts EBITDA for stock-based compensation expense, transactional gains and losses, asset impairment charges, finance and other income, the impact of unrealized gains and losses on foreign exchange contracts, and acquisition costs. The following tables show a reconciliation of net loss to EBITDA and Adjusted EBITDA for the three and six months ended June 30, 2019 and 2018:

<i>(Expressed in thousands of U.S. dollars)</i>			
EBITDA and Adjusted EBITDA	Three months ended June 30,		
	2019	2018	\$ Change
Net income (loss)	\$ (6,971)	\$ (4,323)	\$ (2,648)
Depreciation and amortization	1,953	1,300	653
Finance expense	368	127	241
Income taxes	-	5	(5)
EBITDA	\$ (4,650)	\$ (2,891)	\$ (1,759)
Stock-based compensation expense	898	852	46
Acquisition and integration costs	-	-	-
Finance and other (income) loss	(945)	969	(1,914)
Impairment charges on intangible assets and property, plant and equipment	-	-	-
Loss (gain) on sale of assets	-	-	-
Impact of unrealized (gains) losses on foreign exchange contracts	(331)	267	(598)
Adjusted EBITDA	\$ (5,028)	\$ (803)	\$ (4,225)

<i>(Expressed in thousands of U.S. dollars)</i>			
EBITDA and Adjusted EBITDA	Six months ended June 30,		
	2019	2018	\$ Change
Net income (loss)	\$ (18,995)	\$ (9,823)	\$ (9,172)
Depreciation and amortization	3,520	2,596	924
Finance expense	724	259	465
Income taxes	6	1	5
EBITDA	\$ (14,745)	\$ (6,967)	\$ (7,778)
Stock-based compensation expense	1,691	1,512	179
Acquisition and integration costs	-	-	-
Finance and other (income) loss	(1,778)	244	(2,022)
Impairment charges on intangible assets and property, plant and equipment	-	-	-
Loss (gain) on sale of assets	1,995	-	1,995
Impact of unrealized (gains) losses on foreign exchange contracts	(748)	571	(1,319)
Adjusted EBITDA	\$ (13,585)	\$ (4,640)	\$ (8,945)

9.4 Adjusted Net Loss

This supplemental non-GAAP measure is provided to assist readers in determining our financial performance. We believe this measure is useful in assessing our actual performance by adjusting our results from continuing operations for transactional gains and losses and impairment losses. Adjusted Net Loss differs from the most comparable GAAP measure, net loss, primarily because it does not include transactional gains and losses, asset impairment charges, and acquisition costs. The following table shows a reconciliation of net loss to Adjusted Net Loss for the three and six months ended June 30, 2019 and 2018:

<i>(Expressed in thousands of U.S. dollars)</i>			
Adjusted Net Loss	Three months ended June 30,		
	2019	2018	\$ Change
Net (loss)	\$ (6,971)	\$ (4,323)	\$ (2,648)
Acquisition and integration costs	-	-	-
Impairment charges (recovery) on intangible assets and property, plant and equipment	-	-	-
Loss on sale of assets	-	-	-
Adjusted Net Loss	\$ (6,971)	\$ (4,323)	\$ (2,648)
Adjusted Net Loss per share	\$ (0.03)	\$ (0.02)	\$ (0.01)

<i>(Expressed in thousands of U.S. dollars)</i>			
Adjusted Net Loss	Six months ended June 30,		
	2019	2018	\$ Change
Net (loss)	\$ (18,995)	\$ (9,823)	\$ (9,172)
Acquisition and integration costs	-	-	-
Impairment charges (recovery) on intangible assets and property, plant and equipment	-	-	-
Loss on sale of assets	2,000	-	2,000
Adjusted Net Loss	\$ (16,995)	\$ (9,823)	\$ (7,172)
Adjusted Net Loss per share	\$ (0.07)	\$ (0.06)	\$ (0.01)