

ALPHADIRECT MANAGEMENT SERIES

DECEMBER 17, 2019

IN FOCUS: BALLARD POWER SYSTEMS AND ITS OPERATIONS AND PRODUCTION

This interview focuses on Ballard Power Systems Inc. (BLDP) and its production operations.



Ballard headquarters and production facility in Vancouver, Canada. Source: www.ballard.com

THE ALPHADIRECT INSIGHT

We believe that the growing global interest in fuel cell power solutions for transportation is driven by the converging megatrends of decarbonization, renewable energy and electrification of transportation which is moving toward commercial scale. As demand and volumes grow, the manufacturing challenges are likely to increase and become an even more critical part of Ballard's operating model. To accommodate the growing demand and, importantly, lower the cost of fuel cells for transportation, Ballard is undertaking a multi-pronged strategy to reduce the cost of its products while continuously improving their performance. This alphaDIRECT Management Series focuses on Ballard's production facilities and manufacturing capabilities in Canada, the U.S. and Europe as well as its 49%-owned joint venture located in Weifang, China, which is licensed to manufacture Ballard's next-generation LCS fuel stack and power modules. Once fully commissioned, the JV will have the annual capacity to power approximately 20,000 Fuel Cell Electric Vehicles or FCEVs. All of these joint factors are key aspects of the long-term growth strategy and we believe will be of increasing focus by investors as well as customers and suppliers.

BLDP Business Snapshot

Founded: 1979
Headquarters: Burnaby, Canada
Ticker: BLDP (NASDAQ/TSX)
Stock Price: USD\$6.20*
Market Cap: USD\$1.44B*
Website: www.ballard.com
*As of December 12, 2019



About alphaDIRECT EnergyTech Investor

alphaDIRECT Advisors is a Publishing and Investor Intelligence firm that creates and implements digital content and programs to help investors better understand a company's key drivers including industry dynamics, technology, strategy, outlook and risks as well as the impact they could have on the stock price. alphaDIRECT's expertise encompasses a variety of sectors including Clean Transportation, Emerging EnergyTech, Energy Services, Smart Buildings, Solar, Water Value Chain and Industrial. alphaDIRECT was founded by Wall Street veteran and research analyst, Shawn Severson, after seeing a significant shift in the investment industry that resulted in less fundamental research conducted on small cap companies and a significant decline in information available to all investors. alphaDIRECT's mission is to bridge that information gap and engage companies and investors in a way that opens information flow and analytical insights.

To learn more, visit:

www.alphadirectadvisors.com
or follow us on LinkedIn or Twitter.
@alpha_DIRECT

Participants

Ms. Jyoti Sidhu **Vice President, Operations** **Ballard Power Systems**

Sarbjot (Jyoti) Sidhu was appointed Vice President, Operations in December 2018. Ms. Sidhu has global leadership responsibility for Operations, including EH&S, Quality, Supply Chain, Production, Maintenance and Facilities. Jyoti joined Ballard in 2000 and, for six years prior to her current position, served as Director, Quality. She previously held positions in Production Management, EH&S and Production Planning. Jyoti has led significant projects during her tenure at Ballard, including company-wide training on lean Six Sigma, leadership of Ballard's continuous improvement program and an ERP implementation in the areas of Procure to Pay, Supply Chain and Manufacturing. In addition, she serves on Oracle's supply chain advisory board. Ms. Sidhu earned a Master of Business Administration from Simon Fraser University in 2013 as well as a certificate in Operations Management from the British Columbia Institute of Technology in 2008.

Mr. Shawn Severson **Founding Partner** **alphaDIRECT Advisors**

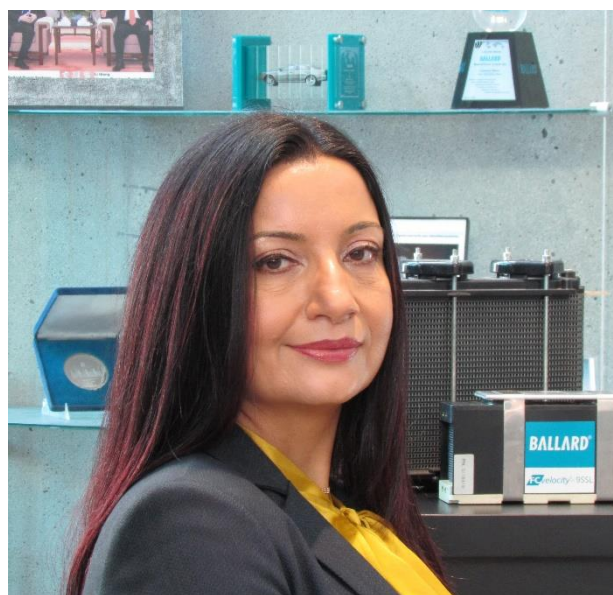
Mr. Severson is the Founding Partner of alphaDIRECT Advisors (ADA), a division of EnergyTech Investor, LLC (ETI). He has over 20 years of experience as a senior research analyst covering the technology and cleantech industries. Prior to founding alphaDIRECT Advisors, he led the Energy, Environmental and Industrial Technologies practice at the Blueshirt Group. Mr. Severson was frequently ranked as a top research analyst including one of the Wall Street Journal's "Best on the Street" stock pickers and multiple awards as Starmine's top three stock pickers.

ABOUT BALLARD POWER SYSTEMS

Ballard a Canadian public company headquartered in Vancouver, British Columbia and is listed on both NASDAQ and the Toronto Stock Exchange under the ticker BLDP.

The Company's vision is to deliver fuel cell power for a sustainable planet. Ballard zero-emission PEM fuel cells are enabling electrification of mobility, including buses, commercial trucks, trains, marine vessels, passenger cars, forklift trucks and UAVs.

For further information please visit www.ballard.com.



Jyoti Sidhu, Vice President, Operations
Source: www.ballard.com

Shawn Severson: First I would like to thank you, Jyoti, for taking the time to speak with us today. The last time that we spoke with Ballard Power Systems we discussed the company's product evolution strategy. Today our focus will be on Ballard's operations. Before we get started, could you give us a brief introduction of yourself and what brought you to Ballard?

Jyoti Sidhu: Certainly and thank you Shawn. I grew up in Punjab, India and my early education took place there. I migrated to Canada in 1988 and joined Ballard in 2000 as a production technician. I did my executive MBA at Simon Fraser University here in Vancouver and completed the operations management program at BCIT, while working at Ballard.

What attracted me to Ballard was the thought of making a difference in the world and leaving a legacy behind for generations to come. I have two children, so I want to make sure the world is safe for them and their future children. As the Vice President of Operations my current responsibilities at Ballard include environment, health and safety, quality and supply chain management. This includes production planning, purchasing, as well as warehouse logistics, production, facilities and maintenance.

Shawn Severson: Thank you for that, Jyoti. Before I jump into a discussion of operations, can you explain briefly what is driving the growing interest in fuel cell power solutions today, particularly in the transportation sector?

Jyoti Sidhu: Today, there are several megatrends converging in the world that are very favorable for zero-emission fuel cells. Specifically these include decarbonization, the need to improve air quality, movement to renewable energy as well as electrification of transportation.

The strongest fuel cell value proposition is in the Medium and Heavy Duty Motive or transportation space, particularly for use cases requiring long-range, rapid refueling, heavy payload, and route flexibility.

At the same time, at Ballard we have dramatically reduced the cost of our products, while simultaneously improving performance over the past decade. So, we can now offer strong zero-emission value propositions for heavy duty vehicle applications. And, many cities around the world have made commitments to curtail or even outright ban internal combustion engines in the coming years.

Shawn Severson: Thank you Jyoti. Can you provide us with an overview of the production facilities that Ballard currently has in operation or that are currently in the construction phase?

Jyoti Sidhu: We have two main production facilities here at our Vancouver headquarters. The first is a 17,000 square foot building and the second is over 13,000 square feet. In addition, we have two smaller locations in the surrounding neighborhood, which we use for warehouse logistics and as a service center.

Here in Vancouver we produce MEAs, plates, fuel cell stacks as well as complete power modules or engines for vehicles.

We are also in the final stages of construction of our joint venture facility in China, which is a 150,000 square foot operation.

In addition, we have subsidiary operations in Hobro, Denmark, where we manufacture backup power products for use in customers' critical infrastructure sites and also perform some basic module repairs. And a subsidiary operation in Southborough, Massachusetts, which focuses exclusively on

fuel cell products for the unmanned aerial vehicle, or UAV, market.

Shawn Severson: Let's discuss the China joint venture production facility that will be commissioned in the next several months. Where exactly is it located and what line of products will it be capable of producing?

Jyoti Sidhu: The Weichai-Ballard joint venture production facility is co-located with Weichai Power's headquarters in Weifang, Shandong Province in the eastern part of China. Weichai has a 51% ownership position in the JV and Ballard has a 49% position. The JV is licensed to manufacture Ballard's next-generation LCS fuel cell stack as well as LCS-based power modules for buses, trucks and forklifts in the China market. And, Ballard is the exclusive supplier of MEAs to the JV – which are a critical component of every fuel cell.

Initially, JV capacity in 2020 will be 10,000 modules per year. Once the JV facility has been operating for a few years, capacity will be sufficient to power 20,000 modules to power that same number of fuel cell electric vehicles, or FCEVs, annually. Another way of expressing this is that we expect to reach manufacturing capacity of about 7,800,000 plates which translates into 40,000 stacks by the 2022-25 timeframe.

Shawn Severson: You mentioned that Ballard will have the exclusive right to provide all MEAs for products manufactured at the China joint venture. Where will those MEAs be produced and how much MEA production capacity do you currently have?

Jyoti Sidhu: We will continue to produce MEAs at our headquarters in Vancouver, where current capacity is over 1 million MEAs per year. However, in early 2020 that capacity will increase to more than 3 million MEAs annually. And, we have further capacity expansion plans that will take us to

over 5 million MEAs annually in the next few years.

Of course, we currently also produce plates and other products here in Vancouver to meet demand for the rest of the world, aside from China.

Shawn Severson: That brings me to my next question. What other production activities do you manage at your headquarters facility in Vancouver?

Jyoti Sidhu:

The key items produced in Vancouver are MEAs, plates, liquid-cooled fuel cell stacks, and complete modules, which go into various applications such as forklifts, buses, trucks, trains, marine vessels and so on. Also, we produce air-cooled fuel cell stacks for use in backup power systems to power critical infrastructure – then, those stacks are integrated into complete systems at our Hobro, Denmark subsidiary.

Shawn Severson: To turn back to the joint venture in China, how much less expensive will the products be coming off that line? And does that provide Ballard with a further competitive advantage outside China as well?

Jyoti Sidhu: Our current estimation is that cost savings will be between 30% to 40% over the next couple of years resulting from localization of our supply chain-based activities in China, together with the high-volume processes being put into the JV facility.

So, this will provide us with a cost advantage, and it's also worth mentioning that Ballard has the exclusive right to buy products directly from the joint venture for sale in markets outside China, as well.

Shawn Severson: Next, I'd like to run through your other manufacturing facilities and what's being produced there. Let's begin with

your subsidiary in Southborough, just outside of Boston.

Jyoti Sidhu: At our Southborough location in the U.S. we have a team focused on designing and producing fuel cell systems for small unmanned aerial vehicles, otherwise known as drones or UAVs. Our Southborough team has a lot of experience in this area and is focused on commercial UAV applications, which we see as a fast-growth opportunity in the mid-term future. We expect UAVs to be used in agriculture, for infrastructure inspections, package delivery, and other applications.

Shawn Severson: And what about your European subsidiary in Hobro, Denmark?

Jyoti Sidhu: As mentioned, the Hobro location manufactures systems for backup power applications. These systems are deployed typically in critical infrastructure such as telecom networks and emergency communication networks.

We also have a European service center in Hobro so we have the capability of servicing our bus modules and other products that are deployed in the European market.

In addition, we are finalizing the establishment of a Marine Center of Excellence at the Hobro site, to specifically focus on the marine sector. This sector has grown in importance over the past year or so, emerging as an interesting new Heavy Duty Motive opportunity for our fuel cell technology.

Shawn Severson: Moving on to any plans for capacity expansion, could you run through each of your facilities and operations and where you think you might need to expand production? And do you envision volumes becoming large enough to justify outsourcing or contract manufacturing of any components or systems?

Jyoti Sidhu: I'll start with our Vancouver sites. We are investing in semi-automated and automated equipment to increase capacity. We are making significant and measured investments in advanced process development, capital equipment and facilities over two years. As an example, we're investing in technology and equipment that will result in a 3-times increase in sealing capacity.

This new tool not only provides us with a significant increase in capacity, it will also improve quality since we will have fewer touchpoints resulting from full automation, along with a reduction in cost. This will provide us with capacity of over 3 million MEAs compared to current capacity of 1 million MEAs, as mentioned.

We are also investing in a manufacturing execution system, so we will have real time visibility into manufacturing processes in order for us to react quickly. We are also continuing to invest in talent, bringing in people with high-volume manufacturing experience, as well as training the current workforce to adhere to high volume methodologies.

And, as I noted we are also building the Marine Centre of Excellence in our European subsidiary, in order to ensure that we can satisfy customer requirements and comply with local content requirements. The team in Denmark is also looking at some other capacity increases within their backup power operation.

At a macro level we are also currently evaluating at what point we will either move processes over to other subsidiaries, build additional Ballard manufacturing operations or achieve our volume and cost goals by seeking a contract manufacturing relationship.

Shawn Severson: Can you outline the focus that your team puts on quality, safety and other foundational elements of Ballard's operations?

Jyoti Sidhu: Sure. We recently hired a new Director of Quality who has an automotive background, given our focus on transportation. We are also certified to ISO 9001 and IATF 16949 standards. These standards are in place to ensure we are developing and manufacturing our products with a disciplined approach. We are using the core tools that are required in the automotive sector to achieve customer requirements. We have also started to train and qualify our quality team to German quality standards, known as VDA, which is well recognized in Europe. This standard is being used to qualify our suppliers, as well.

In the environment, health and safety area we have a certificate of recognition from Occupational Standard of Excellence, OSSE, for our excellent record in safety, as well as a certificate for environment standard ISO 14001. We currently have several initiatives underway from a sustainability perspective.

We are in the early stages of doing some benchmarking and are quite focused on continuous improvement activities using Lean Six Sigma tools within Operations. Currently we have six black belts, 25 green belts and over 70 yellow belts in Lean Six Sigma methodology. We've completed a number of projects to "lean out" our processes, improve quality and reduce costs over the last couple of years.

We continuously focus on having highly engaged and high performing teams, bringing on the right talent and providing development in areas of leadership. In 2019, we've put greater focus on getting the

production workforce performing at high levels in order to ensure delivery of quality products on time to our customers. We are measuring OEE at critical processes and have instituted daily Gemba meetings to see what has happened in the last 24 hours in production, to help us establish our game plan for the next 24 hours.

Shawn Severson: Great. That's a good lead-in to our last question here, what would you consider your biggest challenges and risks, both short term and long term? Do you have any strategies in place or thoughts on how to get around those obstacles?

Jyoti Sidhu: We have talked internally at length about our current actions and future actions to address our growth challenge, including what we are doing with semi-automated or automated equipment investments, as well as system investments, talent management and so on. All of these make me believe that we are in good shape in both the short term and long term.

Going forward, I would highlight the challenge of attracting and retaining manufacturing talent. So, we have widened the potential candidate pool by reaching outside our province and outside the country to attract the right talent.

Another challenge being faced by manufacturers is Industry 4.0 which is all about digital technologies used in manufacturing. We are addressing this on a proactive basis today.

Shawn Severson: Thank you, Jyoti. That concludes today and thank you again for joining us. It's been very helpful for investors and we look forward to talking with Ballard again soon.

Jyoti Sidhu: Thank you.

SHAWN SEVERSON FOUNDING PARTNER

Mr. Severson founded *alphaDIRECT* Advisors, a division of EnergyTech Investor, LLC in 2016 after seeing a significant communication and information gap developing between small and micro-cap companies and the financial community. Mr. Severson has over 20 years of experience as a senior research analyst covering the technology and cleantech industries. Previously, he was Managing Director at the Blueshirt Group where he was the head of the Energy, Environmental and Industrial Technologies practice. Prior to the Blueshirt Group, Mr. Severson was at JMP Securities where he was a Senior Equity Research Analyst and Managing Director of the firm's Energy, Environmental & Industrial Technologies research team. Before joining JMP, he held senior positions at ThinkEquity, Robert W. Baird (London) and Raymond James. He began his career as an Equity Research Associate at Kemper Securities. He was frequently ranked as a top research analyst including one of the Wall Street Journal's "Best on the Street" stock pickers and multiple awards as Starmine's top three stock pickers.



DISCLOSURE

alphaDIRECT Advisors, a division of EnergyTech Investor, LLC, is an Investor Intelligence and Publishing firm, not a licensed broker, broker dealer, market maker, investment banker, or underwriter. This report is published solely for informational purposes and is not to be construed as an offer to sell or the solicitation of an offer to buy any security in any state. This is not a complete analysis of every material fact regarding any company, industry or security.

alphaDIRECT may offer its opinions in its articles, reports and interviews concerning featured companies, or the business spaces and market segments in which they operate. Any opinions are provided solely for the general opinionated discussion of its readers and viewers, and therefore should not be considered to be complete, precise, accurate, or current investment advice, and all investment decisions are solely the responsibility of the reader.

A fee has been paid for the sponsored material contained herein (the "Sponsored Materials"), by the indicated Company. Additionally, *alphaDIRECT* may perform consulting or advisory services for Companies that *alphaDIRECT* produce and publish Sponsored Materials for.

The Sponsored Materials are not and should not be construed as an offer to sell or the solicitation of an offer to purchase or subscribe for any investment. No information in the Sponsored Materials should be construed as individualized investment advice. A licensed financial advisor should be consulted prior to making any investment decision. *alphaDIRECT* makes no guarantee, representation or warranty and accepts no responsibility or liability as to its accuracy or completeness of the Sponsored Materials.

alphaDIRECT assumes no warranty, liability or guarantee for the current relevance, correctness or completeness of any information provided. Furthermore, we assume no liability for any direct or indirect loss or damage or, in particular, for lost profit, which you may incur as a result of the use and existence of the information, provided within the Sponsored Materials. We may distribute our reports through other organizations or companies.

The *alphaDIRECT* content may contain "forward-looking statements," as that term is used in the federal securities laws. Forward-looking statements may be identified by words such as "expects," "objective," "intend," "targeted," "plan" and similar phrases. These forward-looking statements are subject to numerous assumptions, risks and uncertainties described in the Companies' filings with the Securities and Exchange Commission that may cause the Companies' actual results to be materially different from any future results expressed or implied in such statements.

The Companies caution readers not to place undue reliance on these forward-looking statements, which speak only as of the date of the release of the investor content. The Companies undertake no obligation, and specifically disclaim any obligation, to release any revisions to any forward-looking statements to reflect events or circumstances after the date of the release or to reflect the occurrence of unanticipated events.

WWW.ALPHADIRECTADVISORS.COM