alphaDIRECT ADVISORS

ETI ALPHADIRECT MANAGEMENT SERIES

APRIL 19, 2018

IN FOCUS: BALLARD POWER SYSTEMS AND ITS CATALYST TECHNOLOGY

This report focuses on Ballard Power Systems Inc. (BLDP), its catalyst technology and the world's first Non-Precious Metal Catalyst-based product.

FCgen®-1040 air-cooled fuel cell stack using Non-Precious Metal Catalyst technology. Source: www.ballard.com

THE ALPHADIRECT ENERGYTECH INVESTOR INSIGHT

We view ongoing cost reduction as one of the keys to the increase in fuel cell adoption at commercial scale. An important underpinning of the product cost curve is the catalyst used in a proton exchange membrane (PEM) fuel cells. This is a key focus for Ballard, as one would expect, and with recent ground-breaking catalyst developments, such as proprietary treatments to increase durability and new designs to integrate advanced platinum-based catalysts and research into non-precious metal catalysts, Ballard is well-positioned to effectively address this area in our view. By successfully redesigning core alternative platinum components, Ballard has the world's first non-precious metal catalyst product requiring less than 80% of the platinum used in conventional fuel cells. This fuel cell technology has the potential to significantly decrease the cost of PEM fuel cells when produced at large scale.

BLDP Business Snapshot

Founded: 1979
Headquarters: Burnaby, Canada
Ticker: BLDP (NASDAQ/TSX)
Stock Price: USD$3.54.*
Market Cap: USD$617 M*
Website: www.ballard.com
**As of April 16, 2018*

BALLARD®

About alphaDIRECT EnergyTech Investor

EnergyTech Investor, LLC (ETI), a division of AlphaDirect Advisors, is a research 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. EnergyTech Investor's expertise encompasses a variety of sectors including Clean Transportation, Emerging EnergyTech, Energy Services, Smart Buildings, Solar, Water Value Chain and Industrial. EnergyTech Investor 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. ETI'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.energytechinvestor.com
or follow us on LinkedIn or Twitter.

Participants

Dr. Kevin Colbow
Vice President, Technology & Product Development
Ballard Power Systems Inc.
Kevin Colbow was appointed Vice President, Technology and Product Development in February 2016. Dr. Colbow's responsibilities include leadership of the Company's Technology Solutions business segment, which also comprises Engineering Services and IP licensing. Dr. Colbow joined Ballard in 1994 and his areas of responsibility have included research and development, product development, technology portfolio management and product management. He was Director of Research and Development until March 2010, when Dr. Colbow was appointed Director of Product Management with responsibility for fuel cell stack products. Following receipt of a B.Sc. in Chemical Physics from Simon Fraser University in 1986, Dr. Colbow completed an M.Sc. degree in lithium-ion rechargeable batteries at the University of British Columbia and, in 1992, completed a Ph.D. in photoelectron and soft x-ray spectroscopy on semiconductor surfaces. Dr. Colbow has also completed the Certificate Program for Technology Management at the California Institute of Technology and has 23 patents in the area of PEM fuel cells as well as twenty-six published papers.

Mr. Shawn Severson
Founder and CEO
EnergyTech Investor, LLC
Mr. Severson is the founding partner and CEO of EnergyTech Investor, LLC. He has over 20 years of experience as a senior research analyst covering the technology and cleantech industries. Prior to founding ETI 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.

BALLARD®

ABOUT BALLARD POWER SYSTEMS INC.

Ballard Power Systems Inc. engages in the design, development, manufacture, sale and service of proton exchange membrane (PEM) fuel cell products for a range of applications. The company provides Power Products for Heavy Duty Motive, Portable Power, Material Handling and Backup Power applications and also provides Technology Solutions that help customers accelerate their fuel cell development programs.

Ballard believes it is poised with highly-disruptive and field-proven technology at the convergence of three global megatrends – decarbonization, air quality and electrification of propulsion systems – presenting a compelling future for the business. The company's fuel cell value proposition is gaining traction across a broadening array of fuel cell electric vehicles (FCEVs) that include buses, commercial trucks and rail, in the key geographic markets of China, Europe and the U.S. In the company's view FCEVs will become a meaningful portion of the heavy, medium and light duty transport markets where long range, rapid refueling and route flexibility are customer requirements. In addition, in management's view the company also offers significant embedded optionality in such markets as fuel cell passenger vehicles and drones.

Ballard Power Systems Inc. was founded in 1979 and is headquartered in Burnaby, Canada, a suburb of Vancouver. To learn more, please visit www.ballard.com.

Dr. Kevin Colbow
Source: www.ballard.com

Shawn Severson: First, I would like to thank you, Kevin, for taking the time to speak with us today. The last time we spoke with Ballard Power Systems, we focused on the way in which the convergence of key global trends is opening a path for commercial deployment of fuel cell electric vehicles, or FCEVs, in China,Europe and the U.S. Today our focus will be on your catalyst technology. However, before we get started, could you give us a brief introduction of yourself and what brought you to Ballard?

Kevin Colbow: Thanks Shawn, I grew up in Vancouver and did all my formal education in the Lower Mainland. My father was a Physics professor at Simon Fraser University, so I actually did my undergrad degree in Physics there. I then went on to do my Masters at the University of British Columbia, where I focused on lithium-ion rechargeable batteries along with electrochemistry.

After completing my PhD, I left the lower mainland to do my post-doctoral assignment in Germany. I was there for three years, but knew that I would return to Vancouver one day. Once I returned, I started to look for employment in the technology sector, and came across Ballard Power Systems. This was in 1994 and Ballard was a small startup technology company that was founded on an idea that just might change the world. Twenty-four years later, I'm still with the same company where I was appointed Vice President of Technology and Product Devleopment in 2016.

I've always been very interested in technology and I really liked the idea of electric vehicles, mobility - all these sorts of things that were really only visions at that time. I also knew I wanted to do something very applied, as opposed to staying in the academic world. I felt I wanted to try and make a more tangible contribution to society.

Shawn Severson: Thank you, Kevin. For investors new to fuel cells, could you start by giving us an overview of the basics of fuel cell technology?

Kevin Colbow: A fuel cell is an electrochemical device that converts chemical energy from hydrogen and oxygen in the air, directly into electricity, with high efficiency and water as the only by-product.

More specifically, a proton exchange membrane or PEM fuel cell uses platinum as a catalyst at the anode to split hydrogen gas into positively charged hydrogen ions or protons and negatively charged electrons. The PEM allows only the protons to travel through the fuel cell to the cathode—the electrons travel through an external path which creates an electric current that is used to power electrical motors and other devices.

At the cathode, a platinum catalyst helps the protons and electrons combine with oxygen from the atmosphere to produce water vapor and heat. A number of fuel

cells can be put together to create a stack with the desired voltage output. Fuel cells have overall efficiencies including producing, compression and transporting hydrogen and the fuel cell itself of between 40-60%. This is better than the 20-30% efficiency of a gasoline engine, but less than the 80% efficiency of a battery electric vehicle.

Shawn Severson: Could you talk about some of Ballard's most recent catalyst developments and why they are key for the future of fuel cell technology?

Kevin Colbow: We can apply developed proprietary treatments to commercial catalysts in order to greatly improve the durability. This technology will be critical to meet lifetime requirements for automotive applications.

Also, we are developing novel methods and designs to integrate advanced platinum-based catalysts into high performing and durable catalyst layers. These designs allow for significantly lower platinum content than conventional fuel cells, and will be key for high volume automotive commercialization moving forward.

We recently announced a new product called the FCgen®-1040 that's based on a non-precious metal catalyst. This product is a world first, and requires less than 80% of the platinum used in a conventional fuel cell. This new catalyst technology has the potential to greatly decrease the cost of fuel cells when produced at high volumes by reducing the use of precious metals. Also, the catalyst is more tolerant to air contaminants, such as sulfur oxides or SOx, compared to conventional platinum-based catalysts.

Shawn Severson: Thank you, Kevin. As one of your four strategic partners, can you briefly talk about your 20-year relationship with Nisshinbo Holdings?

Kevin Colbow: Absolutely, Shawn. At a high level, I would describe the collaboration as a long-term and multi-faceted relationship where Nisshinbo started off as a supplier of molded carbon bipolar plates. Five years ago, the relationship expanded as Nisshinbo identified Ballard as the most suitable partner to help commercialize its non-precious metal catalyst, or NPMC, that they were developing. The development project is ongoing, and continues to be very fruitful for both companies. Finally, recognizing the strong recent growth and long-term potential of Ballard, Nisshinbo recently decided to become an equity investor in our company. This is particularly encouraging considering Nisshinbo has been intimately involved in the fuel cell industry for over 20 years, and thus their recent investment is a strong endorsement of Ballard's resurgence as an economically viable company with a strong future outlook.

Shawn Severson: So, you just mentioned the recently announced world's first non-precious metal catalyst-based fuel cell product, developed using Nisshinbo's non-

precious metal catalyst technology. Can you talk about the importance of this product and why such a strong focus has been placed on reducing the platinum content?

Kevin Colbow: Since the discovery of fuel cells in 1839, PEM fuel cells have required platinum to produce power. While the amount of platinum used in a PEM fuel cell has come down enormously in recent years, there will always be a desire to further reduce the amount of this precious metal and enable wide-spread commercialization of fuel cell technology. There has been a large global effort in this area, and one of the most promising alternatives to platinum is a family of catalysts that are based on abundant, inexpensive materials such as carbon, nitrogen, and trace amounts of iron. While these inexpensive catalysts are promising, in order to fully utilize them in a fuel cell product, some of the core components require a re-design. Leveraging Ballard's strong understanding of fundamental fuel cell processes, we were able to achieve the necessary design modifications, resulting in the world's first NPMC-based PEM fuel cell.

Shawn Severson: Thank you, Kevin. Can you explain your main competitive advantage within catalyst technology?

Kevin Colbow: Ballard's primary competitive advantage within catalyst technology is our unparalleled knowledge of the entire fuel cell product, from the fundamental physical processes occurring within the individual fuel cell components to the full fuel cell system. Additionally, through our own product line, combined with Ballard's technology solutions projects with automotive OEMs, we have unique insight into the entire fuel cell landscape. This allows us to predict failure modes that others may not be aware of, and tailor our catalysts and catalyst layers specifically for each application. For any new design, Ballard takes a holistic approach by considering not just the raw catalyst materials, but also how the catalyst layer can be modified or designed to achieve synergy between both the catalyst and the other components of the catalyst layer, to meet the specific requirements of the application.

Shawn Severson: Can you talk about your novel catalyst layer design and how this design improves both performance and durability compared to more conventional designs?

Kevin Colbow: It's widely known that the activity of platinum for fuel cell relevant reactions can be greatly improved by alloying it with metals such as nickel (Ni) or cobalt (Co). However, although fuel cells that use these catalysts have greater fuel efficiency, they have historically had difficulty achieving very high power and showed rapid power loss over time. Through extensive research, Ballard was able to determine the fundamental processes responsible for these limitations. By using this knowledge, we managed to develop a novel catalyst layer that was able to realize

the fully expected activity advantage of the alloy catalyst across all power levels while simultaneously stabilizing the alloy catalyst and improving fuel cell lifetime.

Shawn Severson: Can you talk about some of your research projects and your next-generation catalyst design that delivers up to 17x higher activity than conventional platinum catalysts?

Kevin Colbow: Ballard is highly active in the fuel cell research community, and we are currently working with many different suppliers, such as National labs and Universities, to help guide research activities, and to gain access to the most promising pre-commercial catalysts. Currently, Ballard is heavily involved in the development of next-generation nano-engineered catalysts that show enormously improved activity compared to conventional catalysts.

In general, activity refers to the rate that oxygen is reduced, or converted to useful electricity. However, in this specific context, catalyst activity refers to the rate of reaction on the catalyst surface, normalized to the mass of catalyst. As you mentioned, theoretically, having a 17x higher activity would allow for 17x less platinum to be used, but there are many more factors that influence the effectiveness of the platinum, including the ability of the oxygen to reach the catalyst surface, for example.

Shawn Severson: Approximately when do you expect to introduce your next-generation catalyst design to the market?

Kevin Colbow: One of Ballard's novel catalyst layer designs will be introduced into the market during the third quarter of 2018.

The catalyst having 17x activity vs. platinum is at an early technology readiness level and much more work needs to be done to translate the result into practical fuel cell cost reduction. However, we are excited that it shows promise for next generation products, even thought it's still a number of years away.

Shawn Severson: Help us understand how your proprietary catalyst treatment and anode catalyst layer design works and how it prevents corrosion of the anode materials, which would ultimately lead to failure.

Kevin Colbow: The operating conditions inside a fuel cell are highly stressful for most materials, and all commercial catalysts show some degree of corrosion over time. However, in some instances and operating conditions - for example start-up and shut-down - the environment can become particularly damaging to conventional catalysts, leading to rapid power loss. In these cases, all commercial catalysts are very quickly destroyed, which greatly limits the lifetime of a fuel cell.

Ballard has performed extensive analysis of these conditions and has a deep knowledge of the chemistry involved in the degradation. Our proprietary catalyst treatment was developed to specifically block the chemical pathways that lead to

corrosion, thus greatly lengthening the lifetime of our products.

Shawn Severson: How do you see technology advancements at Ballard impacting the cost and competitiveness of your fuel cells over the next few years?

Kevin Colbow: Ballard has a continuous focus on product cost reduction and improved durability, which we address through a number of approaches, such as improved manufacturing processes, product volumes, and lower cost materials. Our ongoing research activities feed into our product designs to further reduce costs, thereby increasing competitiveness. For example, we are anticipating an approximate 40% cost reduction in our fuel cell stack by 2020, compared to 2017 costs, while doubling the product lifetime.

Shawn Severson: What are the upcoming milestones/targets that investors should look for regarding the technology pathway?

Kevin Colbow: We are continuing to work on the NPMC with our partner Nisshinbo, and expect to make continued improvements in the electrode structure to increase the range of applications for the technology, such as the Materials Handling application, or the use of this technology to power electric forklifts. Material Handling has proven to be the first truly commercial fuel cell application, with over 28,000 fuel cell powered forklifts sold and operating in warehouse distribution centers. This will serve as the next step to accelerate market adoption.

In addition to the stack improvements that I just mentioned, we will be introducing a next generation power module next year resulting in more than 60% cost reduction, and enabling true competitiveness with battery powertrains and incumbent technologies.

Shawn Severson: What do you see as the biggest risks to your targets and technology roadmap?

Kevin Colbow: I would say that the greatest risks revolve around timing, Shawn. On the demand side, of course, there is always a risk that market adoption won't occur rapidly enough to support the business, but we are seeing tremendous signs of fuel cell product penetration in a number of application areas now, particularly in transportation. On the supply side, predicting the timing of technology advancements is always inherently challenging. Incorporating the right balance between cost and product performance in the right timeframe is a good example. However, we've got a industry-leading team of technical experts at Ballard and I'm confident in our ability to get it right!

Shawn Severson: Thank you very much, Kevin.

SHAWN SEVERSON
FOUNDER AND CEO

Mr. Severson founded EnergyTech Investor 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.

alphaDIRECT ADVISORS

DISCLOSURE

alphaDIRECT EnergyTech Investor (ETI) is a research and publishing organization, 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.

ETI 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, ETI may perform consulting or advisory services for Companies that ETI 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. ETI makes no guarantee, representation or warranty and accepts no responsibility or liability as to its accuracy or completeness of the Sponsored Materials.

ETI 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 ETI 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.ENERGYTECHINVESTOR.COM