

# ETI ALPHADIRECT MANAGEMENT SERIES

MARCH 26, 2019

## IN FOCUS: BALLARD POWER SYSTEMS AND THE EVOLUTION OF THE EUROPEAN FUEL CELL MARKET.

This report focuses on Ballard Power Systems Inc. (BLDP), its European partners and the fuel cell evolution of the European market.



Ballard Power Systems Europe headquarters in Hobro, Denmark  
Source: Ballard Power Systems

### THE ALPHADIRECT INSIGHT

The European fuel cell market is expected to see an annual growth rate of up to 70% over the next decade and Ballard is well positioned to take advantage of this growth opportunity, in our view. The Company has operated in Europe for many years and has developed strong relationships with key partners such as Van Hool, Solaris, Wright Bus, ADL and VDL during this time. We believe that Ballard has been a first-mover within this important market and the company's field experience is by far the most extensive within the PEM industry across a range of Heavy- and Medium- Duty Motive applications, where the market is gaining significant traction today. Ballard works closely with city transit agencies and other end-customers – as well as infrastructure and hydrogen supply partners – to deploy fuel cell and hydrogen technology.

### BLDP Business Snapshot

**Founded:** 1979  
**Headquarters:** Burnaby, Canada  
**Ticker:** BLDP (NASDAQ/TSX)  
**Stock Price:** USD\$3.07\*  
**Market Cap:** USD\$711M\*  
**Website:** www.ballard.com  
\*As of March 22, 2019



#### About alphaDIRECT EnergyTech Investor

alphaDIRECT Advisors (ADA), a division of EnergyTech Investor, LLC (ETI), 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. ADA's expertise encompasses a variety of sectors including Clean Transportation, Emerging EnergyTech, Energy Services, Smart Buildings, Solar, Water Value Chain and Industrial. ADA 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. ADA's mission is to bridge that information gap and engage companies and investors in a way that opens information flow and analytical insights.

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## Participants

### **Jesper Themsen** **President & Chief Executive Officer** **Ballard Power Systems Europe A/S**

Mr. Themsen has been President & CEO at Ballard Power Systems Europe A/S since 2011. From 2007 to 2011, Mr. Themsen was Chief Technology Officer at Dantherm Power A/S, which has since become Ballard Power Systems Europe A/S, a leading provider of fuel cell systems. Before helping to establish Dantherm Power A/S, Jesper served as Manager of Business Development and Manager of Research & Development at Dantherm Air Handling A/S from 2000 to 2007. Mr. Themsen holds a M.Sc. degree in Mechanical Engineering and Thermal engineering from Aalborg University. He also holds a Graduate Diploma in Management from Aalborg University, and has completed an Executive Leadership Development program with the Confederation of Danish Industry.

### **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 Burnaby, British Columbia and is listed on both NASDAQ and the Toronto Stock Exchange under the ticker BLDP.

The Company provides clean energy products – utilizing fuel cell technology – that reduce customers' costs and risks, and helps customers solve difficult technical challenges or address new business opportunities.

For further information please visit [www.ballard.com](http://www.ballard.com).



*Jesper Themsen, President and CEO  
Ballard Power Systems Europe  
Source: [www.ballard.com](http://www.ballard.com)*

**Shawn Severson:** I'd like to thank you, Jesper, for taking the time to speak with us today. The last time that we spoke with Ballard Power Systems we discussed Ballard's subsidiary, Protonex, and the area of unmanned vehicles including UAV's and drones. Today our focus will be on the evolution of the European market for fuel cells. Before we get started, can you give us a brief introduction to yourself and what brought you to Ballard?

**Jesper Themsen:** Certainly, Shawn. I am the CEO of Ballard Power Systems Europe A/S. I started working with fuel cells in 2002 and in 2010 Ballard invested in the company I was working at. Ballard acquired all remaining shares of that company in 2017. My role has since expanded within Ballard as the European market has gained momentum, becoming a robust market that presents us with significant opportunities for growth.

**Shawn Severson:** Thank you, Jesper. For investors new to Ballard's technology, can you start by briefly explaining the different fuel cell-powered products and services offered by Ballard?

**Jesper Themsen:** Ballard's core products are fuel cells, primarily fuel cell power generators that are getting market traction in Heavy and Medium Duty Motive applications, including buses, trucks, trains and ships as well as for stationary power backup applications. This early market traction is a result of the strong value proposition that our PEM – or proton exchange membrane – fuel cell products deliver in transportation applications that require long range, rapid refueling, heavy payloads and route flexibility – particularly fleet applications where a single refueling station can service a large number of vehicles.

As a general rule-of-thumb that was identified and published by McKinsey & Company, Heavy and Medium Duty vehicles that carry payloads greater than 10 tons and travel more than 100 kilometers – or 60 miles – per day on average are prime candidates for today's fuel cell power systems.

These fuel cells run on hydrogen fuel. A lot of renewable energy is currently being installed in Europe and this renewable energy can be converted through electrolysis into hydrogen, which can be stored and used to power fuel cell generators. This is one of the principle ways to capture hydrogen.

In Europe today we have a growing number of fuel cell-powered city buses. These are zero-emission vehicles in that there are no emissions from the tailpipe and, if hydrogen is produced with renewable energy, these vehicles are zero-emission from well-to-wheels.

We also have other services that we are bringing to market. For example, we offer engineering support for our customers to help them integrate fuel cells into specific applications. In addition, we offer aftermarket service, which is a very important part of bringing these fuel cell power generators to market.

Since this is a relatively new technology for many customers, we need to work closely with customers to ensure that it's working absolutely flawlessly in all applications. We also need to ensure that it's simple for customers to operate. As a result, we have also developed service training programs so that we can work hand-in-hand with our customers, ensuring they are educated regarding how to get the most from our products.

We expect the European market to generate an increased proportion of our total revenue as we move forward in the next few years. As such, Europe will be an ever more important market for us.

**Shawn Severson:** Can you provide us with some color on your European partners (Van Hool, Aberdeen City Council etc.) and the Fuel Cell and Hydrogen Training Programme developed for mechanics and bus technicians?

**Jesper Themsen:** As you know we have been operating in Europe for many years now and as a result we have a first-mover advantage and have developed a range of strong partnerships. Some of the early partnerships we have on the bus side are with Van Hool, Solaris and Wright Bus, all of which are OEMs that produce conventional as well as fuel cell-powered buses. Today we are also working closely with ADL and VDL.

But to get to market it's not enough to have a fuel cell bus, you obviously need hydrogen supply and infrastructure partners as well as city transit agencies that are interested in deploying fuel cell and hydrogen technology. For example, in Aberdeen, Scotland we have collaborated with the Aberdeen City Council for over five years since they integrated the first fuel cell bus into their transit system. Aberdeen is one of the early adopters and has been a very important leader and model for the fuel cell bus market in Europe.

Van Hool is also one of the early-mover OEMs in this market, and they have had very good experience with buses that have now been in operation for about five years in Aberdeen, for example. Today we currently have ten buses running in Aberdeen – with a cumulative one-million miles of operating

experience – and we certainly anticipate getting more buses on the streets of Aberdeen, and all of the U.K. in the near future. In addition, we recently announced that Ballard will also be powering 40 Van Hool fuel cell buses to be deployed in Germany.

Since these fuel cell buses are and will be running every day on commercial routes, we have initiated a training program together with Mercantec, a Danish school for technical education programs in collaboration with Aberdeen City Council and Van Hool. Going forward we hope to be able to more formally educate fuel cell technicians in order to support more buses in the field. In fact, we have a number of technicians going through this training program currently and two highly capable technicians recently educated at Mercantec have already been employed at Ballard in Denmark. They are now traveling to different cities to address any technical issues and support fuel cell bus deployments. They also provide training for new cities that are adopting fuel cell buses.

**Shawn Severson:** How important is it for that service infrastructure for widespread commercial adoption? Many people talk about the fuel infrastructure, but maybe service and support is something that's not looked at as closely or understood in terms of how important this to potential customers.

**Jesper Themsen:** That's a very good point because it's apparent that before you start deploying fuel cell buses or any other fuel cell vehicle, you need hydrogen fueling. As we go through this relatively early market period, continuing education is needed with regard to the technology, including the operation and maintenance of a new bus. This means that, in addition to fuel

infrastructure, you must also train local bus technicians in the early phases. It is very important, especially going forward, that there will be a lot of qualified technicians at bus depots around Europe and we have taken the first steps to prepare the industry for fuel cell bus deployments and other vehicles such as the truck, rail and marine segments.

**Shawn Severson:** Can you talk a bit about the order received back in December 2018 from Porterbrook for your fuel cell module to power the U.K. HydroFLEX train and the importance of this order?

**Jesper Themsen:** In the train segment Ballard has a number of initiatives currently underway. These include our work in China with CRRC – the world's largest rolling stock OEM – and our three-year project in Europe with Siemens to develop a module to power its leading-edge Mireo commuter train.

And, we have recently announced that we are working with Porterbrook to power the HydroFLEX train in the U.K. This is expected to be the first fuel cell train in operation in Europe, which is obviously a very important step for Ballard and the fuel cell industry.

**Shawn Severson:** The European fuel cell market is expected to see growth rates of up to 70% within the next decade. How is Ballard positioned to take advantage of this tremendous market growth and opportunity? Also, can you talk about some of the key European market drivers?

**Jesper Themsen:** Ballard is very well positioned. We have more than 14 million kilometers in bus revenue service under our belt and have fuel cells powering Transport for London buses that have 30,000 hours of operation without changing the fuel cell

stack. So, Ballard's field experience is far and away the most extensive in the PEM fuel cell industry. And, we have experience across a range of Heavy and Medium Duty Motive applications, where the market is gaining significant traction today.

**Shawn Severson:** Can you help investors understand the regulatory environment in Europe supporting zero emissions transportation and some of the recent government funding and incentives supporting the transition?

**Jesper Themsen:** We see new regulations favoring reduced emissions almost every month and many of these initiatives are focused on zero-emission transportation. This is really a fluid market with an amazing uptick. In general, the trend is that between 2025 and 2030 regulations are pointing toward only permitting zero-emission vehicles in our cities – no internal combustion engines.

As an example the Danish government has put forward a plan involving no new buses being CO2 neutral from 2020, new buses being zero emission from 2025 and all buses in cities being zero-emission from 2030. In the National Transport Plan in Norway all new city buses have to be zero emission or bio fueled by 2025. In 2030, 75% of long-distance buses and 50% of new trucks will be zero-emission – and similar ambitious plans are being presented across Europe.

With these new zero-emission plans, many fleet operators have to begin purchasing replacement vehicles now, since many existing vehicles have a lifetime in the 5-to-10 year timeframe. This is a very interesting situation, both for battery electric vehicles and for fuel cell electric vehicles, and in these segments we are talking heavy duty

transportation where fuel cells have significant advantages on range and route flexibility. With hundreds of new fuel cell electric buses expected to be deployed in Europe in the next several years, this represents a tremendous opportunity for Ballard.

And, there are publicly funded programs in some areas, as well. For example, the JIVE program – which stands for Joint Initiative for hydrogen Vehicles across Europe – provides funding aimed at deploying almost 300 fuel cell electric buses in select cities and regions. The buses I referenced for Germany and the U.K. will be funded under JIVE.

**Shawn Severson:** Thank you, Jesper. Can you specifically talk a bit more about the importance of the FCH JU program and the strong ecosystem for hydrogen and fuel cell technology it's supporting?

**Jesper Thomsen:** In order for hydrogen and fuel cells to be successful, it's important to have the whole ecosystem up and running. As mentioned before, it's not enough just to have fuel cell vehicles, you also need to have hydrogen fuel and, for maximum benefit, that should be green hydrogen.

The FCH JU program – or Fuel Cells and Hydrogen Joint Undertaking – brings together partners in predefined programs that effectively cover the entire value chain. FCH JU does this from fairly early research through to deployment and demonstration programs, providing financial support that brings key bring partners together.

**Shawn Severson:** Ballard certainly seems to be well-positioned today and I think from an investor perspective it would be helpful to understand how Ballard has gotten there. Let's look back on how this has developed

over the past 10 years and what brought you to this position today. Can you please provide some perspective on that?

**Jesper Thomsen:** Ballard has been active in the fuel cell business for about 40 years and was one of the fuel cell pioneers in Europe. Ballard started with fuel cell bus initiatives in Europe, which gave us a lot of experience and also created even more interest around fuel cell vehicles. The number of buses that we power in Europe has grown significantly as time has passed. So far we are powering more than 40 buses on the road in the current programs and we are initiating new programs supported by FCH-JU and expect to have over 250 buses on the roads in Europe in the next few years. Modest numbers to this point, but on a rapid growth trajectory.

I think it's also important to mention that, as things have evolved, we have entered new market segments. Today, Ballard is working closely with Audi on fuel cell passenger cars and we are also collaborating with ABB in the marine vertical, with an initial focus on megawatt-scale systems for the cruise ship market. We are also providing stationary backup power systems for select projects in the European market.

**Shawn Severson:** Great, thank you. That's a great bridge into our next question, which is around your goals and milestones for the European market.

**Jesper Thomsen:** Our goals are supported by our increasing activities and clear leadership role in Heavy Duty Motive fuel cell business segments. We want to build our leadership position and leverage it for other Heavy-Duty Motive applications such as rail, truck and marine, where our activities are also growing rapidly. In terms of fuel cell buses

we know programs are already initiated in the hundreds of units – for example, in the JIVE program under FCH JU. From Ballard's perspective, we are keen to both expand and deepen our penetration in bus and related Heavy and Medium Duty Motive applications. We have a number of new projects in our pipeline and we look forward to announcing additional programs as we move forward.

**Shawn Severson:** How do you plan on growing your local service offerings and local presence to support Heavy Duty vehicle deployments? I know that we touched on it a bit earlier, but could you add some more color on how that growth strategy takes place?

**Jesper Themsen:** We have a lot of experience in our service model for fuel cells since, having deployed products in Europe since 2007. Today we have 11 dedicated fuel cell service technicians supporting the different deployments in both motive and stationary equipment, and the service organization is very active this year.

In Cologne, Germany, we will be powering 30 buses and in nearby Wuppertal we will be powering 10 buses. We will have experts available in close proximity, along with spare parts in order to expedite service. We have service centers in Denmark, where our main offices are located, and in the U.K. And, we anticipate growing the service organization in other countries where we will be powering fuel cell vehicles.

**Shawn Severson:** Thank you, Jesper. Lastly, Ballard seems to have a very large market share in Europe based on what we talked

about today. How will you protect your share?

**Jesper Themsen:** Ballard has been the leader in PEM fuel cell technology for a long time and we have had a competitive advantage based on product performance, durability and cost, continued evolution of our product portfolio along with customer support.

That being said, perhaps our most important competitive advantage is our core technology and our industry-leading knowledge obtained from successful customer deployments.

Ballard also continues to develop next generation products – our LCS-based modules are expected to be released later this year under the brand name 'FCMove' – offering a number of performance enhancements. These include 40% lower volume, 30% lower weight, 50% fewer components, more than 2-times the planned operating lifetime, and significant cost reduction.

**Shawn Severson:** Great. Thank you very much, Jesper. I think this gave good insight to investors on what is a very important region for Ballard today and certainly in the future. We look forward to speaking with Ballard again soon.

**Jesper Themsen:** Thank you very much, Shawn.

## SHAWN SEVERSON FOUNDING PARTNER

Mr. Severson founded *alphaDIRECT* Advisors (ADA), 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 Stamine's top three stock pickers.



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