



BALLARD ARE DRIVING THE EXPANSION OF FUEL CELL TECHNOLOGY ACROSS A RANGE OF MARKETS.

THE NEXT NATURAL GAS

Sustainable Business Magazine speaks to Nicolas Pocard, Director of Marketing at Ballard Power Systems, about hydrogen fuel cell technology, the electrification of transportation, and the sustainable future of portable energy.

Ballard Power Systems Inc. is a Vancouver-based developer and manufacturer of proton-exchange membrane (PEM) fuel cells, with a presence in Canada, the United States, Europe, and China. Ballard's products can be used in buses, trains, commercial trucks, forklifts, unmanned aerial vehicles (UAV), and as backup power source for critical infrastructures. As businesses and state entities around the world look for better, cleaner, more cost-effective ways to produce energy, Ballard are driving the expansion of fuel cell technology across a range of markets.

"Our vision is to be the leading global provider of innovative fuel cell solutions for clean mobility," says Nicolas Pocard, Director of Marketing at Ballard Power Systems. "Ballard was originally founded in 1979 by Geoffrey Ballard, and the initial focus of the company was to work on battery technology. Shortly after this, the company got the opportunity to work on fuel cell programs funded by both the U.S. and the Canadian governments. This technology very rapidly became the exclusive focus of the company and since then we have been developing commercial fuel cell systems. Fuel cell technology had been around for some time but was initially just used for the military and space programs, and Ballard was really the first company to take it to a commercial level and put it on the road. This is ultimately still the core of the company: To develop and bring to market fuel cell products, offering superior performance at a reduced operating cost."

FLEXIBLE ENERGY CARRIER

Fuel cells are different to conventional batteries in several ways, making them more efficient and more environmentally-friendly. "A fuel cell is basically an electro-chemical device which generates electricity," says Mr. Pocard. "The electricity is generated by an electro-chemical reaction. Compared to a normal battery where the chemicals which generate the electricity are finite, in a fuel cell you are not so constrained by fuel storage limitations within the device because the fuel itself is air and hydrogen gas, the combination of which with a catalyst keeps generating electricity. Fuel cell efficiency is very high – above 50%. In some systems we are also able to harvest heat given off by the cells to make them extra effective. At the same time, fuel cells deliver zero emissions at the tailpipe, as the only by-product of this chemical reaction is water. The process is efficient, long-lasting, and extremely economical, and hydrogen is a clean fuel suitable for widespread adoption on a societal level. It is a hugely flexible energy carrier." ▶



FUTURE SIEMENS MIREO HYDROGEN TRAIN

"A key advantage of hydrogen is you can store a large amount of energy in a small space," explains Mr Pocard. "As long as you have access to hydrogen, the fuel cells can keep on generating power indefinitely. A second advantage is one of recharging or refuelling time. Whereas conventional batteries can take up to several hours to recharge, a fuel cell vehicle can be refuelled in a few minutes. For a car this takes less than five minutes, and for a bus or a truck still only around ten minutes. With fuel cells, an electric vehicle is long range, with minimal additional weight and very rapid refuelling. No toxic materials are used and the fuel cell stack is recyclable, so at

Ballard we recycle thousands of stacks every year. We also recycle 95% of the precious metal used as a catalyst, plus we refurbish the stacks for another life cycle. So overall the manufacturing process, the product itself, and the afterlife of the product is extremely environmentally friendly."

ELECTRIFYING TRANSPORTATION

As a consequence of these advantages, many governments, businesses, and even individual consumers are beginning to invest in fuel cells for sustainable, clean transportation. "In California there are over five thousand fuel cell-powered cars on the road," says Mr. Pocard. "There are prob-

ably over two hundred fuel cell powered buses operating, including in London on some of the TFL routes. These have been operating using Ballard's systems for the last seven years. We have just been chosen to supply forty fuel cell modules for buses in the city of Cologne and Wuppertal with our partner Van Hool, which is a bus company in Belgium. They are going to build new vehicles using our fuel cell power modules, and these will be operational in 2019. That will be the largest fleet of fuel cell-powered electric buses in Europe. There are lots of exciting things happening on the bus front in Europe with larger scale deployment projects."

Connecting the world of mobile machines

DIGITALIZATION

Improving mobile machine operations

AUTOMATION

Driving mobile machines with e-mobility

ELECTRIFICATION



sales@stw-technic.com
www.stw-technic.com
+1 (770) 242-1002



KENWORTH FUEL CELL ELECTRIC TRUCK

Ballard sees fuel cells as an integral part of electrifying transportation. "At the end of the day, we believe in the future that this electrification will be achieved thanks to technological breakthroughs we have achieved while working on our technology," says Mr. Pocard. "For vehicles like taxis that are in use twelve to eighteen hours a day, conventional batteries will be too limiting where fuel cells could present a viable alternative. With heavy duty vehicles too, like buses, trucks and trains, fuel cells deliver power and range without compromising the payload or passenger capacity or the fleet operation."

SUCCESSFUL COLLABORATIONS

The increasing recognition of Ballard's fuel cell technology has led to some exciting collaborations, in addition to their work with bus OEMs like Van Hool and New Flyer. "We are very happy with our partnership with Siemens," says Mr. Pocard. "It is Siemens who is developing the next generation of hydrogen-powered trains. This project is interesting as in the UK and Germany a significant part of the tracks is not electrified, so many trains are still powered by diesel. These trains are big polluters and the electrification of those lines is far too expensive for a project to be viable. Rather than electrifying the tracks, hydrogen fuel cells enable us to electrify the train into a zero emission vehicle. Because fuel cells are solid-state power generators, there are also very few parts to fail. No oil, no pistons to replace, just effi-



FUEL CELL BUS AT REFUELLING STATION IN LONDON - TOWER TRANSIT DEPOT

cient and reliable power generation. This is very important for transport."

"We have also extended our partnership with Audi," explains Mr. Pocard. "Audi are developing fuel cell cars using Ballard technology, which will be ready to enter the market in approximately 2021. This will lead directly to putting emission free, fuel cell electric cars on the road."

MEETING A NEED

Continuing to work on and improve their technology is a priority for Ballard. "We are really focusing in on mobility," says Mr. Pocard. "So buses, trucks, trains, and even marine transportation. We want to be more cost-effective, improving durability and overall costs. We want the technology to be more affordable and thereby more accessible to different groups for different purposes and applications. We will continue to work on the technical level, for example improving the power density and durability. We are now working with partners like ABB Marine in order to develop and test the technology



for different environments like marine operations. So we are again optimising the effectiveness of the technology in these different contexts to further streamline our products. Ballard has been in this industry for nearly forty years, but this recent and continuing interest in our technology is something we have never seen before. There is a convergence of factors which are really favouring our technology, like the fight against climate change, the electrification of transportation, and increasing regulation to curb emissions and pollution."

"There is a real need for our technology pushing forward and we are happy to be contributing," says Mr. Pocard. "The future success of this technology and electrification is tied up in the fact that, as the world moves towards renewable energy sources, we will not be able to have everything connected on the electric grid all at once. This is an obstacle that hydrogen as a clean fuel and energy carrier can circumnavigate. We believe that hydrogen will replace the role that natural gas plays in our economy today." □



ABERDEEN FUEL CELL BUS FLEET (VANHOOL BUSES)