

Lithium: A Critical Element

n August 23, 2012, advanced materials giant Chengdu Tianqi Industry (Group) Co. Ltd. bought Perth-based Talison Lithium in an \$847 million deal and potentially changed the course of technological development for the next century. Without much fanfare from the average consumer, a single corporation acquired control major part of the world's supply of lithium, a vital element increasingly crucial to electronic and energy innovation.

BY JEAN-SEBASTIEN LAVALLÉE

The world is on the brink of a paradigm shift for energy technology: emerging developments in renewable energy have increasingly addressed efficient storage, rather than greater production. With renewable energy sources (excluding hydroelectric dams) providing only 6% of the world's electricity production in 2011, the vast majority of power generation hasn't fundamentally changed since the invention of Fulton's steam engine. From an admittedly over-simplified point of view, our primary means of generating electricity remains heating water into steam to drive a turbine. Far more

innovation has developed in batteries and techniques for harnessing energy for future use, an application for which lithium's physical and chemical properties are indispensable.

Lithium's increasing ubiquity proves its importance. The world would be very different without light-weight lithium-ion batteries powering laptops and smartphones. Apple recently sold 5 million iPhone 5s in the device's debut weekend alone – each contains a lithium-ion battery. Future technology will rely on lithium and a handful of other strategic elements even more heavily, driven largely by an growing focus on



Jean-Raymond Lavallée, president of Critical Elements Corp., stripping the Rose outcrop at the company's Rose Tantalum-Lithium project located in the northeast part of the Archean Superior Province of the Canadian Shield craton.

Channel sample from Critical Elements' Rose Tantalum-Lithium project deposit.

renewable energy and the battery capacity required to make it practical, and by new "smart-grid" infrastructures which store excess energy produced overnight for use in higher-demand daytime hours. According to the UNEP Collaborating Centre for Climate & Sustainable Energy Finance, global investments in renewable energy totaled over \$257 billion in 2011, with the US contributing \$51 billion of that figure. Moreover, China plans to build 1 million electronic vehicles (EVs) using lithium-ion battery technology by 2015, and 5 million by 2020, in an effort to lower its carbon emissions and gasoline imports, thereby further increasing lithium needs.

In 2010, the global demand for lithium chemicals reached 102,000 tons. By 2020, global demand for lithium is anticipated to swell to 320,000 tons- a figure which Dundee Securities estimates to be about 50% more than 2009's entire global supply. As some analysts expect the EV battery industry will be worth over \$22 billion dollars by the end of 2012.

Our overwhelming reliance on lithium-based technologies in the coming decades mandates the need for strong supplies of the element, both internationally and domestically. Chengdu Tianqi Industry (Group) Co. Ltd.'s acquisition of Talison (which, coincidentally, already supplied 80% of China's lithium

imports single-handedly) has drawn a great deal of attention and reenergized the hard-rock lithium industry. However, while countries like Canada and Chile are saturated with junior lithium miners, in truth there are currently only 5 mines in the world with strong reserves able to produce 99.9% pure battery-grade lithium, one of which my company, appropriately named Critical Elements Corporation (TSX-V: CRE), is currently developing for production by 2015. Our Rose Lithium/Tantalum project in Quebec is geologically similar to Talison's property, and stands to be one of the few dominant sources for global markets and the US in particular. Additionally, through the strong support of the Canadian Government and enthusiastic cooperation from the local First Nations, Critical Elements is eager to spark not only an increase in global lithium



supplies, but a surge in human capital through mining operations and battery manufacturing jobs at home in Quebec. Critical Elements is looking forward to supplying the materials needed for driving the upcoming energy revolution, and changing the way the world works.

Lithium is Driver of Electric and Hybrid Vehicle Growth

Lithium is a key component of lithiumion battery packs that power electric vehicles (EVs) and hybrid vehicles. A recent report from Pike Research forecast global sales of EV charging equipment will grow from 200,000 units sold in 2012 to nearly 2.4 million in 2020, representing a compound annual growth rate of 37%. With lithium a key component to the electric vehicle market, it is crucial that North America has adequate supply to this critical element minus any geopolitical conflicts.

Credit Suisse has forecast a 10.3 percent annual growth in demand for lithium between 2009 and 2020. Global lithium demand has tripled over the past decade, and the global market price of lithium carbonate has tripled since 2001 to its current level of around \$6,500 per ton. An industrial research report by David & Company forecasts that the global market for lithium-ion batteries will increase to \$43 billion by 2020 compared to an \$11 billion levels in 2010 with the primary catalyst the increased demand for electric cars.

Most lithium today is mined in Australia, Argentina and Chile. The largest known deposit is in Bolivia but political turmoil has hampered production. In the United States, there is a Nevada mine with geo-thermal power plants that extracts lithium as a by-product near the Salton Sea in southern California.

China remains the leading importer of lithium minerals and compounds and the leading producer of value-added lithium materials. My company's 100% owned-



Typical spodumene (lithium) mineralization and mobile phone (which all require lithium) at the Rose Tantalum-Lithium deposit located in James-Bay, Québec

High purity lithium is required for a variety of electrical storage needs; from batteries that power electric and hybrid vehicles, or that provide large scale storage of renewable and conventionour Rose Tantalum-Lithium project one of only five deposits globally that meet the rigorous specifications for lithium ion batteries.

But as with capturing any emerging market, time is of the essence. Other nations are already actively making great efforts to establish themselves as leaders in these lithium and vanadium-reliant markets. Subaru chose a lithiumvanadium battery for its prototype G4e EV, significantly increasing the car's range to 120 miles while reducing recharge times to only 15 minutes for an 80% quick charge or 8 hours for a full charge. Also in Japan, a prototype of GS Yuasa Corporation's (GSY) lithium-vanadium phosphate battery showed lower production costs while a 20% output gain compared to a lithium iron phosphate battery. GSY expects the new battery to be used in hybrid electric vehicles through their joint ventures

GG The world would be very different without light-weight lithium-ion batteries powering laptops and smartphones.⁹⁹

Rose Tantalum-Lithium Project, in the James Bay region in Quebec is slated to start production by 2015 and is free of any geopolitical turmoil. We will be a valued global source for conflict-free Tantalum. ally produced power, to the batteries that power electronics including those found in smart phones, laptops and gaming systems. Having proven a purity of 99.9% for our lithium makes



Jean-Raymond Lavallée, president of Critical Elements Corp. exploring the Pivert mineral found on the Rose Tantalum-Lithium deposit in James Bay, Quebec.

with Mitsubishi and Honda, as well as through Toyota, one of their principle shareholders. Finally, BYD China's vertically integrated auto manufacturer and the largest rechargeable battery maker in China also has interest in vanadium chemistries. Not only is BYD actively doing commercial work on lithium-vanadium batteries, but it is also focused on primary resource acquisition; the company has targeted vanadium mineral resources in China's Shaanxi Province.

It is clear we have to ensure that North America does not lose the global war on being the leader in green energy solutions which include access to high quality conflict free lithium. The war of the new millennium is being fought on a monetary and labor scale across the globe with China the market leader for rare earth metals with about 97% of the world's supply. Next on China's plate is renewable energy integration. Ironically, as environmental pollution in the People's Republic of China runs rampant, the country has steadfastly focused on securing leadership status in the renewable industry. The Chinese government has set of goal of China securing 11.4% of its energy from non-fossil sources by the end of 2015, up from 8% today.

I believe we must actively promote our country's ability to source new energy discoveries in an environmentally responsible way. We have an educated and committed talent pool and must continue to provide positive tax incentives that ensure ongoing and continued development. We need to ensure that the US and Canada continue to produce the volume of qualified engineers and alternative energy workers who are needed for opportunities today and in the future.

Employment opportunities in the energy storage sector include manufacturing, electrical and structural engineers, site supervisors and many other titles. Building a career in the energy storage sector can assure thousands of hard-working Americans a stable career in an increasingly global society which outsources more and more career opportunities. The energy storage market will ultimately be much more cost-effective than conventional fossil fuel plant generation, with the added benefit of reduced greenhouse gas emissions.

The US government's commitment to supporting both the renewable energy and electric vehicle industries underlines the need for the rapid development of rechargeable batteries, and has thrown the spotlight on domestic lithium supplies. It is critical that North Americans understand the importance of assuming a leader stake in the alternative energy market. As my company possesses the key critical elements crucial to the electric battery sector, we are committed to being an active and valued voice in implementing change.

Jean-Sébastien Lavallée, P.Geo, President and Chief Executive Officer of Critical Elements Corporation, www.cecorp.ca, represents the third generation of an established Canadian mining family. Mr. Lavallée joined Critical Elements Corporation in 2009. In 2010, Mr. Lavallée made the discovery of the Company's 100% owned-Rose Tantalum-Lithium Project in James Bay, Quebec.