Critical Elements Successfully Produces Battery Grade Lithium Hydroxide in Pilot Plant Testing

written by Raj Shah | October 29, 2018

October 29, 2018 (Source) – **Critical Elements Corporation** (the "Corporation" or "Critical Elements") (TSX-V: CRE) (US OTCQX: CRECF) (FSE: F12) is pleased to announce the results from the Corporation's pilot plant program recently completed at the Outotec Research Center, successfully converting spodumene concentrate from the Rose Project ("Rose") into battery grade lithium hydroxide using a thermal leaching process. These results provide Critical Elements the flexibility, in conjunction with lithium carbonate and spodumene production, to meet all needs of cathode, battery and electric vehicle producers.

The pilot plant conversion process from spodumene concentrate to lithium hydroxide demonstrated strong results **with extraction rates of 93%.** This extraction rate surpasses the worldwide average of between 70 to 75% in what is accepted as an industry standard. In addition, the pilot plant produced **battery grade lithium hydroxide with 99% purity**. A summary of results is provided below:

- Battery grade lithium hydroxide with 99% purity
- High recovery of 93% versus the market benchmark of 70 to 75%
- Overall recovery from spodumene to battery grade lithium hydroxide of 80% versus the market benchmark of 65%

PILOT PLANT WORK DETAILS

The pilot plant work program was conducted at Outotec's Research Center in Finland:

- *Test work campaign, related to Outotec's patent pending lithium hydroxide production process, was carried out for Critical Elements Corporation at the Outotec Research Center in Finland.*
- *Calcined Rose and Rose South zones concentrates were tested during the test work campaign.*
- *Concentrate used for pilot plant testing was provided from the 50 tonne bulk sample taken from Critical Elements Rose and Rose South zones.*
- *The test work included a two-week pilot test run. During the test campaign, the process flowsheet was optimized.*
- *Pilot run was operated for 14 days (24 h/day and 7 days/week)*
- *The main unit operations in the pilot process were:*

    - *Slurry preparation for soda leach*
    - *Soda leach of calcined spodumene*
    - *Soda leach residue filtration and washing*
    - *Lithium hydroxide conversion by lime*
    - *Conversion residue filtration and washing*
    - *Solution purification by ion exchange*
    - *Lithium hydroxide crystallisation*
    - *Crystallization mother liquor recycling*
    - *Lithium hydroxide product washing*

- *High, 93% Li extraction from the calcined spodumene was obtained after soda leach and lithium hydroxide conversion, with only 0.15 w-% Li concentration in the final leach residue.*
- *Test work results produced lithium hydroxide with the following impurity profile in a single stage of crystallization and washing:*

LiOH analyses –impurity levels in LiOH																	
Al	*Cr*	*Mn*	*Ni*	*Cu*	*Cd*	*Pb*	*Mg*	*Ti*	*Fe*	*Be*	*Na*	*P*	*K*	*Ca*	*Zn*	*Bi*	*Cl^-*
ppm	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*	*ppm*
<40	*<5*	*<5*	*<5*	*<5*	*<5*	*<5*	*<5*	*<5*	*<10*	*<6*	*<200*	*<10*	*<100*	*<30*	*<10*	*<5*	*<100*

Successful results using a thermal leaching process demonstrate that Critical Elements can deliver a battery grade lithium hydroxide to the electric vehicle market.

To date Critical Elements has completed the following testing and piloting work:

- Piloting of the chosen concentrator plant design (see Critical Elements' press release dated April 5, 2017).
- Piloting of the thermal conversion of the ore from α-spodumene to β-spodumene (See Critical Elements' press release dated April 13, 2017).
- Piloting of the Thermal Leaching Process for Lithium Carbonate (See Critical Elements' press release dated May 29, 2017).
- Piloting of the Thermal Leaching + Lime Process to produce Lithium Hydroxide currently being completed.

Based on the results of the above work and modelling conducted by Outotec, Critical Elements believes that the overall total recovery rate should approach 80% which compares very favorably to industry standards.

This recovery is based on the following:

- Concentrator Plant Recovery – 92% possible as indicated by Outotec's modelling
- Decrepitation Kiln Recovery – 96% verified in pilot plant
- Thermal Leaching Process – 93% as an average verified in pilot plant
- **Overall yield – potentially as high as 80%**

Outotec is a leading technology company in multiple mining and extraction industries, including the lithium industry, with a global presence and owned R&D facilities in in Frankfurt, Germany and Pori, Finland, as well as other locations.

They offer competent knowledge of the various processing options for both beneficiating spodumene, as well as converting spodumene into saleable lithium salts. Their lithium expertise includes multiple years of research into various lithium processing options, including the understanding and optimizing of the process Critical Elements has chosen for lithium extraction.

“These pilot plant results support the low impurity profile of our feed which facilitates the production of battery grade lithium carbonate and lithium hydroxide at competitive costs without additional purification steps. Critical Elements is very pleased with providing the production of battery grade lithium hydroxide for the Rose Project. These test results demonstrate that the Rose Project can deliver a range of EV products, including battery grade lithium carbonate and hydroxide, to varied end users for varying applications “, stated Jean-Sébastien Lavallée, Chairman and CEO of Critical Elements.

Next Steps

Following this successful lithium hydroxide pilot plant production, Critical Elements will immediately commence basic engineering of a lithium hydroxide conversion facility.

Jean-Sébastien Lavallée (OGQ #773), geologist, shareholder and Chairman and Chief Executive Officer of the Corporation and a Qualified Person under NI 43-101, has reviewed and approved the technical content of this release.

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About Critical Elements Corporation

The Company recently released a financial analysis for Critical Elements’ wholly-owned Rose Lithium Tantalum project (Rose Lithium-Tantalum project feasibility study, WSP, October 20, 2017), which is based on price forecasts of US $750/tonne for chemical-grade lithium concentrate (5% Li2O), US $1,500/tonne for technical-grade lithium concentrate (6% Li2O) and US $130/kg for Ta2O5 in tantalite concentrate, and an exchange rate of US $0.75/CA $. The internal rate of return (“IRR”) for the Rose Lithium-Tantalum project is estimated at 34.9% after tax, and net present value (“NPV”) is estimated at CA $726 million at an 8% discount rate. The estimated payback period is 2.8 years. The pre-tax IRR for the Rose Lithium-Tantalum Project is estimated at 48.2% and the pre-tax NPV at CA $1,257 million at an 8% discount rate (see press release dated September 6, 2017). The financial analysis is based on the Indicated mineral resource. An Indicated mineral resource is that part of a mineral resource for which quantity, grade or quality, densities, shape and physical characteristics can be estimated with a level of confidence sufficient to allow the appropriate application of technical and economic parameters, to support mine planning and evaluation of the economic viability of the deposit. The life-of-mine (LOM) plan provides for the extraction of 26.8 million tonnes of ore, 182.4 million tonnes of waste, and 11.0 million tonnes of overburden for a total of 220.2 million tonnes of

material. The average stripping ratio is 7.2 tonnes per tonne of ore. The nominal production rate is estimated at 4,600 tonnes per day, with 350 operating days per year. The open pit mining schedule allows for a 17-year mine life. The mine will produce a total of 26.8 million tonnes of ore grading an average of 0.85% Li2O and 133 ppm Ta2O5, including dilution. The mill will process 1.61 million tonnes of ore per year to produce an annual average of 236,532 tonnes of technical and chemical-grade spodumene concentrate and 429 tonnes of tantalite concentrate.

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