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Lithium Australia – corporate dashboard

Following an intensive period of research and development, Lithium Australia NL (ASX: LIT or 'the Company') recently reviewed progress across all of its activities, in order to identify the most opportune commercialisation prospects.

As a result, the LIT board has implemented a rationalisation programme designed to consolidate the Company's efforts behind its most advanced technologies and, in so doing, improve management and investor focus for each of LIT's business divisions.

In that way, LIT can provide interested members of the public with an avenue for direct investment in the business divisions of their choice as stand-alone listed vehicles while still allowing them exposure to the circular economy for battery materials that investing in LIT represents. The aim, then, is to achieve greater investment flexibility in terms of the energy-metal cycle.

This report outlines progress within LIT's various business divisions and some of the Company's plans for the future.

LIT business divisions

The Company has developed processing technologies that can integrate the whole lithium-ion battery (LIB) production cycle by way of four business divisions, involving:

- raw materials
- lithium chemicals
- batteries, and
- recycling.

Raw materials

This LIT division has identified materials – lithium micas and fine spodumene in particular – that have long been considered 'waste' in the mining industry. The Company, having identified various opportunities, is seeking partners to recover such waste minerals for processing via technologies developed by its lithium chemical division. LIT's exploration programme, meanwhile, remains active and has a global footprint.

Lithium chemicals

This LIT division focuses on recovering lithium from waste materials such as lithium micas and fine spodumene (commodities less constrained by market pressure) and delivering the resultant chemicals primarily as lithium phosphate (although there are also the options of producing a lithium hydroxide or carbonate) for battery production and other applications.

Battery division

Lithium phosphate is an important commodity for LIT in that it provides direct feed for the Company's battery division. That division, through LIT's wholly owned subsidiary VSPC Ltd ('VSPC'), is currently focused on the development of high-performance cathode powders for use in LIBs.

Recycling division

LIT's recycling division incorporates its 18.9% ownership of Australia's only domestic LIB recycling entity, Envirostream Australia ('EA'). Together, LIT and EA are developing a national LIB recycling programme with the ability to recover all of the battery metals, including the lithium, from spent batteries of this type.

By combining EA's expertise and LIT's proprietary technologies, the Company's recycling division will help the battery industry meet the ethical, social and governance standards the community expects. Further, it can strengthen the industry's capacity to deal with climate change by improving resource sustainability and reducing the environmental footprint of portable power.

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Raw materials

New LIT raw materials divisional manager Mark Strizek is in the process of rationalising the Company's Australian tenement holdings, which include exposure in Western Australia, the Northern Territory, Queensland and South Australia. A complete review of all historic and recent exploration activity has been completed and summaries of the information made available to interested parties.

Greenbushes (Western Australia)

Of particular interest is a significant holding of ground adjacent to and in the vicinity of Greenbushes (Western Australia), the world's largest lithium mine, operated by Talison Lithium Pty Ltd (51% Tianqi and 49% Albemarle). The tenure covers a vast area that includes numerous pegmatites.

Electra (Mexico)

The Company is seeking partners for its 54% interest in the Electra project (lithium clays), which flanks the Sanora lithium clay deposit (recognised as one of the largest deposits of its type in the world), which is owned by Bacanora Minerals plc. Extensive lithium mineralisation has been identified within the Electra project area.

Dudley (South Australia)

Studies of prospective lithium pegmatites at Dudley (Kangaroo Island) have revealed significant potential for high-purity kaolin and halloysite, as well as gem-quality tourmaline. Expressions of interest in these deposits are currently being sought.

Youanmi (Western Australia)

Despite technically successful drilling campaigns at Youanmi, on both vanadium and lithium mineralisation, LIT did not exercise its option to purchase the three exploration licences the subject of the option agreement. The Company felt the purchase price did not reflect the risk and expense required to demonstrate value in the acquisition.

Miscellaneous

The area under LIT's tenure in Queensland has been reduced, and discussions relating to the sale/farm-out of Bynoe (Northern Territory) are ongoing.

Disposal of some of the Lake Johnston package (Western Australia) is currently being negotiated. Meanwhile, drilling is planned at Medcalf, part of the Lake Johnston package not the subject of disposal. That drilling will focus on areas in which spodumene-bearing pegmatites outcrop. Initial environmental benchmark surveys have been commissioned as part of the approval process.

The Company welcomes enquiries with respect to its other tenement holdings.

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Lithium chemicals

LIT's lithium chemicals division has partnered with some of the best technical expertise available – including that of the Minerals business unit of the Australian Nuclear Science and Technology Organisation ('ANSTO') at Lucas Heights in New South Wales – to develop lithium extraction technologies, with the focus firmly on waste materials. Those waste materials can be classified as:

- lithium micas;
- fine spodumene, and
- spent LIBs.

The Company has lodged patent applications for most of the technologies emanating from its R&D programmes. These technologies include the following.

- SiLeach®, for the recovery of lithium and other valuable by-products from mica.
- LieNA®, for the recovery of lithium from spodumene concentrates (with an emphasis on the fine spodumene mostly relegated to tailings by Western Australian producers, due to grade/recovery challenges).
- Recovery of lithium as lithium phosphate.
- Refining of lithium phosphate to achieve an ultra-pure (>99.9% Li_3PO_4) substance.

While the production of lithium phosphate is a common thread in the extraction technologies LIT has developed, there is also the ability to produce lithium hydroxide or carbonate as required.

LieNA® – disruptive spodumene processing technology

The veracity of LieNA®, a hydrometallurgical process based on caustic digestion as an alternative to conventional roasting processes, has been adequately demonstrated by ANSTO in extensive laboratory trials.

LIT recognises that the ability to recover lithium from fine spodumene (and contaminated concentrates) using the LieNA® process has the potential to improve the sustainability of lithium resources, increase the quantum of recoverable lithium and, ultimately, reduce costs. Presently, most spodumene operations achieve recoveries of 50-70%, as a consequence of the physical properties of the target mineral – spodumene has two perfect cleavages and thus a propensity to generate abundant fines during the liberation process, with strict converter specifications further exacerbating the loss of fine spodumene as a result of grade/recovery constraints. It's these issues that provide LIT with an opportunity, since such fine spodumene streams represent ideal feed for the LieNA® process.

The Company seeks partners to commercialise its LieNA® process.

SiLeach® – the preferred process for recovering lithium from micas

SiLeach®, a fluorine-assisted acid-leach recovery process, is designed specifically to break the chemical bonds that form part of the lithium mica lattice. It should be noted that although fluorite (naturally occurring calcium fluoride) is added to enhance the process, the micas themselves, during decomposition, release significant quantities of fluorine, since they may initially contain up to 8% or more fluorine as part of the mineral. Unlike with other processes, the SiLeach® flowsheet has specific fluorine-removal and control steps to optimise the handling of fluorine generated during the decomposition of the mica minerals. Superior water balance is also a key attribute of the SiLeach® flowsheet, allowing for recovery of lithium from dilute process liquors generated during the process. This approach eliminates much of the requirement for evaporation, a high capital and operating cost of competing systems.

To date, two generations of SiLeach® pilot plants have operated successfully at ANSTO and the Company anticipated construction of a Generation 3 pilot plant in the current quarter. The funding package for that construction factored in significant government support in the form of R&D rebates. At present, however, Australian federal government policy on the rebate system remains unclear, thereby creating significant doubt about the surety of that component of the funding package. That, coupled with soft lithium chemical pricing, has prompted the LIT board to indefinitely delay making an investment decision.

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Batteries and cathode materials

Advanced cathode powders

LIT is the sole owner of VSPC, a company with three families of patents covering novel processes for the production of LIB cathode powders. Those VSPC technologies are, to a large extent, chemical-agnostic, meaning they are based around how the nanoparticles are made, not what they are made of.

VSPC technology offers great flexibility in the production of a range of cathode powders. That said, the Company has noted the recent shift in demand to lithium-ferro-phosphate ('LFP') batteries in China, as well as demand generated by the energy-storage sector ('ESS') for this type of battery. These circumstances have prompted VSPC to focus more strongly on the development of LFP cathode powder.

At VSPC, LFP cathode materials have been successfully synthesised using lithium phosphate recovered from mine waste and end-of-life LIBs, thereby providing the potential for cradle-to-grave stewardship by the LIB industry.

Product testing of VSPC-produced battery materials with customers in Japan and China is ongoing. Feedback to date has been positive and VSPC has refined its product morphology to tailor performance to specific applications.

Cathode powder production pre-feasibility study

VSPC's pre-feasibility study ('PFS') for a 5,000 tonnes per annum cathode-material project has been completed, with its strategic recommendations the subject of internal Company review. The study's terms of reference were broadened in April 2019 to include a detailed evaluation of production options in China, as well as greenfield project options within Australia. A production strategy for China is important in the context of VSPC’s partnership with DLG Battery Co. Ltd ('DLG'), a major Chinese manufacturer, for commercialisation of VSPC cathode materials in that country. The results of the PFS will be released in the near future.

Soluna Australia – supplying batteries for the energy-storage industry

LIT/VSPC has entered into an agreement with DLG to:

- commercialise VSPC cathode powders in China, and
- develop a battery distribution business within Australia.

Equity in the distribution business, Soluna Australia Pty Ltd ('Soluna'), is 50% LIT and 50% DLG. Soluna will focus on supplying product to the ESS, and has identified both fringe-of-grid and off-grid applications as fertile markets.

Soluna has plans to establish a number of demonstration projects that have significant benefits over currently installed power infrastructure. Those projects will be hybrid energy management systems with solar and battery storage as their core, plus a range of backup energy sources to supplement the renewable component.

Data collection and a system audit have already been completed on one of the proposed demonstration sites in a remote, off-grid location where diesel power generation will be used as backup.

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Recycling

LIT's recycling division

The current phase of the Company's accelerated R&D programme for the recycling of LIBs was awarded to ANSTO. LIT has already reaped the benefits of its ability to recover nickel, cobalt and lithium in various forms from spent LIBs. The lithium, recovered as a lithium phosphate, was subsequently refined, then used by VSPC to generate cathode powders and, ultimately, coin cell LIBs for electrochemical testing. The performance of the coin cells exceeded VSPC's internal performance specifications, vindicating the Company's use of recycled lithium to regenerate cathode materials.

The significance of this achievement is paramount in ensuring the sustainability of the battery industry, as few recyclers worldwide are able to recover the lithium from spent LIBs in a useable form.

Investment in Envirostream Australia

LIT has increased its equity in Envirostream Australia ('EA') to 18.9% (EA being the only company in Australia with the integrated capacity to collect, sort, shred and separate all the components of LIBs).

This infrastructure is essential to the Company in developing an environmentally responsible solution to the mounting problem of spent LIBs, most of which are currently relegated to landfill. The collection and physical processing/separation of the battery components by EA and LIT's recycling R&D are an ideal fit.

Acceleration of the Company's R&D programme is a prelude to the restructuring of its recycling business, the intention being to amalgamate the capabilities of LIT and EA. EA is expanding its collection and processing capacity in line with the development of LIT's process technology, with the latter already generating coin cell LIBs from recycled materials supplied by EA.

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Comment from Lithium Australia MD Adrian Griffin

"Reorganisation of the Company's business units and asset base will create more focused opportunities for investors with an appetite for the energy-metals and battery sectors. Lithium Australia will be able to reduce costs while continuing to deliver the benefits of its current research programmes. This is critical in a market of depressed prices for battery commodities.

"We're pleased with our progress in all fields of the battery material market and look forward to a successful future as part of the fourth industrial revolution, a revolution initiated by John B Goodenough, who has, at 97 years of age, become the oldest recipient of a Noble prize. He (along with two others) was awarded the Nobel Prize in Chemistry for his pioneering work on lithium-ion batteries, which have changed forever the way we manage energy. For many years the scientific community wondered why Goodenough's achievement had not been properly acknowledged, so it's gratifying to see that all things come to he (or she) who waits!"

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About Lithium Australia NL

Lithium Australia aspires to 'close the loop' on the energy-metal cycle in an ethical and sustainable manner. To that end, it has amassed a portfolio of projects and alliances and developed innovative extraction processes to convert *all* lithium silicates (including mine waste) to lithium chemicals. From these chemicals, the Company plans to produce advanced components for the lithium-ion battery industry. The final step for Lithium Australia involves the recycling of spent batteries and e-waste. By uniting resources and the best available technology, the Company aims to establish a vertically integrated lithium processing business.

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