# Closing the loop on the energy metal cycle

Lithium Australia NL

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**Grand Hyatt Hotel, Hong Kong**



17-18 October 2017

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Lithium Australia NL

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*COMPETENT PERSON'S STATEMENT*

*The information in this report that relates to reporting of Exploration Results is based on and fairly represents information and supporting documentation prepared by Adrian Griffin, a member of the Australasian Institute of Mining and Metallurgy. Mr Griffin is a shareholder in, and managing director of, LIT and has sufficient experience relevant to the style of mineralisation and type of deposit under consideration. He is qualified as a Competent Person as defined in the 2012 edition of the* Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves*. Mr Griffin consents to the inclusion in this report of the matters based on information in the form and context in which it appears.*

# Lithium storage – what's it all about?

Lithium Australia NL

**It's about the biggest change in energy management since the industrial revolution.**


**It's about batteries.**

- Renewable power on demand 24/7 thanks to lithium ion batteries ("LIBs")
- Completely portable energy

The generation of LIBs that makes this all possible has many variants. The highest energy density is provided by those containing cobalt in the cathode and these batteries are well suited to mobile phones, computers, tablets and electric vehicles. Lithium iron phosphate chemistries, often referred to as the "safe lithium battery" have lower energy densities, but are less prone to "thermal runaway" and will withstand a greater number of charge/discharge cycles. These batteries are the popular choice for hybrid electric vehicles and may be found in power tools and backup for renewable energy. Further improvements are on the way, but the ubiquitous LIB is here to stay.

Lithium Australia is striving towards "vertical integration" which will provide the opportunity to apply a range of disruptive processing technologies that will "close the loop" by creating the ability to produce battery materials from primary mineral deposits, and recycling of spent battery metals. Subsequently these can be re-birthed to create new batteries, by applying advanced cathode manufacturing techniques.

# Lithium Australia – a year of achievement 2016-2017

Lithium Australia NL

**Lithium Australia advanced commercialization of the SiLeach® process (acid base lithium extraction from silicates).**

- lithium extraction with the SiLeach® hydrometallurgical process,
- **the only company to recover lithium from all silicates without roasting**,
- processing materials that are otherwise not able to be processed,
- prepared graphite assets for IPO
- embarked on global exploration.


**Lithium Australia also owns 100% of the caustic based LieNA™ lithium extraction process, and exclusive rights to Lepidico's LMax® extraction technology in Western Australia, the locus of global hard-rock lithium production.**

# The future is about sustainability

Lithium Australia NL

**Application of advanced technologies for a sustainable LIB future**

Lithium Australia recognizes the impediments of a rapidly expanding battery industry:

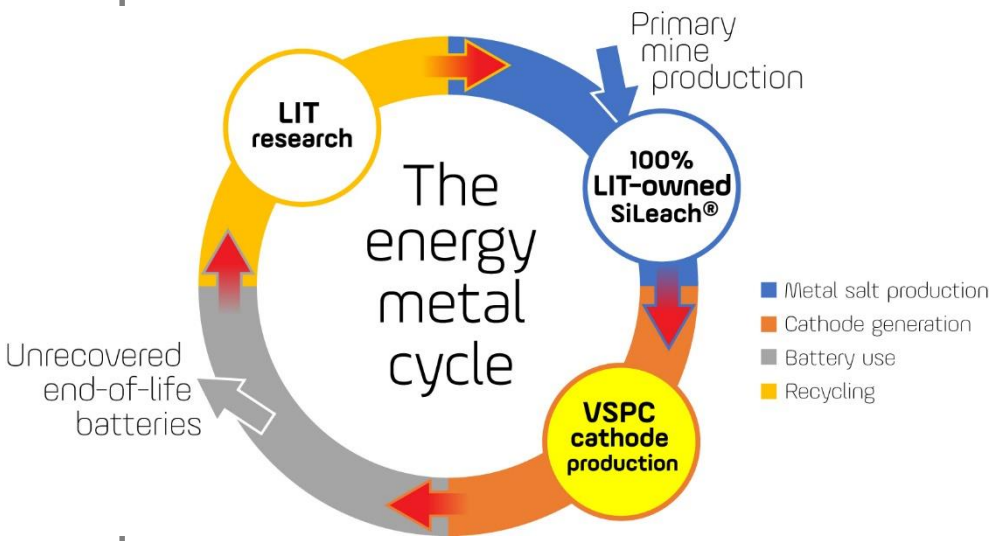
- susceptibility to supply shortages,
- ethical constraints of conflict metals,
- embedded child labour,
- low recycling rates,
- under-utilized waste streams.

To plan a sustainable future for LIBs we need

- better utilization of primary resources
- higher rates of recycling "energy metals" from LIBS
- improved battery production techniques

**Today only 10% of batteries in Australia are recycled and abundant lithium waste from mining operations is discharged to tailings.**

Lithium Australia is striving towards the "circular economy" for the production and utilization of LIBs and is integrating the best technologies to achieve that outcome.




**The future is sustainable production - creating the circular economy**

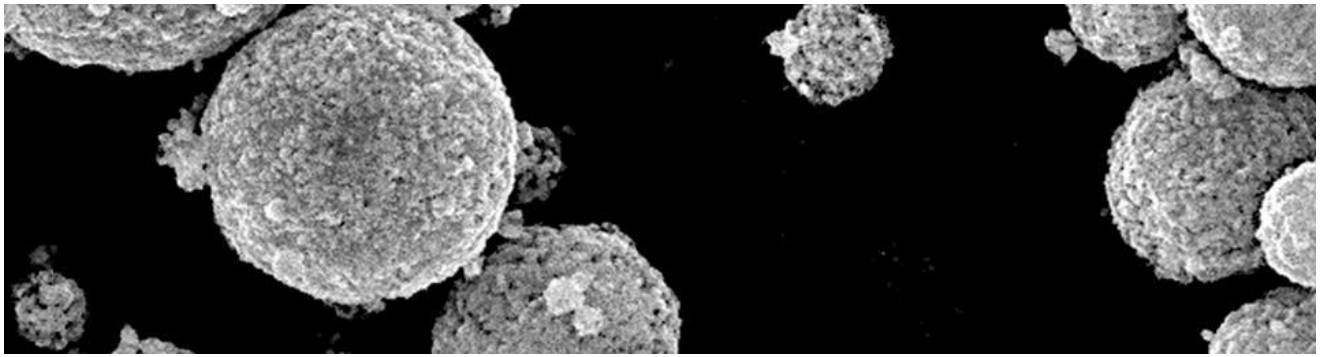
# Development of battery cathodes

Lithium Australia NL

**Lithium Australia is negotiating procurement of advanced cathode production technology by the acquisition of the Very Small Particle Company Limited (VSPC).**

Lithium Australia intends to:

- acquire a controlling interest in the Brisbane (Australia) based VSPC,
- recommission VSPC's advanced cathode pilot plant in Brisbane,
- produce the world's most advanced cathode materials,
- expand VSPC's strategic partnerships.



The VSPC advantages:

- innovative, patent protected chemical process,
- delivery of very precise chemistry to complex metal oxides (cathode materials),
- **fast track to commercialization of superior cathode production.**

# The Lithium Australia Plan

Lithium Australia NL

**Evolutionary technology to produce battery chemicals in the lowest cost quartile.**

**LIT's principal goal will be achieved by:**

- commercialising LIT's 100% owned SiLeach™ lithium extraction technology,


LIT has already produced **battery grade lithium carbonate** and demonstrated the potential profitability of the SiLeach® process. Testing of process improvements already underway.

- commercialising the production of cathode materials.
  VSPC has already produced some of the best cathode material in the world.

- progressing recycling plans to capture the value in waste before it is buried.
  LIT has advanced research programs evaluating the cradle-to-grave cycle of lithium batteries in Australia and North America. LIT plans to create a closed circuit processing stream recovering the "energy metals" for input into the production of new cathode material.

# The recycling imperative – closing the loop

Lithium Australia NL

**Lithium Australia is advancing its hydrometallurgical processes to recover spent battery materials and ease the pressure on primary production.**

Recycling energy metals will reduce the reliance the LIB industry has on the input of primary raw materials. Pressure on cobalt supply is of particular concern to the industry as cobalt is largely a by-product of copper and nickel production, and the rapid increase in demand for the production of LIBs is likely to push cobalt beyond the tipping point.

The lithium recycling rate from LIBs, on a global basis, is currently close to zero. LIT has the technology available to recover that metal as well as the other battery metals, and reintroduce them into the energy metal cycle.

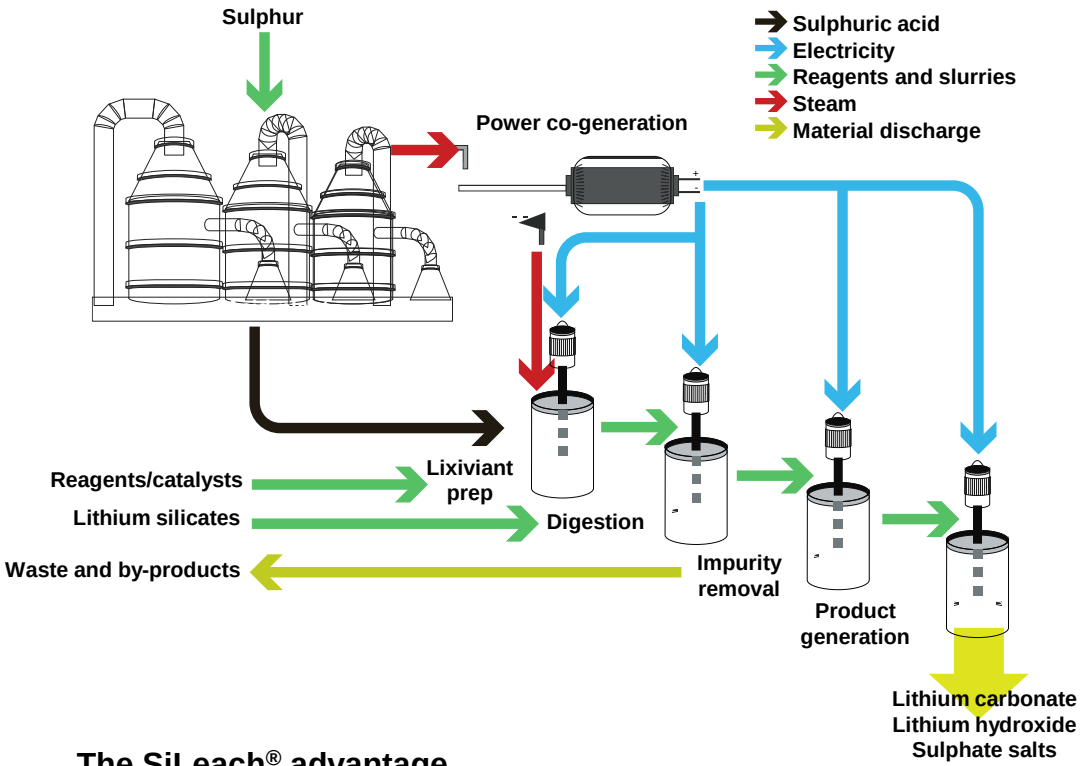
The recyclable content of LIBs may be the cheapest source of energy metals. At present most batteries end up in landfill however Australian state governments, and other governments around the world, are slowly moving towards restricting such practices. At present no LIB recycling takes place in Australia, a situation detrimental to the environment and the future viability of LIBs.

As the energy economy disengages from its roots in fossil fuels, the proliferation of LIBs will increase, and upon market saturation, will require far higher recycling rates than are presently achieved. Market saturation of LIBs is approaching faster than could have been imagined just a few short years ago. Government policies and consumer demand, in the automotive sector in particular, are driving the battery-based power economy. These conditions are ideal for the establishment of a recycling enterprise which will add further environmental credentials to LIB utilisation and value to investors in Lithium Australia.

# SiLeach® - superior processing technology

Lithium Australia NL

## SiLeach® is designed to rapidly digest ANY silicate mineral




During conventional processing, lithium is recovered only from spodumene concentrates, not lithium micas. Also, conventional processing incorporates a roasting phase at temperatures of more than 1000° C, followed by 'sulphation bake', a sulphuric acid process under-taken at about 250° C. The residue is subsequently cooled and leached with water to recover ONLY lithium (as a sulphate), which is then further processed to produce lithium carbonate.

As a hydrometallurgical process occurring entirely in solution (no roasting), SiLeach® reduces energy consumption. Moreover, it's undertaken at atmospheric pressure, so only simple mechanical components are necessary. All metals within the target minerals are soluble in the SiLeach® process, which creates the opportunity to:

- generate significant by-product credits, and
- produce very clean lithium solutions.

The latter point is important in terms of the subsequent production of battery-grade lithium carbonate.

## The SiLeach® advantage

In summary, SiLeach® is an unparalleled processing environment that efficiently digests and recovers all significant metal values from the minerals processed. Thus, it can be applied to a wide range of lithium feedstock with low energy consumption, high metal recoveries and extensive by-product credits. In addition, SiLeach® has applications beyond the recovery of lithium from silicates. It has, for example, been tested on refractory gold ores to remove siliceous gangue material from the ore prior to cyanide recovery of gold. Therefore, SiLeach® demonstrates versatility beyond lithium recovery and may become the benchmark for extraction of a wide range of metals from silicates.

# Graphite

BlackEarth Minerals NL

Lithium Australia NL

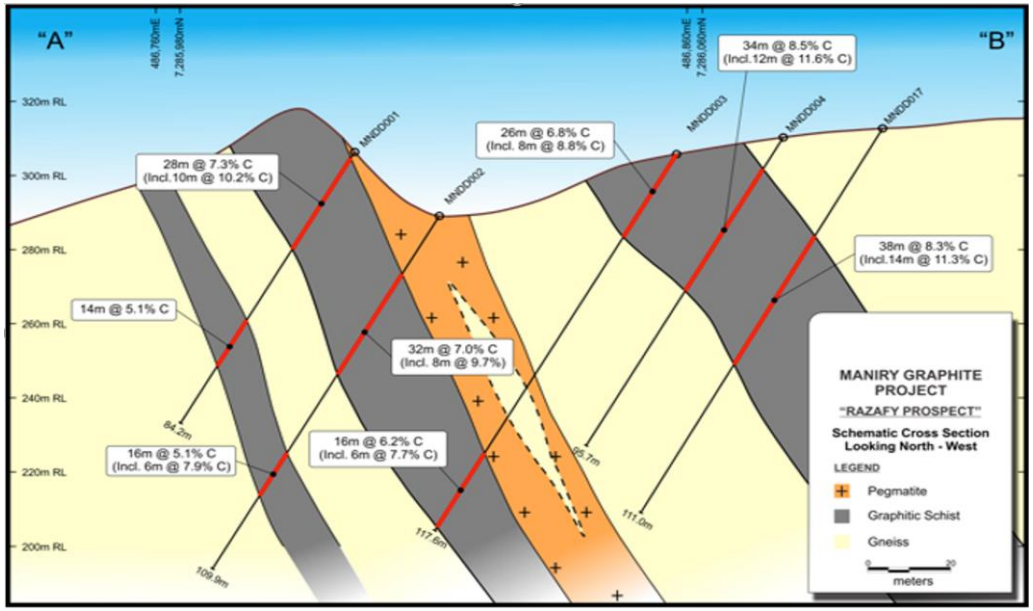
**LIT subsidiary BlackEarth Minerals prepares for IPO**

Graphite explorer BlackEarth Minerals NL (BEM) holds a significant exploration portfolio in Western Australia, as well as graphite projects in Madagascar.

BEM will list on the ASX later this year, with LIT as a major shareholder (a priority entitlement will be offered to LIT shareholders).

LIT has assembled an experienced management team for BEM and LIT chairman George Bauk will represent LIT on the BEM board of directors.

While LIT considers graphite synergistic with its other assets, its decision to have BEM operate as a separate entity was made in the interests of maximising the effectiveness of the LIT management team.




# Why invest in Lithium Australia?

Lithium Australia NL

- ✓ **Contributing to a sustainable lithium future through:**
  - ➢ **Metal extraction form waste minerals**
  - ➢ **Energy metal recycling from spent batteries**
  - ➢ **High-quality cathode production**
- ✓ **World-first, 100% owned technology – SiLeach®**
- ✓ **Developing the world's best cathode materials - VSPC**
- ✓ **Strategic partnerships & alliances in the world's major lithium provinces**
- ✓ **Experienced Management**

# Lithium Australia – corporate snapshot

ASX-listed: ticker LIT
FSE-listed: ticker 3MW

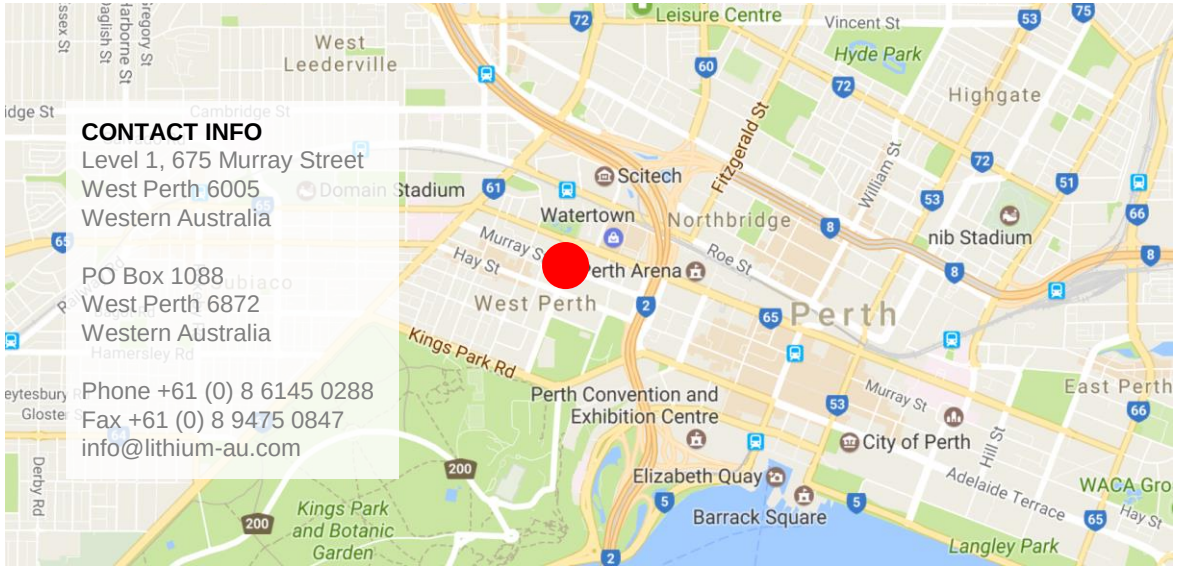
Lithium Australia NL

**BOARD OF DIRECTORS**

**George Bauk**
**(non-executive chairman)**
Expert in specialty metals, particularly rare earths – project management, marketing and financing.

**Adrian Griffin**
**(managing director)**
Exploration, production, mine management, processing technology.

**Bryan Dixon**
**(non-executive director)**
Corporate, finance, mine development.

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|---|---|
| **Price (AU$) as of 17 Oct 2017** | **0.16** |
| **Market capitalisation (AU$)** | **50 M** |
| **Shares outstanding (LIT)** | **313,570,538** |
| **Partly paid shares (LITCE)** | **132,850,148** |
| **Cash position (AU$) (17/10/17)** | **4.8 M** |
| **Debt position (AU$)** | **NIL** |

Investment portfolio at 17/10/17 includes AU$7 million equity in other lithium companies and a substantial exposure to gold exploration in Western Australia.

| **Top 10 holders at 17 October 2017** | **24.63%** |
|---|---|
| JP Morgan Nominees | 4.89 |
| Accuity Capital Investment | 4.78 |
| Citicorp Nominees | 3.15 |
| Adrian Griffin | 2.73 |
| Parkway Minerals NL | 2.33 |
| Horn Resources | 1.68 |
| Huic Noms Pty Ltd | 1.42 |
| BNP Paribas | 1.41 |
| Alan Jenks | 1.20 |
| Apollinax Inc. | 1.04 |