30 June 2023

Patent Application Filed for Lithium-Ion Battery Cathode Innovation

MELBOURNE, Australia – Sunrise Energy Metals Limited's ('**Sunrise Energy Metals**' or '**Company**') (ASX:SRL) CEO and Managing Director Sam Riggall is pleased to update the market on recent outcomes of the Company's lithium-ion battery cathode research and development activities.

Key Developments:

- **Sunrise lithium-ion battery (LiB) test work delivers 45% to 94% increase in battery cycle life for NMC811 cells compared to control LiB's utilising standard electric vehicle industry formulation**
- **Independent test work programs were undertaken on LIB's using nickel-cobalt-manganese (NCM) chemistry at Queensland University of Technology (QUT) and NEI Corporation (NEI) in New Jersey, USA**
- **Initial positive results of NCM622 test work program at QUT were replicated in subsequent NCM811 test work program at NEI**
- **A patent application was filed by the Company in June covering the unique elemental composition of the Sunrise sulphate formulation**

Managing Director and CEO, Sam Riggall said: *"Our research and development (R&D) activities to date have focused on the conversion of metal salts to precursors and cathode active material. The work has demonstrated that a targeted elemental composition, using nickel and cobalt sulphates generated from Sunrise's piloting program, can deliver a 45 to 94% increase in battery cycle life for NMC811 cells compared to control LiB's that utilise industry standard battery-grade metal salts. Improvements of this magnitude are significant, by lowering both cell cost and the life cycle cost of an electric vehicle. We are currently assessing next steps in terms of progressing this initial breakthrough, including working in partnership with one or more existing participants in the EV battery supply chain."*

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Nickel and cobalt are critical metals contained within the cathodes of Nickel-Cobalt-Aluminium (**NCA**) and Nickel-Cobalt-Manganese (**NCM**) LIB's. In both NCA and NCM cathodes, nickel and cobalt make up the majority of both the mass and value of the cathode. In recent years, the battery industry has developed more nickel-rich battery chemistry (such as NCM811) in order to reduce battery cost per kWh and improve capacity.

As part of ongoing R&D activities, the Company has been undertaking test-work programs focused on the conversion of its nickel and cobalt sulphate to precursor and cathode active material (pCAM and CAM). The Sunrise sulphates used in the test work were produced as part of pilot plant operations undertaken during the most recent Feasibility Study for the Project (the Project Execution Plan[1]), which provided both flow-sheet validation and customer samples.

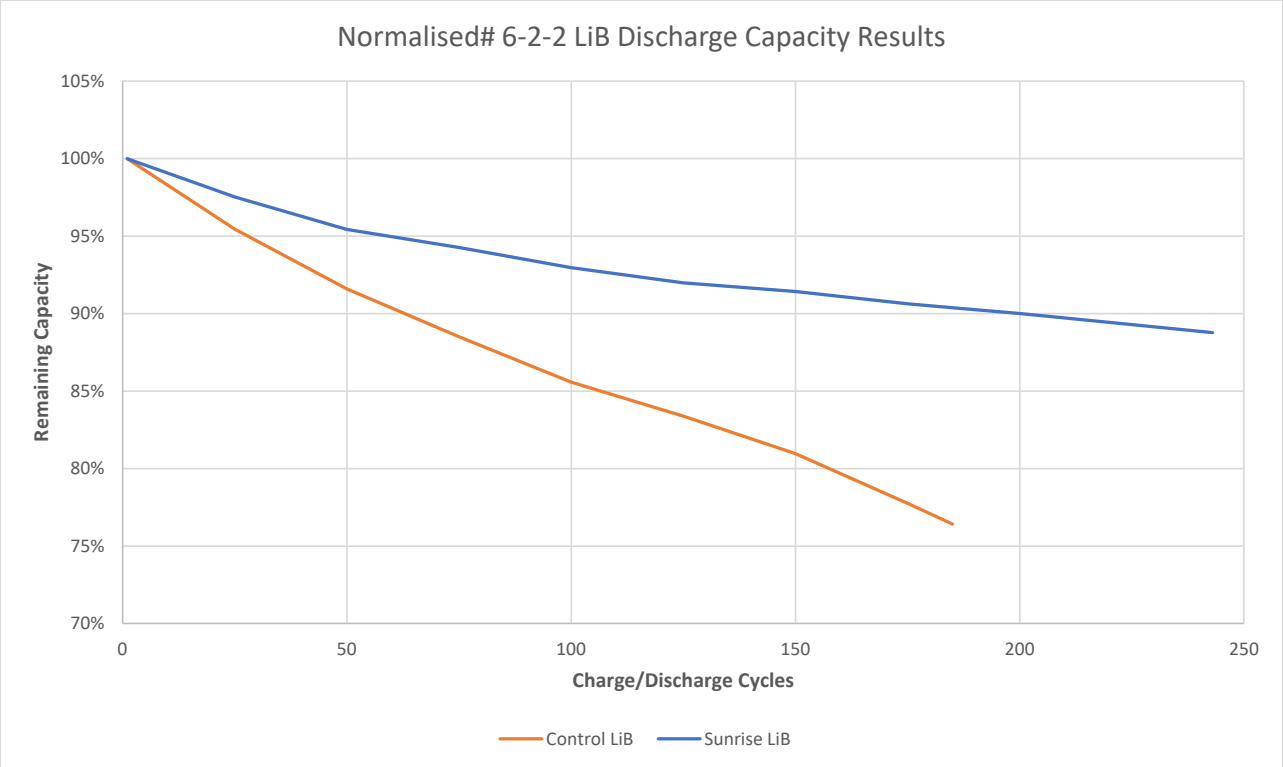
The Sunrise nickel and cobalt sulphate eluate (being a high concentration metal liquor) was further refined using a lab-scale process to produce a feedstock with a targeted elemental composition for incorporation into cells for electrochemical testing. These cells could then be tested against control cells, manufactured in an identical fashion, using industry standard nickel and cobalt salts.

The first phase of the test work program was undertaken by Queensland University of Technology (**QUT**). QUT used the refined Sunrise sulphate to produce a number of NCM622 half-cells[2]. QUT also manufactured a number of 'control' NCM622 half-cells via application of an identical manufacturing process and using industry standard battery-grade nickel and cobalt sulphate sourced from third parties.

The results of the QUT NCM622 study indicated that the specific elemental composition of the Sunrise sulphate had a highly beneficial impact on the durability of the Sunrise cells relative to the 'control' cells. The results showed that the cells manufactured with the modified Sunrise sulphate retained 90% capacity after 200 cycles whereas the capacity of the control cells dropped below 80% after 150 cycles (see **Figure 1**).

[1] For details, including applicable JORC disclosures, see ASX announcement of 28 September 2020
[2] Half-cell LiB's utilise lithium metal anodes as opposed to the graphite anodes typically used for EV batteries

Figure 1: NCM 622 LiB Charge/Discharge Capacity Results (QUT)

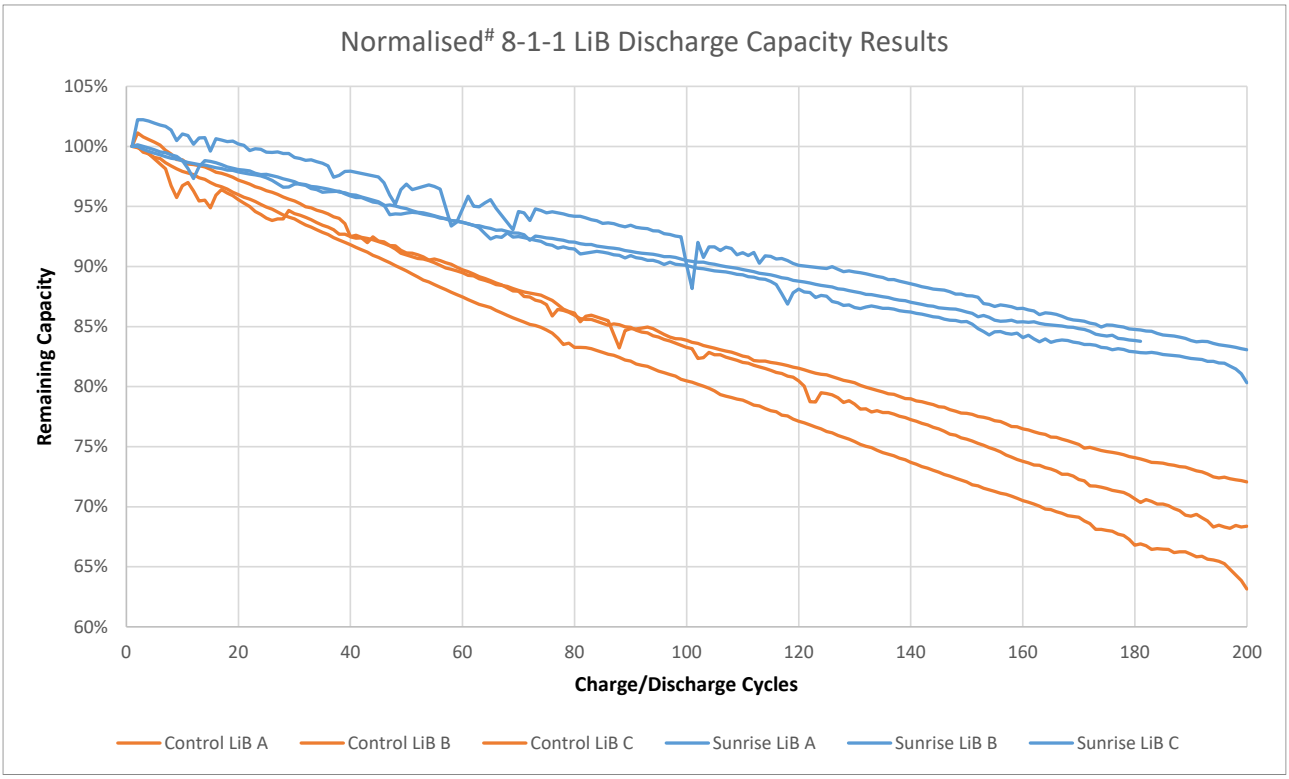


 # Results were normalised for different starting charge capacities to allow like-for-like comparison of cell degradation

Based on the initial QUT results, the Company then initiated a second phase of independent test work undertaken by New Jersey based NEI Corporation (**NEI**). NEI provides advanced materials development services including a range of high-tech battery materials development, characterisation and electrochemical testing services. NEI undertook the same program as the QUT work, except that NEI manufactured NCM811 cathode for the Sunrise and control cells. NEI also developed full-cells, which use a graphitic anode as typically used in EV batteries.

The results of the NEI NCM811 study (see **Figure 2**) replicated the results of the earlier QUT study and indicated that, over a 200-cycle charge/discharge test, the specific elemental composition of the refined Sunrise sulphate had a highly beneficial impact on the durability of the NCM811 cells relative to the control sample. **Based on a minimum 80% capacity threshold, the results demonstrated an increased cycle life of between 45% and 94%. The results also demonstrated a more consistent degradation profile across the samples using the Sunrise sulphate**.

Figure 2: NCM811 LiB Charge/Discharge Capacity Results (NEI)



 # Results were normalised for different starting charge capacities to allow like-for-like comparison of cell degradation

The test work program has, to date, provided support to the Company's belief that significant improvements in cathode material performance can be achieved further upstream by a more targeted approach to feedstock characterisation and elemental composition. It appears that the incorporation of low levels of specific elements (less than typical doping levels), potentially on the surfaces of the precursor particles, may be driving enhancements in cycle life. While downstream processes typically used in cathode manufacturing to improve the durability of the electrode – coating, drying and screening – will continue to play an important role, more work needs to be undertaken to better understand the opportunities upstream by adjusting feedstock compositions to optimise cathode morphology and processing conditions. Further test work is also required to assess if there are any other impacts (positive or negative) on cell performance and characteristics.

The Company notes that neither the Sunrise cells, nor the control cells, had performance characteristics comparable to commercially available NCM811 cells. Nor were these tests conducted over large sample sizes, as it was not the purpose of this work to produce a commercially-comparable cell. Rather, it was to demonstrate the performance uplift that could be generated by a targeted approach to feedstock characterisation, holding other factors constant. Additional work is now required to determine whether the results generated to date can be applied to the commercial production of cells.

The Company has filed a patent application to protect the intellectual property relating to this sulphate formulation and is currently assessing next steps in terms of progressing this initial breakthrough, potentially in partnership with one or more existing participants in the EV battery supply chain.

This announcement is authorised for release to the market by the Directors of Sunrise Energy Metals.

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About Sunrise Energy Metals Limited

Sunrise Energy Metals Limited (ASX:SRL) is progressing its world-class Sunrise Battery Materials Complex in New South Wales, utilising its Clean-iX® technology. The Sunrise Project is one of the largest and most cobalt-rich nickel laterite deposits in the world and is development-ready, with all key permits and approvals in place. Sunrise is also one of the largest and highest-grade scandium deposits globally.

Forward Looking Statements

Certain statements in this news release may constitute "forward-looking statements or "forward- looking information" within the meaning of applicable securities laws. Such statements involve known and unknown risks, uncertainties and other factors, which may cause actual results, performance or achievements of the Company or industry results, to be materially different from any future results, performance or achievements expressed or implied by such forward-looking statements or information. Such statements can be identified by the use of words such as "may", "would", "could", "will", "intend", "expect", "believe", "plan", "anticipate", "estimate", "scheduled", "forecast", "predict" and other similar terminology, or state that certain actions, events or results "may", "could", "would", "might" or "will" be taken, occur or be achieved. These statements reflect the Company's current expectations regarding future events, performance and results, and speak only as of the date of this new release. Readers are cautioned not to place undue reliance on forward-looking information or statements.

Although the forward-looking statements contained in this news release are based upon what management of the Company believes are reasonable assumptions, the Company cannot assure investors that actual results will be consistent with these forward-looking statements. These forward-looking statements are made as of the date of this news release and are expressly qualified in their entirety by this cautionary statement. Subject to applicable securities laws, the Company does not assume any obligation to update or revise the forward-looking statements contained herein to reflect events or circumstances occurring after the date of this news release.