Lithium Universe LIMITED
Building a Lithium Future

ASX ANNOUNCEMENT AND MEDIA RELEASE

22 April 2026

LIFE CYCLE ASSESSMENT CONFIRMS SILVER EXTRACTION PV RECYCLING DELIVERS STEP-CHANGE REDUCTION IN EMISSIONS AND COSTS

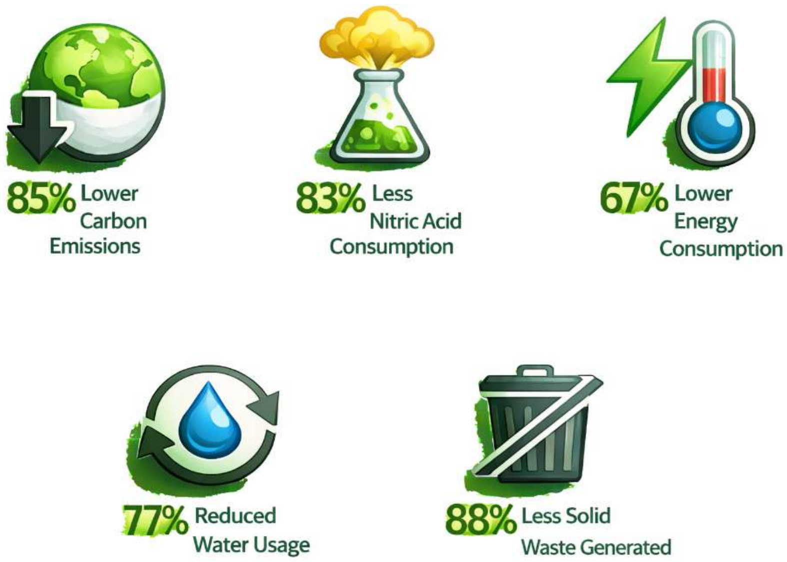
Highlights

- Macquarie University completed Life Cycle Assessment
- Silver Extraction PV Recycling Project (**SEPR**)
- 85% lower carbon emissions compared to conventional processes
- 83% reduction in nitric acid consumption achieved
- 67% lower energy consumption under mild operating conditions
- 77% reduction in water usage from closed-loop system
- 88% lower solid waste generation versus conventional leaching
- Rapid silver extraction: 97.1% achieved in four minutes
- High-purity silver produced at 99.88% (3N grade)
- Closed-loop process eliminates need for downstream refining
- Over three times revenue per kilogram of silver recovered

Lithium Universe Limited (LU7) announced that a Life Cycle Assessment (LCA) of Lithium Universe's Silver Extraction PV Recycling Project (**SEPR**) was undertaken by **Macquarie University** to assess the environmental and economic performance of the process using Jet Electrochemical Silver Extraction (JESE). The study was designed to provide a robust, comparative assessment against conventional nitric acid leaching, which remains the dominant industrial recovery route for photovoltaic waste.

The Life Cycle Assessment adopts a **cradle-to-gate system boundary**, encompassing feedstock handling (intact solar cells), silver extraction, electrochemical recovery, reagent consumption, energy usage, and waste generation. Downstream refining and product finishing were excluded, as the LU7 **SEPR** process produces high-purity (3N, 99.88%) silver directly, thereby eliminating additional processing steps typically required in conventional flowsheets.

The Life Cycle Assessment demonstrates that the Company’s process delivers significant environmental advantages over conventional recycling methods. Carbon emissions are reduced by approximately 85%, reflecting the combined benefits of lower energy intensity and elimination of high-temperature processing. Nitric acid consumption is reduced by 83% through targeted, localised reaction conditions, while energy usage is lowered by 67% due to rapid processing times under mild operating conditions. The closed-loop system enables a 77% reduction in water consumption, minimising effluent discharge and supporting sustainable operations. In addition, solid waste generation is reduced by 88% compared to conventional leaching processes, driven by high selectivity and minimal co-leaching of impurities. Collectively, these outcomes confirm a materially lower environmental footprint and position the technology as a leading solution for sustainable, circular recovery of critical materials from end-of-life photovoltaic systems.



METHODOLOGY AND FUNCTIONAL UNIT

The functional unit for the assessment was defined as **1 kilogram of recovered silver (Ag)**, enabling direct comparison between processes. Primary data inputs were derived from experimental work conducted in collaboration with Macquarie University, including:

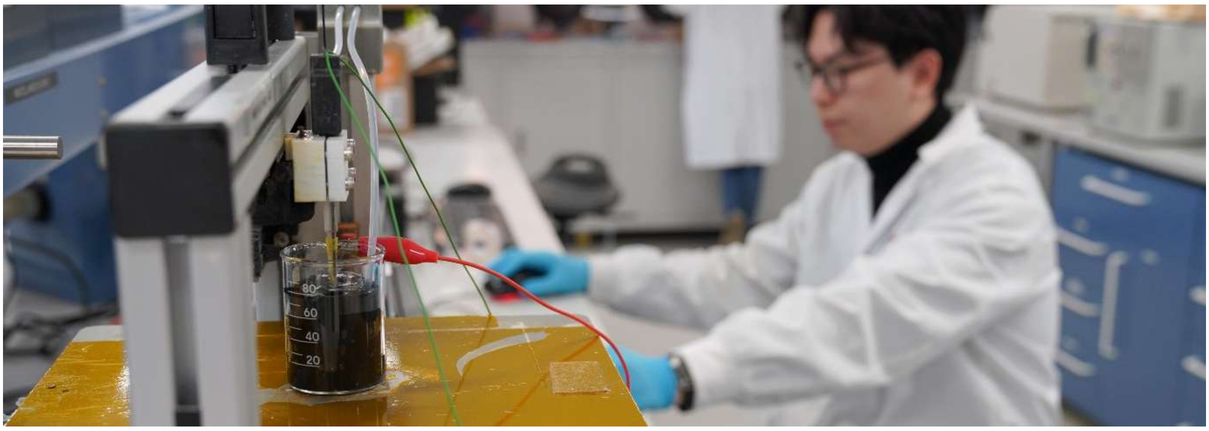
- Silver extraction efficiency: **97.1% in approximately 4 minutes**
- Silver recovery efficiency: **92.6% in approximately 3 minutes**
- Operating conditions: **12 wt% nitric acid (HNO_3), ~2 V, ambient temperature**

The benchmark conventional process was modelled based on industry-standard hydrometallurgical practices, incorporating concentrated nitric acid (≥5 M), extended residence times (ranging from 1 to 48 hours), and downstream precipitation and purification stages.

The following key environmental impact categories were evaluated:

- Global Warming Potential (GWP, kg CO_2-eq per kg Ag)

- Acid Consumption (kg HNO_3 per kg Ag)
- Energy Consumption (kWh per kg Ag)
- Water Consumption (litres per kg Ag)
- Solid Waste Generation (kg per kg Ag)



LIFE CYCLE RESULTS

The results demonstrate that the **SEPR** process delivers **substantial environmental benefits across all key metrics** when compared with conventional acid leaching.

Table 1: Comparative LCA Results (per kg Ag recovered)

Parameter	SEPR Process	Conventional Leaching	Reduction (%)
GWP (kg CO_2-eq)	2.8	18.5	~85%
Acid Consumption (kg HNO_3)	0.6	3.5	~83%
Energy Consumption (kWh)	4.2	12.8	~67%
Water Use (L)	25	110	~77%
Solid Waste (kg)	0.08	0.65	~88%

The most significant outcome is the **approximately 85% reduction in global warming potential**, driven by a combination of lower reagent intensity, significantly reduced processing time, and lower energy requirements. The **SEPR** process achieves rapid extraction within minutes, compared to hours in conventional systems, materially lowering cumulative emissions.

Acid consumption is reduced by approximately **83%**, reflecting the core advantage of the **SEPR** process; **localized, confined microreaction zones**. Unlike conventional bulk leaching, which requires large volumes of acid to overcome diffusion limitations and achieve acceptable kinetics, **SEPR** process precisely targets the silver layer with minimal excess reagents. This results in a step-change improvement in chemical efficiency.

Energy consumption is reduced by approximately **67%**, as **SEPR** operates under low voltage (~2 V) and ambient temperature conditions. Conventional leaching processes often require prolonged agitation, heating, and downstream recovery steps, all of which contribute to significantly higher energy intensity. The elimination of these steps in **SEPR** materially lowers overall energy demand.

Water consumption is reduced by approximately **77%**, supported by the **closed-loop electrolyte recirculation system** inherent to the **SEPR** design. This minimizes fresh water intake and reduces wastewater generation. In contrast, conventional processes require extensive washing, neutralisation, and effluent management, resulting in higher water usage and environmental burden.

Solid waste generation is reduced by approximately **88%**, reflecting the highly selective nature of the **SEPR** process. By avoiding co-leaching of aluminium, silicon, and glass components, **SEPR** eliminates the formation of mixed waste streams and simplifies downstream handling. Conventional processes, by comparison, generate significant quantities of contaminated residues requiring treatment and disposal.

CIRCULAR ECONOMY AND RESOURCE EFFICIENCY

A key outcome of the Macquarie University LCA is the demonstration that **SEPR** enables a **closed-loop recovery pathway**, in which dissolved Ag^{+} ions are directly electrodeposited into high-purity metallic silver without intermediate precipitation or refining. This significantly reduces material losses, reagent consumption, and process complexity.

Importantly, **SEPR** process preserves the structural integrity of the photovoltaic substrate, including the SiNx passivation layer and TiO_2 antireflection coating. This introduces a **secondary sustainability benefit** not typically captured in conventional LCA frameworks; the potential for **reuse or refurbishment of solar cells**.
By maintaining device architecture, **SEPR** process moves beyond simple material recovery toward **higher-value circularity**, where components may be reintroduced into the value chain. This represents a meaningful advancement over destructive recycling methods, which typically reduce materials to low-value outputs.

TECHNO-ECONOMIC CORRELATION

The environmental advantages identified in the LCA are directly correlated with improved economic performance. Techno-economic analysis (TEA), conducted in parallel with the LCA, indicates that the **SEPR** process delivers **revenue exceeding US$2,500 per kilogram of silver recovered**, representing more than a **threefold increase** compared to conventional leaching routes.
This improvement is driven by several key factors:

- Significant reduction in chemical consumption (~83% lower acid usage).
- Lower energy requirements (~67% reduction).
- Elimination of downstream purification and refining steps.
- Reduced waste treatment and disposal costs.

- Short processing times enabling higher throughput.

The rapid kinetics of the **SEPR** process (minutes versus hours) also support the development of **modular, scalable processing units**, improving capital efficiency and enabling flexible deployment at or near waste generation sites.

SENSITIVITY ANALYSIS AND PROCESS ROBUSTNESS

The Macquarie University study included sensitivity analysis across key operating parameters, including acid concentration, interelectrode gap (IEG), and scanning velocity. The results demonstrate that **SEPR** process maintains strong performance within a defined operating window, with optimal conditions identified as:

- Acid concentration: **12 wt% HNO_3**
- Interelectrode gap: **~4.5 mm**
- Scanning velocity: **~7 mm/s**

Within this range, the process consistently delivers high recovery efficiency, low environmental impact, and stable operation. Deviations outside this window result in reduced efficiency or increased side reactions but do not materially compromise overall process viability, highlighting the robustness of the technology.

CONCLUSION

The commissioned LCA conducted by Macquarie University confirms that **SEPR** process represents a **step-change improvement** in both environmental and economic performance for silver recovery from photovoltaic waste.

The process delivers substantial reductions in carbon emissions, reagent consumption, energy use, water demand, and waste generation, while enabling a closed-loop, high-purity recovery pathway. In addition, the preservation of photovoltaic substrates introduces new opportunities for reuse and enhanced circularity.

Collectively, these outcomes position **SEPR** process as a **commercially viable, environmentally sustainable, and scalable solution** for the recovery of critical metals from end-of-life solar panels, aligned with global decarbonisation objectives and the transition toward a circular economy.

Executive Chairman, Iggy Tan, Comment

*"This study from Macquarie University shows our **SEPR** technology is cleaner, faster, and more efficient than traditional methods. We use less energy, less chemicals, and produce less waste, while recovering more silver. It's a smarter, more sustainable way to recycle solar panels and unlock real value from waste".*

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Authorised by the Chairman of Lithium Universe Limited

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Forward-looking Statements

This announcement contains forward-looking statements which are identified by words such as 'anticipates', 'forecasts', 'may', 'will', 'could', 'believes', 'estimates', 'targets', 'expects', 'plan' or 'intends' and other similar words that involve risks and uncertainties. Indications of, and guidelines or outlook on, future earnings, distributions or financial position or performance and targets, estimates and assumptions in respect of production, prices, operating costs, results, capital expenditures, reserves and are also forward-looking statements. These statements are based on an assessment of present economic and operating conditions, and on a number of assumptions and estimates regarding future events and actions that, while considered reasonable as of the date of this announcement and are expected to take place, are inherently subject to significant technical, business, economic, competitive, political and social uncertainties and contingencies. Such forward-looking statements are not guarantees of future performance and involve known and unknown risks, uncertainties, assumptions and other important factors, many of which are beyond the control of our Company, the Directors, and management. We cannot and do not give any assurance that the results, performance or achievements expressed or implied by the forward-looking statements contained in this announcement will occur and readers are cautioned not to place undue reliance on these forward-looking statements. These forward-looking statements are subject to various risk factors that could cause actual events or results to differ materially from the events or results estimated, expressed, or anticipated in these statements.

ABOUT LITHIUM UNIVERSE LIMITED

Lithium Universe Limited (ASX: LU7) ("Lithium Universe" or "the Company") is a forward-thinking company on a mission to close the "Lithium Conversion Gap" in North America and revolutionize the photovoltaic (PV) solar panel recycling sector.

SILVER EXTRACTION - PV SOLAR PANEL RECYCLING STRATEGY

As the global demand for solar energy expands, solar panel waste is projected to reach 60–78 million tonnes by 2050, making efficient recycling solutions critical. Silver is essential for solar panels, electronics, and electric vehicles due to its unmatched electrical conductivity. Industrial demand has surged, especially from photovoltaics and AI technologies, creating a global supply deficit. With production lagging, silver prices have soared to record highs, reinforcing the economic importance of efficient recycling.

Lithium Universe has responded by acquiring Macquarie University's Microwave Joule Heating Technology (MJHT) and Jet Electrochemical Silver Extraction (JESE) method, a breakthrough in recovering valuable metals from end-of-life PV panels. The first stage, developed by Macquarie University, is Microwave Joule Heating Technology (MJHT), a process that uses microwave energy to selectively heat silicon cells softening the ethylene vinyl acetate (EVA) encapsulant that binds a solar panel's layers. This enables room-temperature delamination of glass, silicon, and metal layers without crushing, furnaces, or toxic chemicals. The result is a clean separation of materials, drastically reducing energy use, emissions, and chemical waste while preserving the integrity of high-value silicon and silver components. Following delamination, Lithium Universe applies its Jet Electrochemical Silver Extraction (JESE) process, a micro-jet electrochemical system that directs a fine stream of dilute nitric electrolyte onto the silver pads of solar cells. This method achieves over 95% silver recovery at 96% purity, while using 83% less acid and no chemical additives. The process operates at just 5 volts, recycles its electrolyte, and produces zero heavy-metal waste, establishing a true closed-loop recycling system. Together, MJHT and JESE form a sustainable, scalable recycling platform that converts discarded solar panels into a renewable source of silver, silicon, and other critical materials, a vital step toward circularity in the global clean-energy supply chain.

LITHIUM DIVISION

Lithium Strategy: Closing the Lithium Conversion Gap

Lithium Universe is at the forefront of efforts to meet the growing demand for lithium in North America. As electric vehicle (EV) battery manufacturers prepare to deploy an estimated 1,000 GW of battery capacity by 2028, the need for lithium is expected to rise dramatically. However, with only a fraction of the required lithium conversion capacity in North America, LU7 is determined to play a pivotal role in reducing dependence on foreign supply chains. The company is building a green, battery-grade lithium carbonate refinery in Bécancour, Québec, leveraging the proven technology developed at the Jiangsu Lithium Carbonate Plant. This refinery will produce up to 18,270 tonnes per year of lithium carbonate, focusing initially on the production of lithium carbonate for lithium iron phosphate (LFP) batteries. The refinery's smaller, off-the-shelf plant model ensures efficient operations and timely implementation, positioning LU7 as a key player in the emerging North American lithium market. With a strong leadership team, including industry pioneers like Chairman Iggy Tan, LU7 is well-positioned to deliver this transformative project. The company's strategy is counter-cyclical, designed to build through the market downturn and benefit from the inevitable recovery, ensuring sustained exposure to the growing lithium demand.

Second Refinery Strategy

Lithium Universe Limited has launched a second lithium refinery strategy in the Port of Brownsville, Texas, complementing its flagship Bécancour project in Québec. The initiative creates a binational refining platform to address North America's lithium conversion shortage and strengthen supply chain resilience. Strategically located near the Port of Brownsville, the potential site offers deep-water access, low labour costs, and streamlined permitting within one of the U.S.'s most business-friendly regions. Leveraging a "copy and paste" design from the proven Bécancour refinery, the Texas project can be rapidly deployed to serve nearby gigafactories, aligning with U.S. policy incentives under the Inflation Reduction Act.