LCC ASIA PACIFIC
CORPORATE FINANCE & STRATEGIC ADVISORY

LCC Research

# Investment Opportunities and Challenges in the Global Lithium-ion Battery Recycling Market

**Prepared for:** Australian Battery Recycling and Manufacturing Conference

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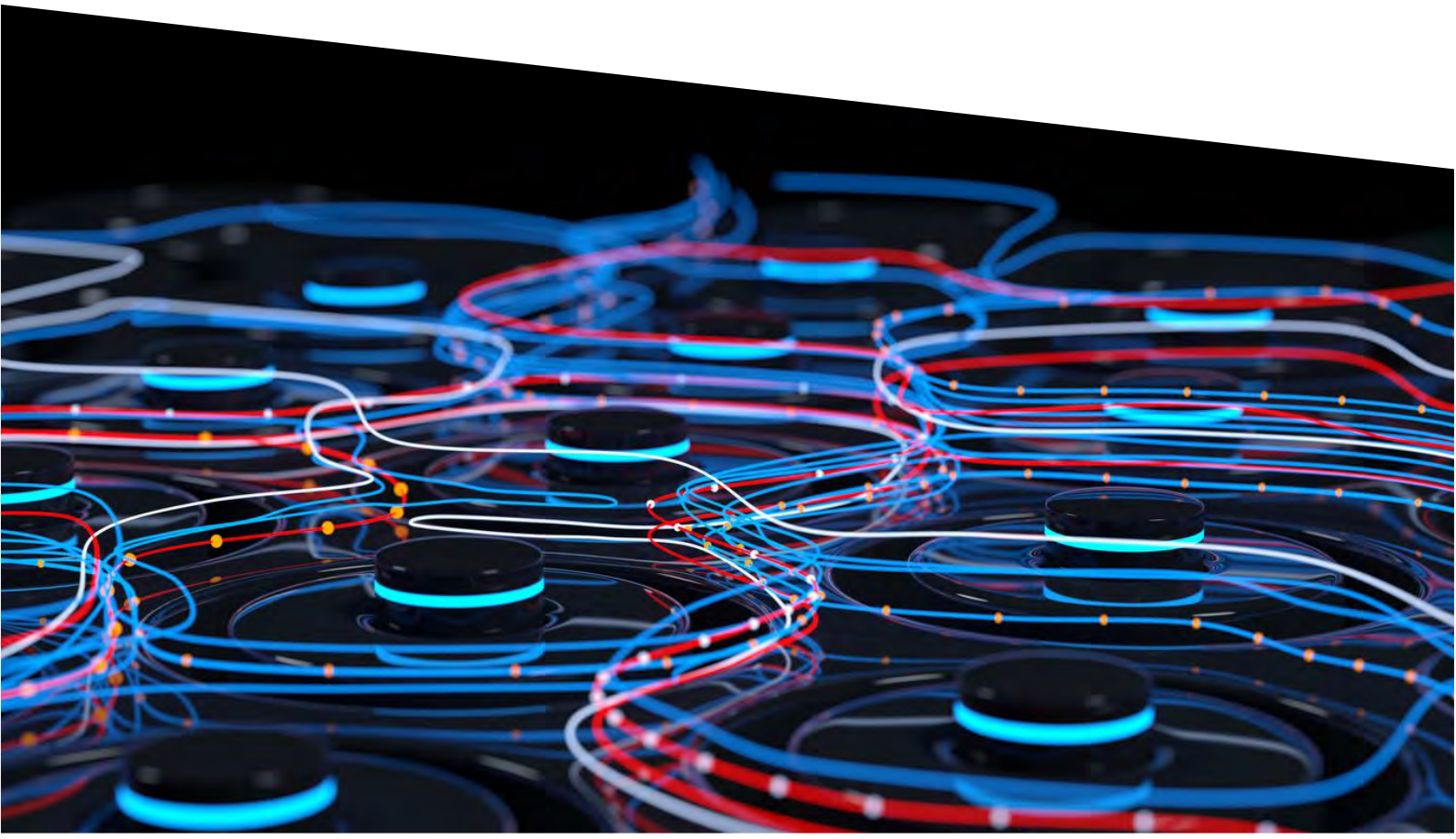

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# LCC Research Report | Global Lithium-ion Battery Recycling Sector

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# Executive Summary

This report highlights key themes and considerations for policymakers in Australia regarding lithium battery recycling and industry development. The global expansion of the broader battery sector underscores the significance of efficient recycling practices, while the competitive landscape is shifting due to factors beyond size. Access to capital markets and strategic alliances play a vital role in scaling recycling operations. International policy action is driving global investment flows which in turn is shaping the economic competitiveness of regional players.

Key Themes for Policymakers:

1. **Recycling for Economical Waste Management and Resource Recovery:** Recycling end-of-life batteries and manufacturing scraps is vital for economic and environmentally sound waste management. Policymakers must focus on collection, recovery, and safe transportation, along with direct investment to promote high-quality recycling processes.
2. **Enabling Factors for Successful Recycling:** Regulatory harmonisation, streamlined processes, digital measures, and accreditation of secondary raw materials all support efficient and sustainable recycling, enhancing cost and climate competitiveness.
3. **Maturing Global Recycling Market:** As the battery industry expands, operational excellence, innovative recycling techniques, and supply chain management are crucial. Access to capital markets, joint ventures, and strategic partnerships will underpin recycling capacity growth.
4. **Global Policy Action and Investment Flows:** Policy actions have a big influence over recycling efforts. Various countries offer incentives for recycling, with the US providing significant support through the Inflation Reduction Act (IRA). Investment trends show a concentration in North America.
5. **Australian Context and Economic Competitiveness:** Australia's battery industry contributes significantly to the economy. While battery manufacturing may face challenges, recycling offer economic opportunities for positive returns by leveraging competitive strengths.
6. **Attracting Investment to Local Recycling Industry:** Foreign investment will become crucial for Australia to capitalise on economic opportunities in the battery value chain. Domestic financial markets coupled with government funding, and foreign capital is vital to reach a sufficient level of capital to stimulate the highest economic and social benefit.

Policymakers in Australia must focus on regulatory support, investment incentives, and strategic collaborations to foster a competitive battery recycling industry. By embracing these strategies, Australia can position itself as a global leader in sustainable battery technology and resource recovery.

# 1. Maturing Global Recycling Market

## 1.1 International Status

With the rapid expansion of the battery industry worldwide, the ability to generate cash flow and invest in efficiency and productivity becomes a crucial advantage for leading recycling companies. This advantage is particularly significant in a market where size already plays a vital role upstream, influencing the sourcing of battery materials.

However, the impact goes beyond just the volume of waste battery for recycling. The impending market consolidation will result in higher barriers to enter and fewer players, affecting the contracts available for recycling production waste. This trend of consolidation is likely to be concentrated among specific markets. For recycling companies, showcasing their ability to efficiently collect, recycle and reprocess materials, will secure them a coveted position. Yet, a capacity challenge is on the horizon, as these companies operate as both buyers and sellers, competitive pricing will eventually drive a decline in profit margins.

In essence, the competitive landscape is undergoing a transformation driven by factors beyond each firms ability to capture a larger slice of market share. Energy security, new technology and supply chain dynamics underscores the importance of operational excellence, innovative recycling techniques, and adept upstream management. As the industry propels toward reshaped market dynamics, agility, strategic adaptation, and value-focused practices will emerge as pivotal elements that define success and sustainability in this evolving battery recycling sector.

## 1.2 Access to Capital Markets and Investment

Recycling materials and products is logistically complex and requires large upfront infrastructure investment. These characteristics have led to low investment from venture capital across the global battery recycling sector. However, increasing circular economy policy announcements have stimulated greater incentive for investment.

We are seeing positive momentum from government incentives to stimulate additional private sector investment with a surge of investment tied to the long-term electric vehicle demand narrative. Management able to demonstrate a pathway to medium- to long-term returns have been rewarded by investors.

Accessibility to capital markets is largely dependent on the stage of development of a battery recycler. Majors such as Redwood Materials and Li-Cycle have developed proven recycling processes and are now in the process of constructing or expanding recycling facilities. Given cash flow generation is on the horizon, these companies have been able to attract substantial debt capital funding.

Investors in companies pursuing major capital projects are more willing to invest when firms reach the “harvest” phase of their investment cycle (i.e., when new projects are coming online or are sufficiently close to commissioning where a shift in growth and free cash flow can be confidently forecast). Amid current market volatility, investors are less willing support when they are in the “Investment” phase at the early stages of multiple years of less meaningful returns/FCF. For managements, boosting confidence in medium to longer-term corporate and project level returns is key.

Less developed battery recyclers are much more dependent on equity financing given the funding is targeted at R&D activities and other expenses necessary to develop and advance recycling technology to a proven state. Exhibit 1 below shows the funding landscape for key global battery recyclers. Grant funding from governments generally becomes more accessible as a battery recyclers’ technology advances and nears or reaches commercial viability.

Exhibit 1

**Funding Mix of 'Pure Play' Battery Recycling Companies in North America**

| Company | Total Funding | % Equity | % Debt / Other | % Govt Grant | % Govt Loan |
|---|---|---|---|---|---|
| **North America** | **USD** | | | | |
| Redwood Materials | $2,867m | 30% | | | 70% |
| Li-Cycle Holdings | $1,343m | 4% | 68% | | 28% |
| Lithion Recycling | $151m | 93% | | 7% | |
| Cirba Solutions | $125m | 40% | | 60% | |
| ABTC | $100m | 10% | 20% | 70% | |
| Aqua Metals | $31m | 81% | 19% | | |
| RecycLiCo Battery Materials | $30m | 100% | | | |
| Princeton NuEnergy | $22m | 36% | | 64% | |
| Momentum Technologies | $21m | 96% | | 4% | |
| Nth Cycle | $20m | 81% | | 19% | |
| Li Industries | $8m | 87% | | 13% | |

**Source**: Crunchbase; Owler; S&P Capital IQ; LCC Research

## 1.3 Strategic Commercial Arrangements

While private market and venture funding has increased, it has been focussed on technology development and not led to a meaningful uptick in recycling capacity. What is more likely to help recycling companies scale capacity are joint venture and asset funding from corporate partners. Recycling start-ups will struggle to scale without licensing their technology or partnering with a large financier. What is more likely to help recycling companies scale capacity are joint venture and asset funding from corporate partners.

Exhibit 2

**Strategic Alliance Arrangements for Key Major Recyclers**

| | Battery Recycling Player | Alliance | Commercial Partner |
|---|---|---|---|
| 1 | RecycLiCo Battery Materials | 50:50 Joint Venture | Zenith Chemical |
| 2 | Li-Cycle Holdings Corp. | 50:50 Joint Venture | Glencore |
| 3 | Neometals Ltd | 50:50 Joint Venture | Mercedes Benz |
| 4 | Ascend Elements | Offtake Agreement | Honda |
| 5 | Redwood Materials | Offtake Agreement | Tesla, Toyota, Volkswagen, Audi |

**Source**: S&P Capital IQ; LCC Research

(1) US$25 Million Lithium-ion Battery Recycling Joint Venture in Taiwan. 50-50 JV to build a 2,000 metric ton per year lithium-ion battery recycling plant in Taiwan
(2) Repurpose a Glencore facility in Europe into the largest source of recycled battery-grade lithium, nickel, and cobalt through a collaborative study
(3) JV with Mercedes-Benz to build a 2,500 tonne a year lithium-ion battery recycling plant in Germany
(4) Ascend Elements will provide the automaker with recycled nickel, cobalt and lithium for its electric vehicles produced in North America
(5) Recycles all electric vehicle batteries from domestic lithium-ion battery materials manufacturing.

Collaboration extends beyond battery manufacturers to encompass other points in the supply chain including car manufacturers and miners, fostering a symbiotic partnership. This mutual relationship entails the battery recycler supplying essential minerals extracted from batteries while receiving used

batteries from manufacturers. The potential to design batteries for easy disassembly adds to the synergy. Such partnerships commonly entail equity investments in the battery recycler, joint ventures sharing development costs, Memorandums of Understanding (MoUs), and technology licensing agreements.

Vertical integration adds another element to the multiple barriers exist for new entrants hoping to compete in the global recycling market which includes incumbent top player's economies of scale and their extensive alliances – a competitive strength that becomes more prominent in the face of low volume constraints.

## 1.4 International Approach to Recycling Legislation

Across major markets, battery legislation and regulations have seen varying degrees of development. Notably, China has emerged as a leader in this regard, implementing an advanced centralised EV battery collection and tracing service network. Recognising the strategic significance of electric vehicle batteries, policymakers in China, the EU, and the US are putting ambitious plans into place to increase recycling efforts. European policymakers have set ambitious recycling collection targets of 70% by 2025 and 80% by 2030. This translates to over 80% of end-of-life batteries and scrap needing to be recycled by 2030.

Exhibit 3

**Synthesis of current large battery recycling policies**

| Policy Levers Framework | China | European Union | United States |
|---|---|---|---|
| **Create cross-cutting market enablers** | Introduced traceability system for management of battery recycling | Introduced Battery Digital Product Passport | |
| **Reshape economic incentives** | | EU tax regulation guides investment into sustainable manufacturing and recycling | Subsidies & tax credits for near-shoring recycling; subsidies for infrastructure development |
| **Harmonise and strengthen existing measures** | Made OEMs responsible for battery recycling; defined specific guidelines | Material-specific recycling & recycled content standards; OEM responsible for recycling | |

**Source**: World Economic Forum *June 2023*

- **EU Battery and End-of-life EV Directive**. To target issues surrounding supply chain volatility, the EU implemented end-of-life battery requirements involving collection and recovery targets, such as doubling the recovery targets for lithium, and doubling the increase in use of recycled materials in future production. Automotive OEMs have also been mandated to accept end-of-life batteries from vehicles owners to incentivise life cycle management by key economic operators.
- **USA Inflation Reduction Act Target.** Similarly, to the EU supply chain concerns, specifically loosening dependency on China, this act provides significant tax benefits and other subsidies for localizing supply chains and fuelling EV uptake. Providing monetary incentives of up to $7,500 for reaching certain thresholds for the extraction, processing or manufacturing of critical minerals and battery components in the US.
- **Chinese Measures.** China established a comprehensive EV battery recycling policy in 2016. Initial groundwork was laid from 2016 to 2018, with full implementation starting in 2019. Steps included mandates for automakers to recycle EV batteries and guidelines for battery traceability, recycling networks, and quality standards for repurposed batteries.

## 1.5 How Policy Action has Shaped Global Investment Flows

Globally, the economics of battery recycling have witnessed a significant upturn over the past year. Rising energy costs, a notable tripling of carbon market prices, and the European Parliament's endorsement of the Fit for 55 package, aligning EU policies with climate objectives, have all contributed to this shift.

Overall, the major markets adopting electric vehicles (EU, USA and China) are working towards achieving economic competitiveness across their local battery value chains without public subsidisation. The 'energy transition' thematic has evolved into 'energy security' and sovereign manufacturing has become a priority matter, emphasised by the current geopolitical tensions and the concentration of critical battery minerals in Asia. With over half of recycling volume expected to come straight from the battery manufacturing plant, recyclers have sought to build facilities in proximity which has had a multiplier effect on local investment, revenue and jobs.

Another observation that can be made from the battery recycling financing environment, is that investment appears to be concentrated heavily in North America. This coincides with the introduction of the Inflation Reduction Act in October 2022 which successfully marked North America as the preferred destination to develop battery manufacturing and recycling operations. The IRA offers fixed level subsidies for net-zero technologies and Exhibit 4 below shows the most significant incentives for battery manufacturers.

Exhibit 4

**IRA Direct Support Measures for Battery Industry**

| Support Measure | Description | Requirements and Comments |
|---|---|---|
| **Advanced Manufacturing Production Tax Credit: Production of batteries and battery components** | Tax credits for qualified components used in batteries:<br>Electroactive Materials: 10% of manufacturing cost<br>Battery Cell: USD 35 per kWh<br>Battery Module: USD 10 per kWh<br>Critical Mineral: 10% of production cost | Battery production must take place in the USA |
| **Advanced Energy Project Tax Credit: Investments in production facilities** | Tax deduction on 30% of the investment cost of establishing production facilities for batteries, battery components, EVs, and critical minerals | Tax credits cannot be combined with Advanced Manufacturing Production Tax Credit |

**Source**: US Treasury, IRS

The subsidies offered to the battery industry by the IRA are not capped in terms of the amount of production, the type of battery produced, or the use of the battery. It is estimated USD 150bn of subsidies will be received by battery manufacturers in the USA by the end of 2032, creating significant incentive to invest in battery manufacturing operations. Given 5-10% of manufactured lithium-ion batteries are rejected, the volume of domestic battery waste in the USA is expected to accelerate as a result, expanding the opportunities for battery recyclers.

Beyond significant support for domestic battery manufacturing, battery recyclers will also benefit greatly from the IRA's indirect subsidies outlined in Exhibit 5 below. Under the Clean Vehicle Credit, USD 3,750 of the tax credit offered to people who purchase an EV requires 40% of the critical minerals in the EV's battery to be produced in the US as of 2023. This rises to 80% after 2026. Furthermore, IRA automatically qualifies critical minerals extracted via battery recycling in the USA as domestic content, regardless of the waste batteries' origin. This is expected to create strong incentives to direct additional investment into the US battery recycling industry.

Exhibit 5

**IRA Indirect Support Measures for Battery Industry**

| Support Measure | Description | Requirements and Comments |
|---|---|---|
| **Clean Vehicle Tax Credit: Personal EVs** | Tax credits of up to USD 7,500 on the purchase of EV<br><br>USD 3,750 if the car meets requirements for critical minerals<br><br>USD 3,750 if the car meets requirements for battery parts | EV assembled in the USA and ceiling on personal income and price of car<br><br>Domestic content requirements for critical minerals in battery<br><br>Domestic content requirements for battery parts |
| **Tax Credit for Qualified Commercial Clean Vehicles** | Tax credits of up to USD 7,500 for smaller vans, and USD for 40,000 for larger vehicles<br><br>Tax credit is the lesser of 30% of the sales price or additional cost of EV compared to equivalent internal combustion engine vehicle | No domestic content requirements for critical minerals in battery |

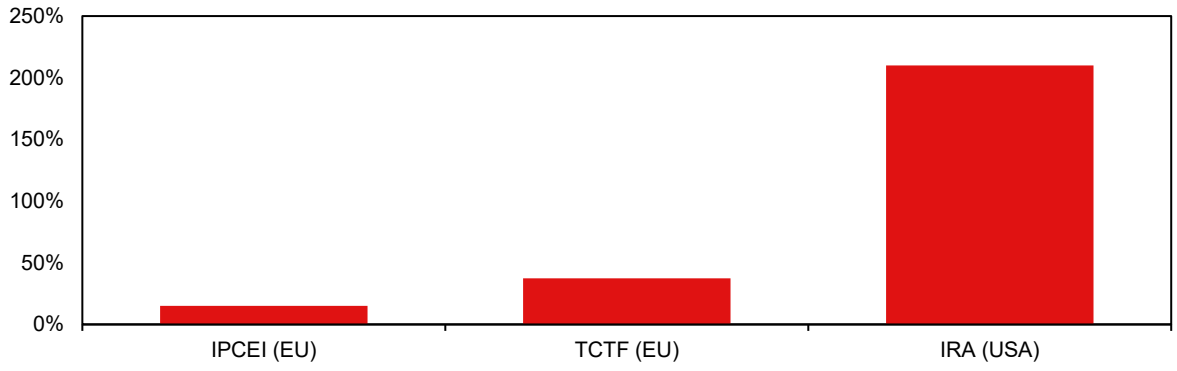
**Source**: US Treasury, IRS

Significant investment flows following the announcement of the IRA can already be seen with Redwood Materials and Li-Cycle receiving USD 2.0b and USD 375m of debt financing from the US Department of Energy to expand the capacity of existing recycling facilities.

The US Government support for battery manufacturing and recycling dwarves the comparable European incentives including the Important Projects of Common European Interest (IPCEI) which offered EUR 6bn subsidies for the battery supply chain and the Temporary Crisis and Transition Framework (TCTF) which provides investment support for the manufacturing of strategic equipment to drive the EU energy transition. According to estimates by Menon Economics, US battery manufacturers receive as much as USD 2.10 per each dollar invested compared to less than USD 0.40 for European counterparts.

Exhibit 6

**Battery Subsidy Intensity Across Different Jurisdictions**




**Source**: Menon Economics

The accessibility of European support for battery manufacturing and recycling is also generally more administratively intensive than the USA given the European Union's strict state aid rules, which aim to prevent unfair competition. This may provide an explanation as to why European battery recycle start-ups are relatively few and limited in their funding accessibility. Though the IRA will likely impact the European battery industry negatively over the short to medium term, it will remain a key growth area

for both recycling and manufacturing as Europe enjoys more secure demand growth for EVs pending the ban of new fossil fuel vehicles starting in 2035.

However, a noteworthy concern arises in two forms. First is the potential over-investment in capacity and secondly, the implementation of aggressive industrial policies and market subsidies by governments aggressively trying to secure local battery supply. Either of these scenarios holds the potential to expedite the decline in prices quicker than firms are able reach a commercial stage of development. This outcome could exert downward pressure on recycler's profit margins, consequently leading to a premature contraction in profit margins. As such, prudent management and strategic alignment with market dynamics will be pivotal in navigating these challenges and securing long-term sustainability within the battery recycling landscape.

# 2. The Australian Context

## 2.1 Domestic Economic Competitiveness

Domestically, the battery industry added approximately $1.3 billion value and 6,000 jobs to Australia's economy in 2020. Australia needs to take action to secure such an important economic value add. Australia's critical minerals endowment, emerging materials and manufacturing capabilities, global strategic partnerships and reputation as a low-risk investment destination makes it uniquely positioned to play a leading role in the global battery technology revolution at every node of the value chain.

Australia is a global leader in mining raw materials but we have a massive opportunity to diversify along the battery value chain and develop a domestic specialisation in downstream areas. A high tax rate and high labour costs make it hard for Australia to compete with global peers in manufacturing so it is unlikely that we will have a domestic battery manufacturing sector.

Australia's competitive advantage extends to refining metals and there is a real opportunity to springboard from this knowledge base and develop technology in battery recycling and refining black mass. Strategic investments in battery recycling will become crucial in Australia to mitigate pollution and to optimise the reuse of precious resources.

Exhibit 7

**Headline challenges and advantages to commissioning a recycling facility in Australia**

| Challenges | Advantages |
|---|---|
| - **High construction costs**<br>o Construction workers in Australia earn over 30% more than highest OECD countries.<br>o Cost of materials can also be higher due to our geographic isolation<br>- **Low battery feedstock** | - **High-skilled labour force** with advanced chemical engineering experience<br>- **Low energy costs**<br>o Cost advantages in high refining automation (with scale)<br>- **Low sovereign risk** with open bilateral trading partners |

From a corporate perspective, the viability of a domestic battery recycling capability hinges upon two critical factors, cost and volume. Cost competitiveness lies in our ability to commission automated battery disassembly options to supplant labour-intensive methods, while also keeping downward pressure on energy bills. Achieving scale and generating operating leverage is then dependant on the volume of waste batteries available to be recycled.

For consumers, safety is paramount. High heat is a critical safety issue in the wide scale uptake of batteries, and by developing a solution to mitigate battery fires that is effective in the Australian climate, Australian manufacturers could also access export markets in other warm climate countries. Australia can establish itself as a global leader in battery safety and reliability standards which will present global opportunities for our insurance and consulting sectors.

## 2.2 Supportive Australian Policy Action

While the Australian government is arguably lagging competing economies, regulatory incentives have been implemented encouraging the growing sector.

- **Tax Incentives.** The Battery Stewardship Council (BSC), formed in 2018 aims to provide the framework to significantly increase battery recycling and collection in Australia. In 2020, under ACCC authorisation, BSC established a national scheme for managing expired batteries through rebates for cost for collecting, sorting and processing expired batteries.

- **National Reconstruction Fund.** Approximately one third of the $15 billion National Reconstruction Fund will be available to companies operating in the battery sector, across areas including value adding in resources, innovation in low emission technology and support for clean energy component manufacturing.
- **National Waste Policy.** Implemented in 2018, the National Waste Policy helps to facilitate collective industry, government, and community action by 2030. Encapsulating five overarching principles including, avoiding waste, improving resource recovery, increasing the use of recycled material and their demand, better management of material flows and improved information support.
- **Critical Minerals Strategy.** The Critical Minerals Strategy 2023-30 aims to help foster a domestic supply chain for government declared "critical minerals". This strategy extends to battery recyclers because it encompasses initiatives to develop a sovereign critical mineral circular economy.

## 2.3 Attracting Investment to a Local Recycling Industry

Australia's Federal Government has allocated approximately A$300 million (equivalent to US$200 million) in battery related R&D investments since 2015. In stark contrast, the UK Government has committed almost US$740 million in funding. Comparatively, the United States has demonstrated substantial commitment, injecting US$700 million in the past year alone, augmenting previous substantial investments. These investments are anticipated to play a pivotal role in shaping their global competitive standing in the realm of battery technology and its wide-ranging applications.

Exhibit 8

**Primary Sources of Investment for Australian Battery Recyclers**

| Type | What Investors Look For | Capital factors for local recyclers |
|---|---|---|
| **Equity** | • **Higher returns** to balance failure risk<br>• **Proven track record** of company and management team important in emerging market<br>• Financial sponsors tend to prefer high ROI projects with **low capital intensiveness** | • Preference for investing in **novel technology R&D** over mechanical services model<br>• **Corporate VC funds** are more likely to take an equity stake in a start-up that is aligned with their business strategy |
| **Debt** | • **Required return** on investment is low but requires adequate compensation for default risk<br>• Primarily a **project finance vehicle**<br>• Increasingly looking for **green and ESG credentials** | • Debt investment internationally is predominantly **Government backed** for recyclers<br>• Made available for **facility construction** rather than R&D programs<br>• Corporate or financial lenders will opt for debt financing for **asset purchases** |
| **Government** | • Projects that meet **government investment guidelines**<br>• **Multiple channels** to provide capital but main support through grants<br>• Backstop to prevent **market failure** in essential industries | • **Standalone commercial merit** of a start-up to meet ROI targets for taxpayer funds<br>• **Circular economy** thematic has made recyclers a priority target for grant funding<br>• Budget availability is **politically motivated** |
| **Foreign Capital** | • Prefer **low sovereign risk and high-skilled labour**<br>• Industry participants look for favourable logistics and **vertical integration** to their downstream processes<br>• Foreign financiers largely **mirror domestic banks** | • Seek **exportable recycling technology** that can be deployed or licensed overseas<br>• Low incentive to **establish an Australian presence**<br>• JV partnerships are preferred by international firms in the battery sector |

Investment will be required for Australia to capture new economic opportunities in the battery value chain and keep pace with increasing demand for batteries and battery minerals.

## 2.4 Recommendations for Australian Policymakers

Recycling materials from end-of-life batteries and from manufacturing scraps during production ensures economical and safe waste management and prevents losses of valuable commodities. The economics of battery recycling depend on the costs of collecting, handling and disassembling the batteries, and on the scale of technological reliability and material value of batteries recycled. Regulation of and investment into collection and material recovery incentivise the development and wide-spread application of high-quality recycling processes currently in the early-stage of maturity. Material recovery protocols must be established early to ensure that the ballooning battery market is handled in an environmentally friendly fashion.

Countries with a more mature battery recycling sector have followed differing strategies for a more effective solution to acute challenges in their regional market. We believe Australia must consider targeted policy initiatives and technology deployment to sufficiently influence corporate and consumer behaviour.

Four underlying enablers for successful recycling include:

1. **Concerted regulatory action** including harmonised regulations related to the international and interstate movement of batteries; tightened recycling targets differentiated by material significance; improved battery ownership and liability schemes; and safe transportation of hazardous units. Public support for and industry commitments to improved recycling processes will vastly enhance recovery rates for valuable materials.
2. **Designing the Australian battery ecosystem** towards a streamlined and clarified regulatory environment and processes. Clarity of information around a domestic policy framework and insurance regime for storage and transportation of batteries will be paramount to improving consumer safety and attracting foreign investment.
3. **Efficient and safe collection, transport and recycling** of batteries is enabled technically via digital measures such as battery passports and tracing and tracking technologies, leading to decreased transaction costs and higher collection rates.
4. **Accrediting of the environmental advantages** of secondary raw materials strengthens the cost and climate competitiveness of recycling by creating demand and new quality standards.

# Appendix

### Sources and Uses of Funds Across Major Battery Recycling Firms

| | | | | Funding Use | | | |
|---|---|---|---|---|---|---|---|
| Company | Date | Amount ($M USD) | Funding Type | R&D | Pilot/Demo Plant | Commercial Plant | Corporate Expansion |
| **Redwood Materials** | Feb-23 | 2000.0 | Govt. Loan | | | • | |
| | Sep-21 | 50.0 | Equity | • | | • | |
| | Jul-21 | 775.0 | Equity | • | | • | |
| | Aug-20 | 40.0 | Equity | • | • | | |
| | May-17 | 2.0 | Equity | • | • | | |
| **Li-Cycle** | Feb-23 | 375.0 | Govt. Loan | | | • | • |
| | May-22 | 200.0 | Debt | | | • | • |
| | Dec-22 | 50.0 | Equity | | | | • |
| | Sep-21 | 100.0 | Debt | | | • | • |
| | Feb-21 | 615.0 | Equity | | | • | |
| | Nov-20 | Undisclosed | Equity | | | • | |
| | Oct-18 | 2.7 | Grant | • | • | | |
| **Lithion Recycling** | Sep-22 | Undisclosed | Equity | • | • | | |
| | Apr-22 | 7.5 | Grant | • | • | | |
| | Apr-22 | 15.0 | Govt. Equity | | | | |
| | Feb-22 | 125.0 | Equity | | | | |
| | Aug-19 | 3.8 | Grant | | | | |
| **Cibra Solutions** | Feb-23 | 50.0 | Equity | • | | | • |
| | Oct-22 | 75.0 | Grant | | | • | |
| **ABTC** | Mar-23 | 10.0 | Equity | | | • | |
| | Mar-23 | 20.0 | Equity | | | • | |
| | Nov-22 | 10.0 | Grant | • | • | | |
| | Oct-22 | 57.7 | Grant | | | • | |
| | Oct-21 | 2.0 | Grant | • | • | | |
| **Aqua Metals** | Oct-23 | 6.0 | Debt | | | | • |
| | Jul-23 | 20.0 | Equity | | | • | |
| | Jul-23 | 5.0 | Equity | | | • | |
| **RecycLiCo** | Aug-22 | Undisclosed | Grant | • | | | |
| | Jan-22 | Undisclosed | Grant | • | | | |
| | Sep-21 | 20.0 | Equity | | | | • |
| | Aug-21 | Undisclosed | Grant | | • | | |
| | Mar-21 | 2.7 | Equity | | • | | |
| | Nov-20 | Undisclosed | Grant | • | • | | |
| | Sep-20 | 2.0 | Equity | | • | | |
| | Feb-20 | Undisclosed | Grant | | • | | |
| | Nov-18 | 1.5 | Equity | • | | | |
| | Jan-18 | 2.0 | Equity | • | | | |
| | Oct-17 | 0.3 | Equity | • | | | |
| | May-17 | 1.0 | Equity | • | | | |
| | Jan-17 | Undisclosed | Grant | • | | | |
| **Princeton NuEnergy** | Nov-22 | 12.0 | Grant | • | • | | |
| | May-22 | 7.0 | Equity | • | | | |
| | Mar-20 | 0.9 | Equity | | | | |
| | Jan-20 | 1.5 | Grant | • | | | |
| | Jul-05 | 0.3 | Grant | • | | | |
| **Momentum Tech** | Dec-21 | 20.0 | Equity | • | | | |
| | Aug-18 | 0.7 | Grant | • | | | |
| **Nth Cycle** | Dec-22 | 2.2 | Grant | • | | | |
| | Mar-22 | 1.0 | Grant | • | | | |
| | Feb-22 | 12.5 | Equity | • | • | | |
| | Aug-21 | 0.3 | Grant | • | | | |
| | Apr-21 | 3.2 | Equity | • | • | | |
| | Sep-19 | 0.1 | Grant | • | | | |
| | Jun-19 | 0.2 | Grant | • | | | |
| **Li Industries** | Aug-22 | 7.0 | Equity | • | | | |
| | May-20 | 0.8 | Grant | • | | | |
| | May-18 | 0.2 | Grant | • | | | |

## Sources and Uses of Funds: Redwood Materials and Li-Cycle

| Company | Date | Funding Amount ($M USD) | Type | Use of Funds |
|---|---|---|---|---|
| **Redwood Materials** | Feb-23 | 2,000.0 | Government Loan | Funds will be used to expand Redwood's Nevada recycling facility |
| | Sep-21 | 50.0 | Corporate Round | Fund expansion of existing recycling operations in North America, R&D, and general corporate purposes. Ford will partner with Redwood create closed loop battery recycling and access supply of critical battery minerals |
| | Jul-21 | 775.0 | Series C | Fund expansion of existing recycling operations in North America, R&D, and general corporate purposes |
| | Aug-20 | 40.0 | Series B | Fund R&D expenses related to developing battery recycling processes |
| | May-17 | 2.0 | Seed | Fund R&D expenses related to developing battery recycling processes |
| **Li-Cycle Holdings** | Feb-23 | 375.0 | Government Loan | Funding will be used for the construction of Li-Cycle's Rochester battery recycling hub and assist the company in expanding operations. |
| | May-22 | 200.0 | Convertible Note | Funding will be used for the construction of Li-Cycle's Rochester battery recycling hub and assist the company in expanding operations. |
| | Dec-22 | 50.0 | Post-IPO Equity | LG Energy & Chem have chosen Li-Cyle as their official lithium-ion battery recycling partner. Funding will be used ot facilitate Li-Cycles global expansion |
| | Sep-21 | 100.0 | Convertible Note | Funding will be used to accelerate growth of battery recycling footprint in the US and globally to scale Li-Cycle's proven technology and access new customers and markets. Koch will also partner with Li-Cycle to provide EPC services and Optimise Process Design |
| | Feb-21 | 615.0 | IPO Via SPAC | Funding will be used to accelerate growth and construct recycling facilities and other infrastructure |
| | Nov-20 | Undisclosed | Series C | Fund development of Rochester recycling hub and international expansion activities |
| | Oct-18 | 2.7 | Grant | Fund R&D activities to develop novel process for the recovery and recycling of valuable materials from all types of lithium-ion batteries. |

# Important Information

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LCC Asia Pacific's Sydney office is located on the lands of the Gadigal people and we both acknowledge them as Traditional Owners and pay respects to Elders past, present & emerging.

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