



The FBICRC team (from left): Stacy Osenbaugh, Jacques Eksteen, Stedman Ellis, Jenny Shewan, Mark Aylemore, Jo Staines, Peter Talbot, Derek Hall, Kelsee Sewell

## CEO Welcome

We are now in the second year of our CRC's six-year program. The transformative role batteries will play in our energy future is underpinning a growing collaboration aiming to deliver a real legacy for Australia at a time when demand for batteries is expected to grow at least 9-fold over the next decade.

### Delivering our initial portfolio of projects

The FBICRC team is focused on the commencement of all projects which participants have supported with expertise, and allocations of cash and in kind commitments. A total of 13 out of 28 projects (including six scene setting projects) have been contracted. Budget reviews, business development and a phased approach to selected projects should ensure we have contracted all current projects supported by participants by 30 June 2021.

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### A growing CRC

We remain a growing CRC open to new participants. Existing and new participants have so far added nearly \$8M in new cash commitments into the CRC over the past year. The contribution of BASF in terms of cash and expertise towards our program has been particularly significant.

We welcome the following new participants Ardea Resources, EV Metals Group, Alpha HPA, Solvionic, GMG Group, Feline Pty Ltd and Sicona Battery Technologies. The CRC now has over 60 participants across the battery value chain.

### New opportunities

We have commissioned an Australia battery industries value chain analysis by Accenture to provide a robust, credible and contemporary business case for the investment in Australia's battery industries at a time when new opportunities for industry development are emerging.

The Federal Government's Modern Manufacturing Strategy is one these opportunities – and the latest announcement re \$140M in funding available in the first round is described in this newsletter. At the same time, batteries are a key enabling technology for the Federal Government's Technology Investment Roadmap, the boom in utility scale batteries, the electrification of mining and defence industries applications.

The CRC will use the Accenture work to help industry participants articulate the broader opportunities to grow Australia's battery industries.

### Transition into the next phase

We look forward to working with all participants in the CRC as we enter the next phase of our work. A showcase of our activities and ambitions is planned for a research forum on 19 and 20 May which will held with opportunities for face-to-face participation in Brisbane, Melbourne and Perth to enable access for all participants.

**Stedman Ellis, CEO**

[Stedman.ellis@fbicrc.com.au](mailto:Stedman.ellis@fbicrc.com.au)

## National road map: Resources Technology & Critical Minerals Processing

The Australian Government announced its Resources Technology and Critical Minerals Processing road map on the 4<sup>th</sup> March 20201.

With the launch of the road map, businesses in the critical minerals processing and resources technology sectors are able to apply for co-matched grant funding under the \$1.3B Modern Manufacturing Initiative(MMI).

Project proponents will have four weeks to apply for grants under two of the three (MMI) streams – the Manufacturing Translation stream and Manufacturing Integration stream. A total of \$140 million in funding is available for this first round across all six National Manufacturing Priorities, with further funding to be available in future rounds. [Applications are open until 5pm AEDT 1 April 2021.](#)

A third funding stream – the Manufacturing Collaboration stream – will open later this year. This stream will be designed to support major projects.

The road map is available [here](#). More information about the grants is available [here](#). For more information or assistance in accessing the grants, contact Jacques Eksteen ([Jacques.eksteen@fbicrc.com.au](mailto:Jacques.eksteen@fbicrc.com.au))



Resources Technology & Critical Minerals Processing

### In the News:

**Using our resources strengths to grow manufacturing | Prime Minister of Australia**

<https://www.pm.gov.au/media/using-our-resources-strengths-grow-manufacturing>

## Research & Project Updates

### Scene setting reports:



The governance of battery value chains: Security, Sustainability and Australian Policy Options  
Read it [here](#)



Li-ion battery cathode manufacture in Australia – a scene setting report  
Read it [here](#)  
[Listen to the webinar](#)



Certification and LCA of Australian Battery Materials – Drivers and Options  
Read it [here](#)  
[Listen to the webinar](#)



State of Play: Electrification  
Read it [here](#)



State of Play Australian Battery Industries as at March 2020  
Read it [here](#)  
[Listen to the webinar](#)



Australian Landscape for Lithium-Ion Battery Recycling & Reuse in 2020  
[Register for the webinar here](#)



Development of a trusted supply chain for Australian battery minerals and products



Battery Industry Hubs

Information on all the FBICRC projects below is available on our website: <https://fbicrc.com.au/research/>  
New scene setting reports, updates and events are also available there.

Cathode Precursor Pilot Plant Mark Aylemore, Curtin University	Super Anode Amanda Ellis, University of Melbourne	National Battery Testing Facility Peter Talbot, QUT	Process Legacy Arie van Riessen, Evan Jamieson, Curtin University
Electrochemical Testing Jose Alarco, QUT	Certification and life cycle analysis Damien Giurco, UTS	Beneficiation and Chemical Processing of Lithium Minerals Aleks Nikoloski, Murdoch University	Trusted supply chains Prokopy Vasilyev, Curtin University
Future electrolyte systems Maria Forsyth, Deakin University	Microgrid Battery Deployment (residential) Tyronne Fernando, UWA	Mine Electrification (mobile) University of Adelaide	Innovative Nickel and Cobalt Extraction Technologies Elsayed Oraby, WA School of Mines
	Recycling, Repurpose, Reuse Jo Staines, University of Melbourne	Vocational Workforce Development Nhi Do South Metropolitan TAFE	

### Cathode Precursor Pilot Plant

The Cathode Precursor Pilot Plant and Testing facility is a flagship project of the CRC in enabling further value-adding to Australian battery minerals and chemical products. This project will establish the economic and technical feasibility and supply chain requirements for cathode precursor manufacture in Western Australia at industrial scale. A team of fourteen industry and four research participants in the FBICRC are investing in the Project which is anticipated to be valued at more than \$16 million over the period 2020 to 2024. The project aims to provide a steppingstone to industrial scale investment and tap into a market in precursor production that was worth \$22.1 billion in 2017 (of which Australia earned no revenue). The project is aimed at growing Australia's high-value exports for new markets, local jobs, and sovereign supply in the advanced battery materials segment of the battery value chain.

The scene setting report '*Li-ion battery cathode manufacture in Australia*' undertaken by a team from the Queensland University of Technology with support from Hatch Engineering and contributions from Curtin University FBICRC, provided a strong foundation for the establishment and development of the Cathode Precursor Pilot Plant project in Western Australia, which will complete Stage 1 in March, and received Board approval for Stage 2, which includes the full scope and costing of the project, in December.

The WA Government announced in July 2020 a search to attract a global precursor or cathode active materials (CAM) manufacturer to the State, with a \$13.2 million commitment announced in the WA Recovery Plan.

A photo of the BHP Pilot Plant at the CSIRO Waterford facilities in March 2020.



Curtin University Deputy Vice-Chancellor, Research, Chris Moran said, "Curtin University is proud to host and lead the Cathode Precursor Materials Pilot Plant project, a flagship project funded by the Future Battery Industries CRC.

"This facility is instrumental to the creation of a battery materials industry in Australia, to perform continuous development and pilot production of active materials, and demonstrate Australia's capability to produce on-spec battery materials for this rapidly growing industry. The facility will provide Australia with the capability to continuously produce a broad range of battery cathode chemistries utilising Australia's nickel, lithium, cobalt, manganese and aluminium resources for qualification and serves as the design basis for industrial scale operation."

### Additional funding

Global organisation BASF, with operations in nearly all battery sectors and almost every country in the world, has provided additional funding and essential expertise and state of the art equipment to the project. Alongside project participants BHP, MRIWA, JordProxa, IGO and Blackstone, this project has significant national and international support, recognition of growing collaboration and integration and making the best use of available resources to overcome challenges, meeting the current and future needs of industry.

Through BASF's additional contribution, the project can be fast tracked, providing greater testing and scale-up flexibility. The pilot plant will be able to reach outputs of the size necessary to demonstrate appropriate material performance within a reasonable timeframe.

Four fully integrated, fully automated and continuous (i.e., not batch) P-CAM production units, including process designs, controlled feed systems, precipitation reactors and crystal aging reactors with ancillaries for safe operation have been ordered for the pilot plant.

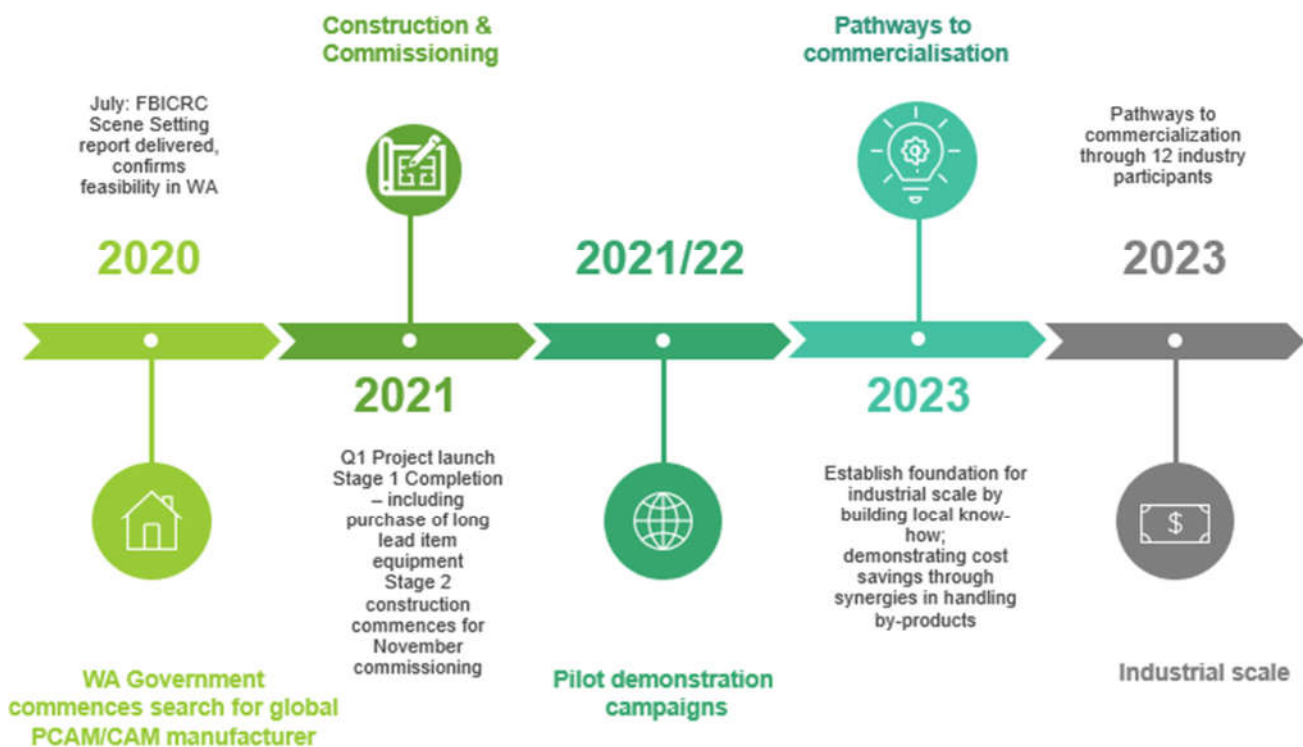
These units are the basis for BASF's P-CAM plants in China, Finland, and the USA.

With these state-of-the-art production units, the Pilot Plant will be able to:

1. Run four different P-CAM chemistries (i.e., Ni-Mn-Co-Al ratios) simultaneously, or
2. Run the same chemistries under four different conditions e.g., temperature, pH, stirring rate, relative reagent concentration combinations, etc.
3. Improve scale - once the system is optimized, the batch rate increases – producing four times as much continuously for several days in a row. In this case 100 kg of PCAM can be manufactured in two weeks.

Phase 2 includes the design, construction, and commencement of pilot plant campaigns from late 2021, which allows for the lead time required to source the P-CAM production units. These will work in concert with a redesign of BHP's existing nickel sulphate pilot plant facilities in CSIRO Waterford facilities.

*Indicative timeframe for Cathode Precursor Pilot Plant Project*



## Landscape for Battery Recycling

In 2020, the CRC commissioned a scene setting report to be undertaken by CSIRO, to understand the case for an Australian battery recycling industry. It included a survey of industry participants, policy makers and researchers to understand the biggest challenges and opportunities for LIB recycling in Australia.

CSIRO Project Lead Anand Bhatt said, “A stakeholder survey across all sectors of the battery value chain was undertaken to identify key barriers and challenges the industry faces.”

“Overall, all stakeholder sectors believe there are strong opportunities for future Australian industries, namely reuse (second-life), recycling

and materials recovery and cell manufacturing as the top opportunities identified.”

The scene setting report will be used to inform a flagship project on recycling. For more information contact Jo Staines ([jo.staines@unimelb.edu.au](mailto:jo.staines@unimelb.edu.au))



## Ensuring waste is not wasted

Process Legacy, one of the Future Battery Industry CRCs (FBICRC) projects has commenced investigation into turning mine tailings and process residue into economically viable co-products.

Professor Evan Jamieson, who is co-leading this project with Professor Arie van Riessen from Curtin University, coined the phrase “waste is a product made to poor specifications.”

Lower value resources such as sand, aggregate and other minerals are often co-disposed as waste.

“These resources are not waste but are wasted. Like all products, they need to be produced to a standard and that creates significant opportunities and a new industry,” Professor Jamieson said.

The pair are championing a collaborate approach between industry, government regulators and advocates utilising academic and independent specialist facilities such as the Chemistry Centre WA.

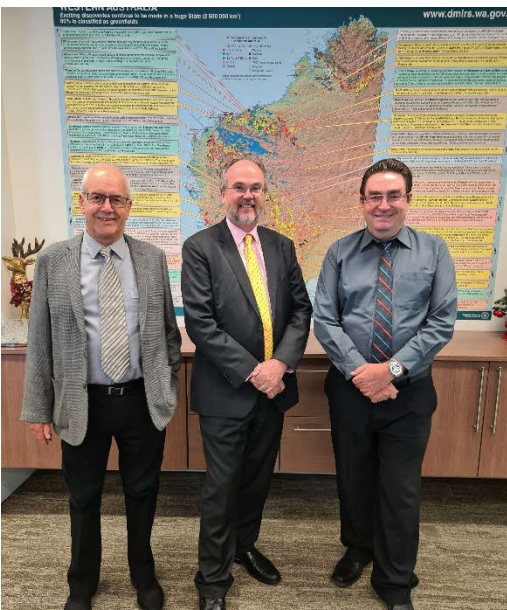
Central to co-product development are the application of clear standards and a regulatory framework to operate within.

An additional benefit to the prevention of resources being wasted, is the clear and significant level of industry development and employment that is expected to follow.

WA Minister for Mines and Petroleum Bill Johnston said, “Process Legacy is a great example of industry and government working collaboratively to create new industries and jobs for Western Australians.

“It’s also addressing how companies can be more sustainable when it comes to mining and mineral processing waste.”

The project is currently in Stage 1, to get involved in the project or for further information, contact Evan Jamieson ([evan.jamieson@curtin.edu.au](mailto:evan.jamieson@curtin.edu.au)).



WA Minister Johnston (centre) with Prof van Riessen (left) and Prof Jamieson (right)

## A Hub of Activity

The FBICRC will undertake a scene setting study into Battery Industry Hubs, led by UWA's Dr Kirsten Martinus, Graduate Research Coordinator and Senior Lecturer, Department of Geography and Planning.

The study will target three international battery industry hubs in Japan, USA and Germany, to inform three questions:

1. What does good look like? (against economic, environmental and social criteria)
2. What can Australia learn from them? (establishment to mature operations)
3. What can be applied in Australia?

Project Lead Dr Kirsten Martinus said, "Australia is well-placed to develop a global battery industry hub. It possesses much of the world's battery minerals, and its stable political environment can guarantee future secure supplies for other nations."

"This project will provide the foundational understandings on what is needed to develop such a hub in Australia."

The desktop study, due for completion by early June, will look at battery grade chemicals, battery



materials, cells and battery fabrication, battery pack assembly and recycling.

The study will include interviews with CRC participants BASF, GEDC, MRIWA, Multicom, Queensland Government and the Critical Minerals Facilitation Office, and international battery hub related companies, policy makers and research organisations in target countries.

This initial study will set the scope for subsequent research and help inform industry and policy development.

If you would like to find out more or get involved in future workshops, please contact FBICRC Project Lead Dr Kirsten Martinus ([kirsten.martinus@uwa.edu.au](mailto:kirsten.martinus@uwa.edu.au)).

## In the News

### IGO's investment in a global lithium joint venture with Tianqi Lithium Corporation

<https://www.igo.com.au/site/investor-center/tianqi-transaction-information>

### Wesfarmers to forge ahead with billion-dollar lithium mine

<https://www.smh.com.au/business/companies/wesfarmers-to-forge-ahead-with-billion-dollar-lithium-mine-20210217-p573h1.html>

### Construction set to start on Australia's first lithium-ion battery manufacturing plant

<https://www.abc.net.au/news/2021-03-04/australias-first-lithium-ion-battery-manufacturing-plant-tomago/13216070>

### Ecograf's WA manufacturing facility granted Major Project Status

<https://www.ecograf.com.au/news/ecografs-wa-manufacturing-facility-granted-major-project-status/>

Do you have any news you'd like us to share? Tag us on LinkedIn @Future Battery Industry CRC

## Project Management & Risk

With the CRC moving to an operational state in 2021, systems and processes have been established to support good project management and implementation. Risk has been identified as a key area, highlighting:

1. the need for project risks to be better understood at the outset, with a robust process for managing risks as they evolve during the project.
2. an understanding and management of interproject risks and project interdependencies.
3. a requirement to review CRC-wide risks to ensure that relevant business, financial, legal, compliance, governance, intellectual property, brand/reputation and security risks are captured.

Each project will have a Project Execution Plan, owned by the Project Leader and reviewed by a Project Management Committee consisting of the main project participants.

Project Coordinator Stacy Osenbaugh said, “These are live documents that help track changes during the lifetime of projects and enable effective Management of Change processes such as changes to the risk register and schedule to be identified and addressed early.”

“We want to support projects to ensure that the key milestones and deliverables are met through key activities and tasks, that have clear ownership and accountability.”

## Participant Workshops

Look out for new training opportunities in business management, leadership development and entrepreneurship. This quarter includes:

### IP 101 Seminar

Patent and Trademarks Attorney Wrays hosted an ‘IP 101’ workshop on 24th February 2021.

With over 20 participants, the session included practical knowledge on how to identify and capture the IP arising from projects, evaluate, protect and manage IP to make it commercialisation ready.

The seminar will be held again later in the year, and also covers:

- IP 101
- Processes and systems to capture IP
- Inventorship-Ownership-Access – ensuring clear chain of entitlement to patent rights
- The role of patent landscape searching
- Freedom to Operate – mitigating risk and liability

### Risk identification and management

The CRC is currently working through guidelines and proposals to develop risk identification and management training materials and workshops for projects, to be completed in the first 4 weeks of project commencement.



**COMING SOON**  
[climate-kic.org.au/clp21](https://climate-kic.org.au/clp21)

FUTURE  
BATTERY  
INDUSTRIES

CLIMATE  
KIC  
AUSTRALIA

The FBICRC is sponsoring 5 teams in this year's Climate-KIC ClimateLaunchpad (CLP) competition. Last year, two battery related teams made it into the global final. Register for updates at <https://lnkd.in/q9DUwQy>

Aimed at researchers, students and new startups and anyone else with an innovative business idea, CLP is set up to help aspiring entrepreneurs grow their ideas into global businesses. CLP is responsible for more than 6,700 ideas that have resulted in the creation of more than 8,000 jobs within 1,900 new companies.



## FBI CRC Vocational Skills and Future Jobs

The Vocational Workforce Development Project has delivered an interim report, following interviews or online surveys with 26 companies, augmented by information from four lead researchers and subject matter experts in industry areas that are not yet developed in Australia. An additional 25 peak industry bodies, State Government bodies, and the TAFEs from most other jurisdictions were also interviewed.

The report from South Metro TAFE, has highlighted some key industry skill requirements across the battery value chain including:

- Mining- initial findings show no new or unique skill requirements for vocational workers, skills for mining battery mineral concentrates were like other surface extraction mining that Australia is experienced in.

*One interviewee noted that “In a production scenario, accredited training would make it substantially easier to employ people for a wider range of roles. Most importantly, this would also reduce the need to go and hunt for university graduates that have had some sort of prior exposure or experience in this field which would provide greater flexibility to the company especially in staffing the right roles with the right skill sets.”*

- Refining and precursor development – Process Operators and Lab Technicians are key roles, with additional data management, chemical safety skills and knowledge.
- Component and battery manufacturing – this is a highly multidisciplinary field including chemistry, chemical engineering, chemical manufacturing, process engineering and advanced manufacturing.
- BESS production – electricians, electrical assemblers and electronics technicians
- BESS installation and maintenance – National accreditation by the Clean Energy Council required for electricians with additional in-house training
- Electric Vehicle servicing and infrastructure – additional training in Electric Vehicle Service as part of automotive technician training, electricians required to install charging infrastructure.
- Recycling – training in safe handling and storage, Process Operator skills.

The next phase of this project is to assess the skills gaps by mapping the new and existing skill needs against existing curriculum, training delivery and workforce supply.

For more information contact Nhi Do ( [Nhi.Do@smtafe.wa.edu.au](mailto:Nhi.Do@smtafe.wa.edu.au)).

### Events Calendar

- |   |   |
|---|---|
| 8 <sup>th</sup> March                   | Climate Launchpad applications open. Sign up to receive updates: <a href="http://www.climate-kic.org.au/clp21">www.climate-kic.org.au/clp21</a>   |
| 18 <sup>th</sup> March                  | Critical Raw Materials for Electric Vehicles (CRM4EV) showcase on Western Australia’s assets and capabilities in the battery supply chain & rare earth minerals<br>Register here: <a href="https://lnkd.in/dQZG32K">https://lnkd.in/dQZG32K</a> |
| 25 <sup>th</sup> March                  | Webinar: Australian Landscape for Lithium-Ion Battery Recycling & Reuse in 2020<br>Register for this event <a href="#">here</a>   |
| 19 <sup>th</sup> & 20 <sup>th</sup> May | Participants Research Forum   |

If you have an event you would like to add to our calendar, please contact [jenny.shewan@fbicrc.com.au](mailto:jenny.shewan@fbicrc.com.au)