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Project Title	MCi Carbon Plant - Myrtle
Industry Partner	MCi Carbon
Industry Sector	Other Energy Intensive & Hard to Abate
Technology Pathway (Primary)	Carbon Capture & Storage / Utilisation
NIM Pillar	Technology Demonstration
Source	NIM Awards 2023
Description	The MCi Carbon Plant is a groundbreaking project aimed at scaling up the development and demonstration of cost-competitive solutions for efficiently decarbonising hard-to-abate industries globally. This initiative showcases MCi Carbon's innovative technology, which transforms carbon dioxide (CO2) emissions from industrial processes into valuable building materials and products for the circular carbon economy. The proposed demonstration plant will use a proprietary technology developed by MCi. This technology uses an accelerated version of a natural earth process called mineral carbonation. This technology has the potential to lock away millions of tonnes of industrial CO2 emissions every year, should pilot programs and demonstration scale plants such as this project prove successful. Over the course of 15 years of research and development with substantial Australian Government and industry investment, MCi has developed technology to convert carbon dioxide (CO2) emissions into useful materials. MCi is scaling its technology and working with customers and partners to identify the best industrial locations to build its first Carbon Plants to capture CO2 emissions and convert them profitably into solid materials called carbonates. Used in many construction, consumer and manufactured products, these carbonates further reduce the carbon footprints in products, supporting the circular economy. This double carbon reduction delivers a negative carbon lifecycle benefit and produces high quality, verifiable, permanent carbon offsets. MCi's technology leads in a new cleantech field called CO2 Utilisation and Carbon Capture and Use (CCU) which treats CO2 as a resource not a waste. This assists Australia in transitioning towards net zero emissions by 2050. This aligns with global goals surrounding reducing the impacts of climate change as technology that specifically targets abatement of industrial CO2 emissions forms a key part of the overall solution. In 2023, MCi Carbon secured it's first commercial customer, global leader of the refractories market RHI Magnesita (LON: RHIM), who are headquartered in Austria. MCi has secured federal government funding via the Carbon Capture and Utilisation Development Fund (CCUSDF) grant program to help fund the design and construction of an industrial scale demonstration plant.

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Innovations Employed	The MCi Carbon Plant represents a significant innovation compared to the state of the art. While traditional carbon capture technologies focus on CO2 storage, MCi's breakthrough lies in the transformation of captured CO2 into high-value materials, such as magnesium carbonate, calcium carbonate, and amorphous silica. This innovative process accelerates mineral carbonation, typically taking millions of years, into a matter of minutes in an industrial setting. MCi's technology is novel not only for the company but also nationally and internationally. Through the implementation of this project, MCi will be contributing towards achieving national emissions reductions goals. This technology has the potential to provide a safe and permanent solution for long term and durable carbon storage. If the project was not constructed, a significant step towards implementation of CO2 capture technology would not commence, which would have an adverse effect on working towards achieving decarbonisation goals. MCi is an industry leader meaning that this project also sets an important precedent for other environmentally conscious projects in the region.
Dimension of Novelty	**Company & Country** It was new to Company, Country and International
Innovation Collaboration	**In-house** Australia **Cooperation with scientific institutions** University of Newcastle **External Partners** Orica (ASX: ORI)
Intellectual Properties	MCi Carbon developed this innovation via a cooperation with Newcastle University, primarily driven by its dedicated and experienced chemical engineering team, with additional support from collaborations with Orica, MCi's founding major shareholder. The company owns a portfolio of patents, protecting key process steps in the technology, and maintains trade secrets to safeguard its intellectual property. MCi Carbon holds patents to protect its intellectual property and ensure a "right to operate" in the face of global competition. These patents, progressed and secured across a range of patent families in dozens of national jurisdictions, serve as a formidable barrier to potential imitators and protects the company's innovative process.
IP Links	Not found
Timetable & Progress	**Prototype system tested in intended environment and operating at close to expected performance (TRL 6)** MCi Carbon has achieved a technological readiness level of 6 – soon, with the completion of the plant, will reach TRL 7. The technology has been successfully proven at a semi-continuous pilot plant since 2016, with global customer projects across multiple countries. The breakthrough in techno-economics, allowing production at near-ambient conditions, demonstrates maturity in scaling.

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MISSION

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	Project started in 2016 The project was initiated in 2016 with the establishment of the semi-continuous pilot plant. Subsequent developments and collaborations have continued to advance the technology, with major inputs from the technical team going towards the design of the new plant.
Financing (Public/ Private)	**Funding Public - Yes** Over AUD $30 million of NSW and Australian Federal government funding.
Finance Links	Australian Government Industry Funding Program
Project Phase TRL	TRL 6
Problems to be Solved and Risks to be Managed	As a key part of business development and gaining social license to operate, MCi Carbon actively participates in policy engagements and advocacy for a carbon processing industry, with CEO Marcus Dawe and COO Sophia Hamblin Wang regularly contributing to thought leadership in international forums, summits, and conferences. A more recent challenge for MCi fund-raising has been the degradation of global capital market conditions. As an emerging-technology, MCi will remain unprofitable in the short term, which requires investors to have a long-term and high-risk appetite to provide funding. To combat these issues, MCi has taken a long-term and targeted approach to raising capital. The MCi team have been targeting values-aligned strategic partners who are seeking additional benefits in tandem with funding, rather than traditional financial investors. A highly inflationary environment has effected operations. MCi have carefully managed budgets to ensure the team remain within their means. The MCi teams are continually seeking opportunities to preserve capital by working with suppliers and partners and managing project timelines in a prudent manner.
Preliminary or Final Results Achieved	MCi Carbon's patented process for reacting CO2 with low value minerals has progressed as such that the technology can now produce valuable magnesium and calcium carbonates and silica products at near ambient conditions. This breakthrough in techno-economics, which has been independently validated via technical due diligence and detailed technical review, has unlocked an opportunity for industrial CO2 sources to convert their emissions profitably, lowering barriers to technological adoption. Results to date (non-exhaustive) include: • Demonstrated direct mineral carbonation of flue-gas streams, 70% emissions reduction in steel plant • Demonstrated mineral carbonation of flue-gas streams as a profitable pathway • Demonstrated the lifecycle and environmental benefits of the technology • New carbon negative magnesium carbonate products were developed improving the commercial potential of the technology • Support several early career researchers and a PhD candidate providing industry relevant training and experience in areas of skills shortages

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	• Contributed to the industry advocacy group 'CO2 Value Australia', with the mission of educating Australian Industry about Carbon Capture and Utilisation
CO2 Emissions Reduction Potential - Implementation and Future Market	MCi presents a convincing case for hard-to-abate industries on their pathway to decarbonise. Whilst emitters view decarbonisation as a costly exercise, MCi is a profitable solution for their carbon capture. MCi's technology operates under ambient conditions and without the intervention of chemicals. Feedback and commitment from customers indicate that MCi's technology and team competitively differentiate from competitors. MCi provides a scalable solution for permanent carbon capture from a range of gas streams such as flue-gas and/or concentrated CO2 streams. In the capture process, MCi can utilise industrial waste streams to permanently store CO2, creating valuable materials for use in the construction and building materials sector that generate revenue. The feedstock materials required are available globally in the form of industrial waste streams or abundant natural minerals. This availability enables implementation of MCi's technology throughout Australia and internationally. The production of carbon embodied materials from the process further bolsters the technologies market potential, offering valuable products for use across the construction and building industry, whilst displacing further downstream emissions through material substitution.
Market Positioning	MCi Carbon is currently working with leading industry players across the globe to deploy its technology. The company has secured partnerships with major mining, steel, and cement companies and is engaged in multiple pilot projects in Australia and overseas. MCi's technology has been adopted by one of the world's largest providers of commercial explosives and blasting systems, Orica (ASX:ORI), and the global leader of the refractories market, RHI Magnesita (LON: RHIM), with MCi positioned for rapid growth and commercial penetration across other key markets including steel, cement, and mining. MCi Carbon have a two pronged commercialisation approach: firstly, identifying and securing feedstock sources (mineral rich wastes) and secondly identifying suitable emitters. Currently MCi Carbon are exploring sources of serpentinite in Europe and Australasia, slags globally, waste concrete in Asia, ash in Asia, lime kiln dust in Australia and smectites in the United States. MCi Carbon's commercial team are also progressing market penetration in low-carbon and negative emissions materials: magnesium carbonate, amorphous silica, calcium carbonate, carbonated pozzolans, manufactured sand, raw limestone and consitioned filler globally.
Project Location	Australia
Project & Technology Links	MCi Carbon Plant_Project Information, PDF, demonstration, mineral carbonation MCi Carbon_September 2023, PDF, general overview presentation Letter of Support_Orica, PDF, partner, Orica, support

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Technology Links	MCI Carbon