ARC Centre of Excellence for Green Electrochemical Transformation of Carbon Dioxide – GETCO2

Strategic Plan

Contents

1 Introduction

1.1 Acknowledgement of Country

The ARC Centre of Excellence for Green Electrochemical Transformation of Carbon Dioxide acknowledges the Traditional Owners and their custodianship of the lands on which the Centre operates, including Nodes in Meeanjin (Brisbane), Gadigal Country (Sydney), Naarm (Melbourne), and Kaurna Country (Adelaide). We pay our respects to their Ancestors and their descendants, who continue cultural and spiritual connections to Country. We recognise their valuable contributions to Australian and global society.

2 Our Vision

Our vision is to position Australia as a global leader in carbon dioxide transformation and generate long-term economic, social and environmental benefits nationally and internationally.

3 Our Values

WIP - Example…Respect, research excellence, integrity, curiosity, collaborative, inclusive, accountability…

4 Our Purpose

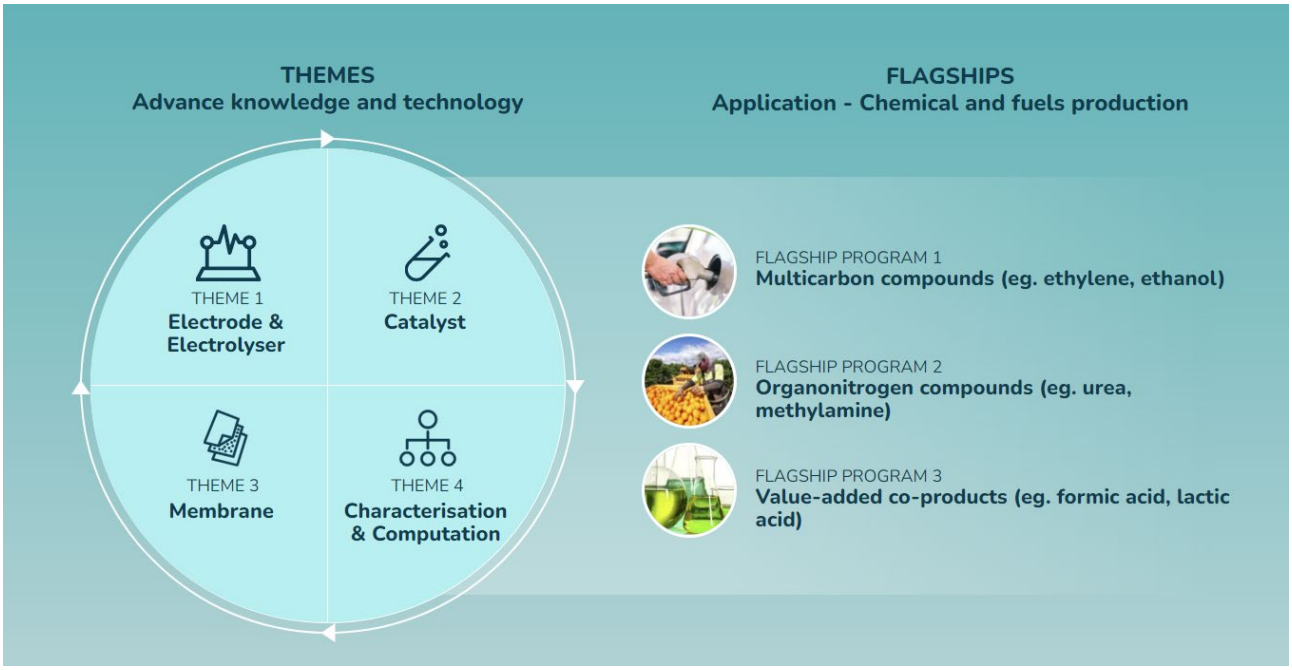
GETCO2 aims to advance carbon dioxide electrochemistry innovations to enable the conversion of carbon dioxide into valuable products and transition Australia to a carbon-neutral economy. The Centre will generate new knowledge using experimental and computational approaches to develop systems-level understanding to furnish industry-ready carbon dioxide utilisation technologies. GETCO2 will enhance capacity through collaborations, establishing the Centre as an international hub for research, training, technology translation and strategic advice for stakeholders and policymakers. Thus, accelerating Australia's progress towards net zero emissions targets, growing a sustainable economy and creating future jobs.

5 Objectives 2023-2030

1. Advancing fundamental knowledge of carbon dioxide conversion in electrochemical systems to selectively manufacture diverse value-added products.
2. Developing innovative electrolysers and key components (catalysts, membranes and electrodes) for highly efficient, scalable and durable electrochemical carbon dioxide conversion.
3. Demonstrating carbon dioxide conversion to value-added commodity and fine chemicals to enable industry-ready carbon dioxide utilisation technologies supporting the emergent Australian circular carbon economy industry.
4. Training the next generation of highly skilled scientists and engineers, equipped with unique expertise in catalysis, functional materials and advancing manufacturing for carbon dioxide utilisation across Australian research communities and industries.

6 Research Framework

GETCO2 Research Themes focus on fundamental advances in knowledge and technology, while our Flagships focus on application of fundamental scientific discoveries to production of chemical and fuels.



7 Outcomes

The Centre outcomes will ripple across scientific disciplines, industry sectors and policy development. Our new electrolyser materials and designs will be transferrable to other fields such as green energy. Our people will lead the next generation workforce. Our technologies will help to reshape Australia's energy and resource export industries for long-term resilience and growth.

1. Creating new knowledge on the kinetics and mechanism of CO2 electrocatalysis, and the complex dynamics of the transport of gas, liquids and ions in electrolysers.
2. Developing novel concepts and designs for electrolysers and new technologies for electrocatalytic CO2 reduction including electrodes, membranes and catalysts, new analytical methods for characterising working electrocatalysts and new computational tools to model electrolysers.
3. Expanding research capacity in materials science, chemical engineering and sustainable energy technologies through training of next generation researchers.
4. Linkages and translation of research through extensive collaborations with established international research leaders, and strategic partnerships with industry, government and end-users of the technologies developed.
5. Contribute to the National Science and Research Priorities, addressing the twin challenges of advanced manufacturing and energy.

8 Indicators of Success – Key Performance Indicators

GETCO2 is committed to achieving ambitious targets over the Centre lifetime. We are committed to working together to holistically build the capacity and develop the science and technology to deliver an enduring legacy. We are committed to transparency in communication of our goals and achievements within the Centre and externally. Key Performance Indicators (KPIs) are listed in Table 8.1.

8.1 GETCO2 Key Performance Indicators (KPIs) 2024-2030

Performance Measure	2024	2025	2026	2027	2028	2029	2030
1. Number of research outputs							
Peer-reviewed journal articles	20	40	80	90	90	90	60
Books/Chapters/Position papers	2	2	2	3	3	3	3
Conference publications (Abstracts/presentations/posters)	20	40	50	70	80	50	30
Patents and IP disclosures	0	2	2	3	5	4	2
2. Quality of research outputs							
Percentage publications in top quartile of discipline specific (subject) area according to CiteScore	80	80	80	80	80	80	80
Highly cited publications	0	4	4	6	6	4	4
Prestigious awards/prizes for innovation/impact	2	4	4	4	6	4	2
Invited talks/keynote/plenary lectures	12	20	25	25	30	30	30
Percentage joint publications across Nodes and/or between CIs and PIs	50	60	60	60	60	60	60
3. Number of workshops/conferences held	3	3	3	3	3	3	3
4. Number of training courses held	3	3	3	3	3	3	3
5. Number of additional researchers working on Centre research							
Postdoctoral researchers	12	8	4	4	4	4	2
PhD Students	12	8	2	8	12	2	2
Masters/Honours students	6	6	6	8	8	8	8
Associate Investigators	12	4	2	2	4	4	2
6. Number of postgraduate completions							
HDR completions	0	0	4	20	4	8	20
7. Number of mentoring programs offered	2	2	2	2	2	2	2
8. Number of presentations/briefings							
To the public	4	4	4	4	4	4	4
To government (parliamentarians and department/agencies at State & Federal level)	2	3	3	3	3	3	3
To industry/business/end users	4	6	8	8	8	8	8
9. Number of new organisations collaborating or involved with the Centre							
Total new industry & academic partnerships/projects	2	2	2	2	2	4	4
10. Number of female research personnel							
Total female research personnel	24	30	40	50	50	50	45
11. Centre-specific KPIs							
External fellowships/stipends awarded to CIs/PDRAs/PhD students	2	2	2	2	2	2	2
Other research income $,000	0	500	1,000	1,000	1,000	1,000	1,000
% female PhD recruits	40	40	40	40	40	40	40
Technologies at TRL4	0	0	1	1	1	1	1
Technology licencing	0	1	1	1	1	1	1
Media outreach	20	20	20	20	20	20	20

9 Our Participants

Collaboration is central to GETCO2's pathway to impact, from the fundamental discovery level to uptake and application of technologies. GETCO2 comprises 7 Australian universities, 5 international universities, and 7 industry/government organisations supporting our research program and strategic portfolios. GETCO2 also connects more widely with associates who offer additional expertise to the core program.

10 Research Translation & Intellectual Property Plan

Building functional and enduring partnerships with industry sectors, philanthropic and government agencies will be critical for GETCO2's future success and impact. To help accelerate Australia's transition to a carbon-neutral economy, strong and expanding industry engagement supported by technology capture and translation is vital.

Objective:

To build relationships with potential suppliers and end-users in the CO2 conversion value chain and to provide extensive opportunities for networking, outreach, engagement, and technology translation.

Strategies:

An Annual Industry Workshop will be held (hosted on a rotating basis between the Nodes) to provide an opportunity to promote and market the innovations and creativity taking place in GETCO2 to current and future stakeholders, the public and important government representatives. We will leverage our CI and wider Advisory Committee and Associate Investigator networks to help us target partners early to enable the right timing for investment in taking GETCO2's research to the next step in Technology Readiness Level (TRL).

Measurable and Translatable Goals. While collaboration and fundamental science and engineering discovery is at the core of GETCO2's mission, we will identify and maintain measurable, translatable targets, such as;

- Aim to advance three key technologies to TRL 4 by year 4. These will be accompanied by measurable technical goals and reporting.
- A clear and early articulation to Policy Makers with respect to where GETCO2 is heading. For example, what are the underpinning techno-economics surrounding the new CO2 circular economy? This will

enable us to develop a much-needed understanding of the intimate relationship between social, environmental and economic sustainability and thereby marry GETCO2's vision and objectives with government's net zero and decarbonisation objectives.

- We will organise our research efforts to target both global commodity chemical products e.g. fuels, ethylene, and a 'moonshot target', e.g. urea, formic acid, through our Flagship Projects.

Build a Translational Culture. Our fundamental research will be undertaken with the end goal of breakthrough technology development. GETCO2 will embrace two-way knowledge exchange with industry to build a professional culture for best practice industry engagement. Our translational culture will be developed through training and engagement activities between researchers, government and industry and through facilitating workshops between node research offices and institutional tech transfer units (such as UniQuest). Our translation activities will also be supported by the Industry Placement Program as part of the Capacity Building Portfolio. Researchers who are enthusiastic about entrepreneurial pathways will be mentored and supported, and where appropriate, connected to UQ Ventures and similar entrepreneurship programs available across our networks.

IP Protection and Technology Translation. Significant new IP will be generated by GETCO2, overseen by the Research Program Committee (RPC), tracked in the IP register and reviewed annually with research performance. We will also work with our partners with the help of Commercialisation and Technology Transfer Offices at participating universities, ensuring our researchers are aware of the fundamentals of IP protection and disclosure. Our strategic industry partnerships will involve end-users in research activities and planning for translation of the Centre's scientific and technological developments. Our industry linkages will provide the vehicle for application of the various developments and we will work alongside industry to generate impact. Where sensible, we will work with our industry partners in scaling up our designs, new materials and processing methodologies for pilot and demonstration scale manufacture and operations, to facilitate translation. A Business Manager supported by GETCO2 will seek opportunities for engagement and build connections with the broader industry. GETCO2 is well placed to deliver excellent science, and supported by our partnerships, we also have the agility to bridge innovation gaps and compete in the international landscape.

11 Risk and mitigation plans

Risks will be managed through our governance framework (Section 12), by regular review of activities and outputs by our key committees, and by establishing a clear structure and routine for reporting and oversight. Our Centre Plans and Annual Performance review will support the management of risks.

A detailed Risk Management Plan is included in Appendix 1.

12 GETCO2 Governance Framework

13 Emerging Research and Research Performance Management

Task/Management Issue	Strategy/Process	Outcome

Explore emerging research areas	Over the course of the seven-year lifespan, the Centre will rise to new challenges and seize new opportunities as they present through:
	• Strategic Funds, which will support initiatives such as seed funding, spin-out research and high-impact translational opportunities,
	• Seeking advice from Advisory Committees on
	  ○ international and industry landscape
	  ○ new strategic partnerships and avenues for further investment,
	• Regular review of research performance through the Research Program Committee (RPC) reporting to the Centre Management Committee (CMC), and development of an Annual Plan.
		The Centre maintains agility and contingencies to capitalise on research findings and respond to outcomes of leading international endeavours.

Determine additional funding sources to ensure continued support for ECRs, postdoctoral scholars and HDR students	Additional funding will be sourced for personnel: • ECR/MCRs will be mentored to apply for external, prestigious fellowship schemes, • Strategic funds may be used to support Equity Diversity and Inclusion initiatives, • Long term Centre budget planning & review will include continuity for completing HDR students,	The Centre provides continuity and facilitates career pathways for our emerging leaders.

	• As the Centre progresses and develops key partnerships, we will engage with the National Industry PhD Program.	
Additional project funding sources	Additional funding will be sourced for projects: • Innovative research with potential application outside the Centre's focus will be considered for ARC Discovery Programs • Development of projects to higher TRLs will be considered for ARC Linkage or Industrial Transformation Research Programs, along with Australian Renewable Energy Agency bids with current and new industry partners • Connections with international colleagues will instigate further project growth which will be considered for International funding opportunities • Technologies developed will be considered for venture capital investment to prepare them for market.	Centre research is leveraged for wider transfer and impact.
Allow projects which have reached their natural end to be closed down. Discontinue underperforming projects & redistribution of funding.	Our aim is to establish and maintain a collaborative culture which inspires and motivates researchers. We will assess project performance and lifespan through the following review mechanisms outlined in the Collaborative Research Agreement (CRA) and Application: 1. All projects will be described in detail on the Project Agreement template and approved by the CMC, 2. Research Themes (RT) & Flagships Projects (FP) have two co-leaders with shared accountability, 3. RT/FP leaders report research progress to Research Program Committee (RPC) for quarterly review, 4. RPC reports research progress to Centre Management Committee (CMC) for quarterly review, 5. CMC reports to Advisory Committees for biannual review, 6. The CRA enables the CMC though the annual review of performance to make directions and/or recommendations to address research progress, including re-allocation of funding.	The Centre maintains the appropriate oversight, collaborative culture and flexibility to ensure a sustained high standard of research performance.

14 Succession plans for critical positions and staff development as future leaders

GETCO2 will embed leadership continuity through mentoring at all levels across the Centre, to build a steady pipeline of qualified and capable future leaders. Each CI holds a service leadership role in the Centre, and leadership development through training and mentoring will be offered to all Centre members through the Mentoring and Professional Development Plan. Gender balance and diversity in leadership will also be supported through targeted mentoring and coaching programs for female researchers (from HDRs to senior researchers) to grow the future leadership pipeline.

Positions	Strategy/Process	Outcome

Centre Director (CD)	The CD is supported by the Deputy Director, RPC, CMC, Node and Portfolio leaders, who contribute leadership to the Centre. These leaders could share CD responsibility if the CD was no longer in the role. A search for a new CD would then be conducted by UQ in consultation with the ARC as outlined in the Grant Agreement.	The Centre maintains inclusive leadership strongly supported by the governance structure.
Deputy Director (DD)	The DD is mentored by the CD. The CD in consultation with the CMC, may appoint a replacement DD on reasonable notice to the other Parties and subject to ARC approval. The CMC, RPC, Node and Portfolio Leaders are capable to step into the DD role.	Potential Deputy Directors are developed through the governance structure.
Chief Operations Officer (COO)	The COO will maintain contact with the national network of ARC Centres of Excellence COOs for development opportunities. The COO is supported by a team of professional staff who together can continue operations if there was a period of temporary absence. If the COO can no longer conduct the role, UQ would undertake a competitive recruitment process to hire a replacement in consultation with the ARC as outlined in the Grant Agreement. The COO will support the career development of professional staff, and encourage connections with the national Centres of Excellence network.	The Centre supports the development of research management capacity.
Research Theme/Flagship Project Leaders	Each Theme/Flagship is led by two co-leads, providing back-up for each other. The leaders are supported by a team of CIs, who may step into the lead role if required.	Research leadership is developed and maintained.
Portfolio Chairs	The leaders are supported by a team of CIs, who may step into the lead role if required. All CIs contribute to both research and service functions.	Service leadership is developed and maintained.
RPC Chair	The RPC Chair is supported by a CI appointed as Deputy Chair, subject to biennual review. The Chair is also supported by RT/FP leaders who may step into the lead role if required.	Research leadership is developed and maintained.
Chief Investigators (CIs)	The CIs comprise mid-career and senior academics which provides an ideal dynamic for peer-to-peer mentoring. The CRA provisions enable the replacement of Specified Personnel if for whatever reason they are unable to perform their duties. The Associate Investigators also support the research capabilities of the Centre.	The Centre maintains continuity in research capacity and builds leadership, and can respond to changing needs.

HDRs, ECRs, MCRs	All committees will include an HDR/ECR/MCR representative in a position of responsibility working aside senior academics on decision-making committees. Research supervision will be cross-theme and cross-nodal to enable exposure to varied leaderships styles and provide a number of avenues for guidance and career support. An HDR/ECR/MCR committee will be established to inform and lead Centre initiatives, mentored by senior members so that we develop future CIs.	HDR/ECR/MCRs gain varied leadership experience in research and service.