RACE for 2030

RELIABLE
AFFORDABLE
CLEAN
ENERGY

2023
ANNUAL REPORT

Australian Government
Department of Industry, Science and Resources

AusIndustry
Cooperative Research Centres Program

Accelerating the transition to
Reliable, Affordable, Clean Energy

Driving innovation for a secure, affordable, clean energy future.

Acknowledgement of Country

RACE for 2030 would like to respectfully acknowledge the Traditional Owners of the ancestral lands throughout Australia and their connection to land, sea and community. We recognise their continuing connection to the land, waters and culture and pay our respects to them, their cultures and to their Elders past, present and emerging.

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RACE for 2030

We are RACE for 2030: an industry-led Cooperative Research Centre (CRC) for energy and carbon transition.

We were established in 2020 with $68.5 million of Commonwealth funding. Our 80+ partners provide us with cash and in-kind contributions. This combined funding allows us to invest around $350 million of total resources in research, commercialisation, capacity building and market transformation through to 2030.

We are committed to helping Australia accelerate its transition to reliable, affordable, clean energy by 2030. Our aim is to deliver over $3.8 billion of cumulative energy productivity benefits and 20Mt of cumulative carbon emission savings.

RACE for 2030 currently has 20 full-time employees managing research, partner activities, market transformation and operations.

Our vision

A flourishing low carbon Australia, where energy research improves quality of life and boosts energy productivity.

Our mission

Driving innovation for a secure, affordable, clean energy future.

The
year in review

80+
industry partners

9
Australian universities and the CSIRO

10
international research organisations

$12.5M
cash committed to projects

$10.5M
in-kind committed to projects

8
PhD research scholarships awarded

18
projects launched

21
projects completed

NEW research plan
delivered for 2024 and beyond

RACE for Electric Vehicles (EVs)
program launched

RACE for Change
Re-named and expanded from **RACE for Everyone** program

A summary of our
research

$12.5M

Cash funding committed to projects

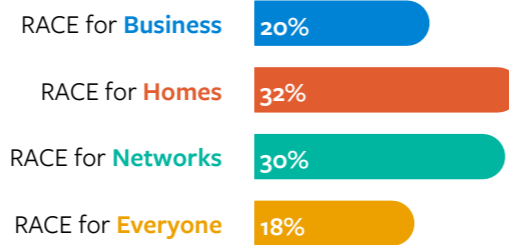**$8.4M** in 2022

$10.5M

Total in-kind committed to projects

$8.3M in 2022

8

PhD students awarded research scholarships

Distribution of program funding

RACE for **Business** — 20%

RACE for **Homes** — 32%

RACE for **Networks** — 30%

RACE for **Everyone** — 18%

80+

industry partners

8 + 1

Australian universities and CSIRO

10 international research organisations

18

projects launched in 2023

21

projects completed in 2023

Our cumulative project breakdown

17

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66

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Chair's
message

I am pleased to present RACE for 2030's third Annual Report.

The past year has been another of immense challenge. We continue to operate in an environment of convulsive change; and to meet Australia's decarbonisation goals, many of our economic systems – not just energy – need to undergo significant transformation. Decarbonisation of the economy and decentralisation of the energy system go hand in hand, which is why we are working on the two key transitions at the same time. Properly done, these transitions will both contribute significantly to our outcomes in 2030.

These transitions represent a big leap for many Australians and, of course, for Australian businesses. We are certainly seeing a growing appetite for progress and a strong desire for leadership in this area. That is where RACE for 2030 can play a unique role; this partnership between academia and businesses asks cutting-edge questions and seeks answers to those questions in a practical way.

There has been much to highlight over the past year in terms of RACE's work. We have made progress on a number of major projects, details of which are outlined in the 'Our research' section of this report. I would like to focus on a couple of highlights among the many projects underway.

1. The growth in demand and adoption for electric vehicles (EVs) presents immense opportunities for decarbonising transportation in Australia, along with a number of challenges around how to best integrate them with the energy grid. Our Strategic Electric Vehicle Integration (SEVI) project commenced in early 2023. The integration of EVs with renewable energy generation and storage – on a scalable and replicable level – will play a significant role in helping Australians to reduce their carbon emissions. The results from SEVI will help to build critical understanding and confidence in the benefits of integrated EVs among end users, industry and policymakers. We know our collective work has the potential to positively impact policy: we saw this in 2022 when the conclusions from our EV project helped guide changes in taxation to better support business fleet employees charging their EVs at home.

2. As Australia races to address its net zero challenges, precinct areas – such as university campuses, light industrial precincts, shopping centres, apartment complexes and suburbs – represent a unique opportunity to trial decarbonisation initiatives. Our Pathways to Net Zero Precincts (NZP) project kicked off in late 2023 and will examine at least 13 case study precincts across five Australian states. We are excited to see the results of this major project, which will empower policy makers, developers and citizens to support net zero transitions.

The rising commitment we are seeing from businesses and consumers, coupled with the government's commitment, creates immense opportunity to generate further momentum as we head towards 2030 and for Australia's outcomes towards 2050. In the end, both the decarbonisation and decentralisation transitions will be driven by people: millions of end users and thousands of businesses changing their behaviour and making different choices.

I would like to thank our incredibly capable executives and staff who work with passion and energy towards creating a better future. I would also like to thank our partners for their strategic collaboration working with us as we translate research into meaningful impact.

And lastly, but certainly not least, my thanks to our expert and committed Board members. They ensure our accountability to all our partners and funders and contribute their passion and expertise to these crucial endeavours.

We continue to be excited about how much further we will go together.

Louise Sylvan AM
Chair
RACE for 2030

CEO's
message

As the world experiences unprecedented impacts from global warming, and end users and businesses struggle with high energy costs, our drive to make a difference at RACE for 2030 has never been stronger. We are passionate about transformative change in carbon emissions and energy services, and motivated to achieve this through collaborative innovation with our partners.

Our research program accelerated rapidly over the past year. We committed $23 million to research to catalyse decarbonisation and reduce energy costs in existing homes, precincts and businesses, along with smart charging of electric vehicles, validating 24/7 renewable energy use and enhancing load flexibility for businesses. Seven of these projects were multi-million-dollar projects, which we co-designed with our partners. Our total research funding commitment after three years of operations is $43M of resources for 83 projects, 36 of which have been completed.

At the three-year mark of our 10-year Cooperative Research Centre (CRC) journey, we recognised the need to renew our research plan. Our evolved research plan reflects the rapid changes in the energy market, the policy landscape and technological advances. And it builds on the learnings from our 17 opportunity assessments and the 66 additional research projects we have committed to, as well as intensive engagement with our partners. The research program and this renewal is led by Dr. Bill Lilley, our Chief Research Officer (CRO), who joined us in March. I welcome Bill to RACE and would like to thank Dr. Chris Dunstan for his contributions as CRO during our establishment phase.

RACE is now more nimble in how we address the research needs of our partners and the community during this time of dynamic change; and in parallel, we are increasing our focus on applying this research to activate fundamental systems change. We are here to deliver impact, and we recently recruited Beth Brunoro as Leader Innovation and Impact to boost our capacity to enhance the application of our research across the energy ecosystem.

Collaboration is central to the power of our CRC. Thank you to our 80+ partners for your ongoing support, for sharing your insights and joining us in co-designing great projects. Our industry partner base is growing steadily as we add greater flexibility in how new organisations participate and partner with us.

I would also like to thank our incredible and dedicated RACE team for their contributions over the past year.

Together we have the power to shape a cleaner, more sustainable future.

Jonathan Jutsen
CEO
RACE for 2030

Our
partners

RACE for 2030's reason for being is to facilitate the adoption of impactful collaborative research and innovation within the energy industry.

We have an engaged and growing group of over 80 partners; these partnerships are the key to our success. We would like to thank our partners for their continued commitment and investment in energy and carbon reduction innovation.

We are pleased that our partners are so engaged in our cooperative research projects and are committing their funding to projects of their choice.

We want our legacy to be transformative and sustainable change in energy services and carbon emission reductions through collaborative innovation.

An improved approach to how we work together

This year, we substantially changed the way we work with new partners. We now provide the opportunity for new organisations to join us as project-only partners. This has greatly increased flexibility to bring new industry partners into RACE.

We have also continued to improve our processes to speed up project approvals and increase the use of co-design in large projects to achieve agreed objectives and streamline project operations. Now, we also have an even closer working relationship with our business and research partners. This helps us to better understand their priority research needs and facilitate partnerships with industry to develop projects.

RACE has 80+ Partners

Industry associations and users · Research providers · Network business and retailers · Startup companies · State Governments · Education and training providers · Technology companies and investors

RACE brings together the whole energy value chain to coordinate and facilitate

- Knowledge sharing
- Market transformation
- Impact

Our partners

Our
research

At RACE for 2030, we have developed an innovation framework to review our original program milestones, along with research outcomes from each of the 17 opportunity assessments performed over the last three years.

Those studies were complemented with a review of recent changes to the domestic and international energy landscape, facilitated by discussions with our research and non-research partners. This led to the development of our revised research program.

Our refined research themes provide a high-level narrative of the research through which RACE will deliver reduced carbon emissions, improved energy affordability, and co-benefits in sustainability practices, energy productivity and community health. In total, there are 11 themes across five programs.

There have been two core changes to our research agenda: the development of a standalone electric vehicle program (RACE for Electric Vehicles) reflecting the international and domestic significance of this cross-sectoral technology; and the development of our RACE for Change program, which replaces and expands on the earlier RACE for Everyone program.

The role end users play in the energy transition, along with the impacts on them, remain our core drivers at RACE. We will ensure we keep them front and centre by continuing to take a whole-of-system view; this helps break down the silos that plague the energy transformation.

Amidst widespread views and activities underway across the energy sector, RACE is well placed to provide a unified voice in end-user-led activities. This is critical in ensuring the end-user community is treated equally alongside traditional supply-side focused solutions.

RACE will deliver research that allows industry to better understand the role of end-user actions. We will expand our research in humanities and economics to ensure end users are better heard and understood. We will develop methods to translate these findings into quantitative planning and operational tools that deliver true optimisation with the end user front of mind.

Our future research projects will reflect a mix of prescribed research questions, along with new industry-led enquiries brought by our partners. This will ensure we remain agile to industry needs, while also providing the industry with a vision of broader future trends from our research community.

While RACE can facilitate a unified view of end-use actions, it can only do so through coordinated actions extending beyond our research programs and partners. RACE will increase its collaboration across the sector to ensure we build upon, rather than reproduce, research questions required to transform our energy sector. We will broaden our policy and regulatory impact through expanded collaboration with key entities at local, state and federal levels to maximise the translational impact of our research community. We will also increase our knowledge exchange with international agencies and researchers to improve the two-way exchange of lessons for the transformation journey.

"We are operating in a market where large-scale, transformative change is critical. Our role is to look across the industry, taking a whole of system view, taking the time to understand the issues and ensure an integrated and collaborative approach. That's why at its heart, our new research plan is about being responsive to industry needs and taking a systems approach so we can deliver meaningful change with the end user in mind."

Bill Lilley
Chief Research Officer

Research programs and themes

	Theme	Purpose
RACE for Business	**Theme 1:** Digitalising industry	This theme investigates how data-driven insights and connectivity can unlock value-added services and personalised products for customers. Real-time analytics that improve decision making for businesses will be developed, driven by circular economy practices to improve productivity and reduce emissions. Understanding the role of machine-human interfaces and equipping the workforce with necessary digital skills will be critical in developing socially acceptable solutions. Delivering trusted and consistent sources of information and decision-making tools will ensure that solutions scale at a pace required to decarbonise the economy.
	Theme 2: Decarbonising businesses and supply chains	This theme will develop ground-breaking business models required to implement and scale energy efficient solutions in new and existing businesses. It will have a strong focus on activities in HVAC, fuel substitution, renewable integration, flexible operation and innovative building materials. Actions will be explored for individual businesses and those operating in shared-service communities, such as net zero precincts. Big-data analytics to monitor building performance, identify and track energy-saving opportunities and maximised services will be delivered. Awareness campaigns will help scale outcomes across a diverse set of stakeholders.
RACE for Homes	**Theme 3:** Mainstreaming efficient electric homes	This theme explores the how and why of owners and renters electrifying their homes, including energy efficiency options to reduce consumption. Research will consider the role of community-based solutions as well as the influence of community behaviour on individual choice. Policy and regulatory settings required to decarbonise Australian homes will be developed to treat embodied emissions and improve health outcomes for occupants. Finally, applying research findings through an innovation network will encourage end users to seek energy-efficient solutions as business-as-usual practice.
	Theme 4: Engineering smarter homes	This theme will examine the role of home technologies that enable responsive actions to minimise costs and emissions. It will explore what level of control people are willing to give to devices, systems and companies, and how they could be encouraged to help deliver benefits to the wider community. It will investigate the technologies and control techniques required to better integrate renewable energy through flexible demand and develop policy and regulatory settings that enable these actions at scale. Structured synthesis of research findings and targeted information sharing will assist Australian households to choose the best technologies to reduce emissions and costs according to their preferences and needs.
RACE for Networks	**Theme 5:** Designing future networks	This theme will study emerging social trends, lifestyles, routines, and practices of end users. It will explore their impact on power system design and the evolving role of market architecture, including the roles and responsibilities of system actors. Understanding how end-user desires and actions are implemented in complex decision-making tools is a fundamental research topic to be delivered. For the true optimisation of the power sector to be realised, new partnerships and engagement, and collaborative communication will be utilised. This will help to explore future states of the sector.
	Theme 6: Developing local grid solutions	This theme considers how end users want to use, control and value their Consumer Energy Resources (CER) devices. It will examine where, when, and how CER could be best deployed to minimise costs and emissions using real-time facilities that allow faster local decision making. Standardised methods for securely integrating CER will be developed considering social, economic, environmental and technical factors. Research outcomes will be shared through collaborative data networks to help scale CER solutions to their full potential.

	Theme	Purpose
RACE for Electric Vehicles (EVs)	**Theme 7:** Optimising transport and power use	This theme reflects changes to potential ownership models that balance end-user expectations of economic benefits with transport needs. Emerging social trends, lifestyles, routines, and practices likely to impact vehicle use will be determined, along with an understanding of how EV adoption will be affected by different cohort behaviours and choices. Optimal provision of transport and electricity networks will be determined through advanced integrated design, balancing the needs of multiple services. To achieve maximum societal impact, determining and sharing key information on how to realise benefits in integrated systems will be critical to enable this emerging cross-sectoral technology.
	Theme 8: Integrating electric vehicles with the grid	This theme explores user behaviour, incentives and pricing strategies that establish preferences for smart charging for individuals and fleets. Determining the role of vehicle-to-everything (V2X) is fundamental to understanding future-use cases where users balance their transport needs with those of the wider grid, including system resiliency. Research will explore how widespread EV use affects power system dynamics. Policy and regulatory development will allow seamless integration of EVs while maintaining security and privacy.
RACE for Change	**Theme 9:** Incorporating end users in whole-of-system design	This theme will make true optimisation of the energy system, with a focus on the role of the end user, a central focus. Understanding and enabling end-user preferences is critical to ensuring a balance between demand and supply options. Developing innovative fore-sighting methods will ensure the end users' views are captured in future energy scenarios. This will include understanding emerging social trends, lifestyles, routines and practices that are likely to impact on energy use. Policy and regulatory enablers will be developed to encourage participatory exploration of future energy systems. Measuring and building trust through tools and practices between customers and service providers is a critical area of research to enable end-user participation in whole-of-system planning.
	Theme 10: Transforming systems through innovation	This theme focuses on the transformative change required to deliver Australia's decarbonisation goals in the energy sector. Proactive longitudinal approaches will be developed to track the success of project outcomes and refine research priorities built on a common understanding of industry needs. Fast-tracking change by building tailored communities of practice and selective systems-based training for key decision makers is vital to reduce risk in future planning and program delivery. Developing clear communication material to facilitate change among a range of different stakeholders will help drive Australia's transition to a net zero economy.
	Theme 11: Building a net zero workforce	This theme will enhance the rapid development of a net zero workforce. Mapping the skill sets in demand supply-side by sub-sector is critical for planning development in schools, vocational and tertiary facilities and industry. Pathways to develop cross-cutting skills, including digital uplift and systems thinking, will be explored and will include the retraining of displaced workers in carbon intensive employment. Policy development for increasing diversity and inclusion in energy-related employment is vital along with the development of innovation networks for knowledge diffusion.

Our
case studies

To reflect our evolving research focus, we launched three key projects in 2023. These projects aim to influence transformative change as Australia transitions to better energy productivity and strives towards decarbonisation.

Strategic EV Integration (SEVI): embedding research in EV demonstration projects

The integration of electric vehicles (EVs) into our energy system will play a critical role in decarbonising transportation in Australia. However, as demand and uptake of electric vehicles in Australia accelerates, so too do some fundamental EV integration challenges.

Our Australian Strategic Electric Vehicle Integration project (SEVI) began in early 2023 to address these challenges, and to investigate how to integrate EVs with renewable energy generation and storage in ways that are both scalable and replicable.

The project – which is expected to run for an initial three-year period – is in its first stage of research and co-design and is being co-led by Curtin University and the University of Technology Sydney. The project's Industry Reference Group is sourced from across the energy value chain, with representation from the energy market operator, state and territory governments, automobile manufacturers, peak bodies and energy utilities.

Together, we will uncover the wider value of integrating EVs, by employing three on-the-ground, partner-led demonstrations, which will take place across Australia in 2024. The demonstrations will focus on the use of EVs in business fleets (NSW), private vehicles in urban precincts (WA) and in regional areas (SA). The findings from these demonstrations will be shared in 2025 through an industry report and video. They will be essential to informing Australia's understanding of how EVs can be effectively, efficiently and equitably integrated into the electricity grid, the wider built environment and society as a whole. They will also shape the development of larger-scale projects in this area, supporting broader adoption of EVs.

Partners

Research partners:
Curtin University (Curtin), University of Technology Sydney (UTS), Griffith University (Griffith), Monash University (Monash), RMIT University (RMIT), University of South Australia (UniSA)

Industry partners: Ausgrid, Australian Power Institute (API), eleXsys Energy, Endeavour Energy, Power Tech Energy, SA Dept of Energy & Mining, SA Power Networks, Selectronic Australia, Starling Energy, SwitchDin, Western Power

Commitment

$3.39M cash funding

Pathways to Net Zero Precincts: research to accelerate adoption

Our three-year Pathway to Net Zero Precincts (NZP) project began in October 2023. It will generate and share knowledge to accelerate the decarbonisation of places like university campuses, light industrial precincts, shopping centres, apartment complexes and suburbs.

Urban precincts are ideal in terms of geographic scale for trialling, monitoring and managing decarbonisation activities that integrate land uses and distributed energy resources such as solar, batteries and electric vehicles: they are small enough to apply innovations quickly and large enough to achieve economies of scale. Successful net zero precinct learnings and applications can then be applied and replicated more broadly on a larger scale for greater impact.

The project will examine at least 13 case-study precincts across five states of Australia. This will be a collaborative effort between industry, communities, government and academia. Researchers from partner universities are involved, along with more than 13 project partners. Precincts included as case studies represent a cross-section of precinct areas; from universities and shopping precincts through to residential zones. The project's objective is to collect and collate learnings using three synthesis pathways: achieving net zero certification; optimising distributed energy resources within grids; and determining best practice governance.

Findings from the net zero innovations will allow the results of this research to be embedded into industry business plans, NZP certifications, governance regimes (e.g. government development approval processes, and ongoing industry or citizen managed Distributed Energy Resource (DER)) and the broader electrical network.

The project will give policy makers, developers and citizens the opportunity to connect to innovative technologies and governance arrangements to support net zero transitions.

Partners

Research partners: Curtin

Research centres: Cisco-Curtin Centre for Networks

Industry partners: Development WA, Hesperia Property, Sustainable Built Environment National Research Centre (SBEnrc), Western Power

Commitment

$2M cash funding

Energy Upgrades for Australian Homes: reducing demand on the grid

Immense opportunities exist to electrify Australian homes by installing products and services to reduce demand on the energy grid.

Our Energy Upgrades for Australian Homes (EUAH) project, which commenced in September 2023, will upgrade millions of existing Australian homes by 2030. Around 90% of Australian homes were built prior to the introduction of energy ratings, so there is abundant possibility in this space. The project's overall goal is to have energy upgrades occur in 1 million homes initially and then grow to include the majority of Australia's 10 million homes.

A change of this magnitude calls for a cleverly designed delivery model that is: scalable at a national level; easy to implement at the local community level; and designed for varying climates, housing types and household groups. Central to the research is the co-design, monitoring, and evaluation of place-based pilot projects in collaboration with industry partners. Findings from the research will help to inform policy and regulation commentary on how scaled innovation could be enabled to provide energy upgrades for Australian homes.

This project will change the way households use energy in order to lower energy bills and decarbonise. It will generate new knowledge about social, technical, and environmental enabling conditions, and test effective policy, delivery, funding, behaviour change and supply chain interventions. This will, in turn, help to facilitate the implementation and uptake of home energy upgrade programs in diverse communities across Australia.

Our EUAH project will play a critical role in the transition towards net zero emissions for Australian homes and will deliver cost and comfort benefits to Australians.

Partners

Research partners: Monash, CSIRO, Queensland University of Technology (QUT), RMIT, University of New South Wales (UNSW), UniSA, UTS

Industry partners: Climate-KIC Australia (Climate-KIC), Energy Efficiency Council (EEC), Knauf Insulation Pty Ltd, NSW Office of Energy and Climate Change (NSW OECC)

Commitment

$3.69M cash funding

2023 summary of our projects

The table below is a summary of the projects started and completed during the past year, along with the financial and in-kind contribution.

A full list of our research projects is outlined on .

	Started in FY22				Started in FY23			
	Ongoing No. of projects	Total value Cash + In kind	Completed in FY23 No. of projects	Total value Cash + In kind	Ongoing No. of projects	Total value Cash + In kind	Completed No. of projects	Total value Cash + in kind
Opportunity Assessments			6	$1,727,720	1	$264,538		
Fast Track			9	$1,987,158	7	$2,072,260	3	$283,861
Standard Track	3	$3,885,507			4	$9,064,661		
Industry PhDs	14	$3,734,188						
Non-research			2	$170,721	2	$162,500	1	$100,000
Total	**17**	**$7,619,695**	**17**	**$3,885,599**	**14**	**$11,563,959**	**4**	**$383,861**

Opportunity Assessments[1]

Project	Lead Partner	Race for 2030 Partners	Status	Cash	$ in kind
H3/H5 combined					
H3: Home energy technologies **H5:** Smart algorithms	UNSW	UNSW, Ausgrid, Department for Energy Efficiency and Climate Action (DEECA), Endeavour Energy, Griffith, Mirvac Ventures, Redgrid, UTS	In progress	$215,624	$48,913

1. See 2022 annual report for previous program and theme structures listed in these tables
https://racefor2030.com.au/corporate-documents

Research projects

B4: ENERGY FLEXIBILITY FOR WATER CORPORATIONS

This project aims to investigate the renewable energy and demand management strategies (REDMs) that support the renewable transition of high-demand users. Its benefits will extend to surrounding communities and the electricity network.

○ In progress

Lead partner: RMIT

Partners: RMIT, C4Net, Coliban Water, Monash, Sydney Water

Cash: $399,000 | **$ in kind:** $232,366

H3: SOLARSHIFT

This project will coordinate and operate a large number of domestic electric water heating systems (DEWH) as a giant, 'Megawatt scale' thermal battery to soak up excess solar generation and support network supply and demand. New DEWH control strategies and tariffs will be designed, aimed at creating savings for energy users. Project parties will also work with a retail partner during the second phase of the project.

○ In progress

Lead partner: UNSW

Partners: UNSW, Ausgrid, Endeavour Energy, International Energy Agency, NSW OECC, Solar Analytics

Cash: $552,076 | **$ in kind:** $324,600

N1: STRATEGIC EV INTEGRATION: EMBEDDING RESEARCH IN EV DEMONSTRATION PROJECTS

Over three years, this project will investigate a selection of early-stage use cases for EVs in fleets, precincts and regions through a process of co-design and collaborative implementation with industry partners.

See for more information.

○ In progress

Lead partner: Curtin, UTS

Partners: Curtin, UTS, API, Ausgrid, Endeavour Energy, Griffith, Monash, NSW OECC, Planet Ark Power, PowerTech Energy, RMIT, SA DEM, SA Power Networks, Selectronic, Starling Energy, SwitchDin, UniSA, Western Power

Cash: $3,390,000 | **$ in kind:** $4,098,915

B1: FOOD VALUE CHAIN STUDY

This study provides an aerial view of the major barriers to the implementation of energy productivity improvements in food value chains, along with the drivers for overcoming them. This was done by integrating a review of studies that analysed the location of energy consumption across food value chains and those with identified barriers and enablers to energy productivity.

✓ Completed

Lead partner: A2EP

Partners: A2EP, Agrifutures, Climate-KIC, UTS

Cash: $71,596 | **$ in kind:** $0

B1: ELECTRIFYING THE COLD CHAIN – PHASE 2

Phase 2 of this project will explore the use of an innovative eutectic refrigeration system (developed during Phase 1) as an alternative to current eutectic refrigerated vehicles, which perform poorly in terms of energy efficiency and temperature control. The developed system will be built and demonstrated on a refrigerated body.

○ In progress

Lead partner: UniSA

Partners: UniSA, Agrifutures, Aldom, SA DEM

Cash: $248,402 | **$ in kind:** $343,140

B2: AI-READY FLEXIBLE BUILDINGS TO MINIMISE CARBON INTENSITY

The heating and cooling of office buildings accounts for up to 40% of their annual energy use. This project aims to unlock load flexibility to leverage reduced carbon intensity. A model will be developed that is expected to unlock between 10%-30% shiftable load on an average day (across the buildings included in the study).

○ In progress

Lead partner: Monash

Partners: Monash, Buildings Alive

Cash: $125,563 | **$ in kind:** $70,906

B3: TECHNO-ECONOMIC FEASIBILITY STUDY OF MECHANICAL VAPOUR RECOMPRESSION (MVR) FOR IMPROVING ENERGY EFFICIENCY IN MEAT RENDERING

This is a targeted technical and economic feasibility study aimed at reducing the risk of adoption of Mechanical Vapour Recompression (MVR) technology for heat supply in the meat processing industry. The study will include detailed analysis of the key heating processes. The main outcome will be a design that will guide pilot integration of MVR into the meat rendering process.

○ In progress

Lead partner: RMIT

Partners: RMIT, AMPC, A2EP

Cash: $76,849 | **$ in kind:** $47,426
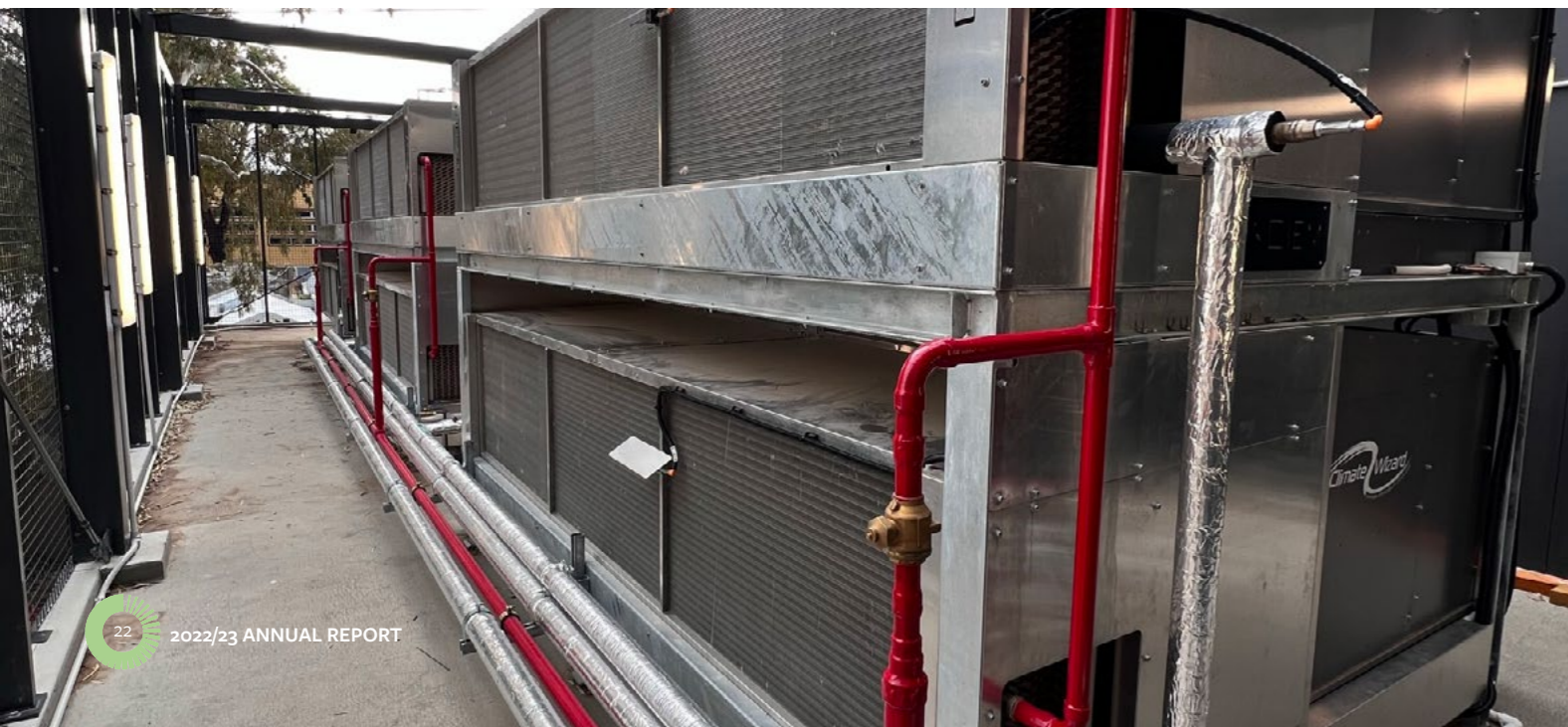
B4: ENERGY TRENDS VISUALISATION TOOLS

This visualisation project will develop online and interactive tools, so that energy stakeholders can better engage with, and understand, the growing range of distributed energy resources. It will help informed decision making, build consumer trust and drive innovation.

○ In progress

Lead partner: UNSW

Partners: UNSW, Australian Energy Market Operator (AEMO), Ausgrid, Endeavour Energy, Energy OS, Powerlink, UTS

Cash: $205,000 | **$ in kind:** $108,264

H1: SCOPING: LOW CARBON SMART HOMES (SAPN)

The purpose of this project was to conduct a review and refresh of the research framework and methodology previously developed for the SA Power Networks: Low Carbon Smart Homes Pilot. The Pilot focused on the electrification of homes and demand flexibility.

✓ Completed

Lead partner: UniSA

Partners: UniSA, Monash, UNSW, UTS

Cash: $100,000 | **$ in kind:** $0

N2: OPTIMISED ZONE SUBSTATION MV VOLTAGE MANAGEMENT TO INCREASE DISTRIBUTED ENERGY RESOURCE (DER) HOSTING CAPACITY

This 12-month project will utilise a novel solution to manage the challenges introduced by DERs in power distribution networks. It will leverage Planet Ark Power's unique power electronics and software solution, eleXsys. The outcome of the project will inform future trials to deploy eleXsys in DER-rich networks.

○ In progress

Lead partner: Monash

Partners: Monash, Planet Ark Power

Cash: $286,620 | **$ in kind:** $165,952

N2: IDENTIFICATION, KEY MANAGEMENT AND TRUST FOR INVERTERS FOR DISTRIBUTED ENERGY RESOURCES (DERS)

This project will develop a distributed framework for device identity management and status information. This will enable network operators (or virtual power plant operators) to establish secure communications and continuously monitor compliance with security requirements. It will also support DER owners with life-cycle management of their devices.

○ In progress

Lead partner: Monash

Partners: Monash, Selectronic

Cash: $150,014 | **$ in kind:** $94,083

N3: BEHIND THE METER FORECASTING & OPTIMISATION

This project will develop an innovative Predict+Optimise benchmark and test bed for aggregate and behind-the-meter forecasting and co-optimisation algorithms. In the near term, this project promises to enable higher renewable energy penetration and savings of up to 20% (in dollar terms) for customers. In the long term it can enable creation of new markets and value streams.

○ In progress

Lead partner: Monash

Partners: Monash, SwitchDin

Cash: $104,750 | **$ in kind:** $232,325

E1: BEHAVIOURAL INSIGHTS FOR THE ENERGY SECTOR

This project aims to start filling knowledge gaps around the beliefs and values of energy consumers, as well as the factors that drive their behaviour. These insights will assist the energy sector (including consumer advocacy groups and policymakers) in integrating customer-centric, evidence-based strategies into their frameworks.

○ In progress

Lead partner: UniSA

Partners: UniSA, Monash, UNSW, UTS

Cash: $56,092 | **$ in kind:** $95,307

E1: BENCHMARKING CUSTOMER PRIORITIES AND TRUST IN THE ENERGY SECTOR

This study aims to benchmark customer priorities and trust in the energy sector. The aim is to identify leverage points for building community trust, given the transition will be influenced by customer preferences, engagement and behaviour change.

○ In progress

Lead partner: QUT

Partners: QUT, Ausgrid, Brighte Energy, Western Power

Cash: $203,596 | **$ in kind:** $191,714

E3: DEFINING ENERGY EFFICIENCY FOR INCLUSION IN THE AEER

This project aims to define energy efficiency for inclusion in the Australian Energy and Employment Report (AEER). This will help to accurately measure the energy efficiency workforce, support the case for energy efficiency policies and programs and support the development of training and skills to help deliver the transition.

✓ Completed

Lead partner: UTS

Partners: UTS, DEECA, EEC, NSW OECC, SA DEM

Cash: $86,903 | **$ in kind:** $29,250

E3: ELECTRICITY SECTOR WORKFORCE PROJECTIONS FOR THE 2022 AEMO INTEGRATED SYSTEM PLAN

Australia needs to understand the imminent required changes to best manage the transition in the energy workforce. The Australian Energy Market Operator (AEMO) produces an Integrated System Plan (ISP) every two years, with alternative scenarios of what might happen between now and 2050. This project developed electricity sector workforce projections broken down by technology, occupation and location, and was published shortly after the 2022 ISP.

✓ Completed

Lead partner: UTS

Partners: UTS, AEMO, API, DEECA, NSW OECC, SA DEM

Cash: $60,134 | **$ in kind:** $35,977

E3: CARBON MANAGER PILOT PROGRAM

This project aims to define energy efficiency for inclusion in the Australian Energy and Employment Report (AEER). This will help to accurately measure the energy efficiency workforce, support the case for energy efficiency policies and programs and support the development of training and skills to help deliver the transition.

○ In progress

Lead partner: Sydney Water

Partners: Sydney Water

Cash: $130,000 | **$ in kind:** $2,500

Industry PhD projects

Over the life of RACE for 2030, we aim to graduate 55 high quality doctoral candidates in industry relevant disciplines. The industry-led topics allow for detailed investigation and insights based on international best practice and local research for the duration of each project.

Since 2020, RACE has approved 19 PhD scholarships. In FY23, 9 students commenced their PhD program, in addition to the 6 students that commenced in FY22 (with one withdrawal). Currently, there are still 4 students who are awaiting their Australian student visas.

In FY23, RACE explored other avenues, such as offering top-up scholarships to students who have already commenced their PhD programs. This will be implemented in FY24.

B5: TECHNOLOGIES TO IMPROVE PROCESS PERFORMANCE AND METHANE YIELDS DURING HIGH-SOLIDS ANAEROBIC DIGESTION OF SUGAR MILL WASTES

Lead partner: Griffith

Partners: Griffith, Singh Farming

This project will investigate optimising solids content from anaerobic digestion (AD) of agricultural wastes, so that less water can be used to produce biogas (when compared with conventional wet AD). This will also allow for a reduction in reactor size and operating costs.

✓ Contract (Executed)

N1: DEMAND MANAGEMENT OF V2H AND V2G USING MICROGRID AND ENERGY STORAGE BASED EV CHARGING SYSTEMS

Lead partner: Griffith

Partners: Griffith, Planet Ark Power

This project will analyse V2H/V2G systems and their impact on the conventional network and renewable energy system. It will include the analysis of Plug-in Electric Vehicles (PEVs) technologies, energy storage system (ESS), electric power conversion and Microgrid control technologies, PEV battery charging technologies and infrastructure, and utility interfaces. It will also investigate the economic, social and environmental impacts of energy storage-based EV charging systems.

✓ Contract (Executed)

N2: OPTIMAL PARTICIPATION SCHEME FOR VIRTUAL POWER PLANTS IN ENERGY AND RESERVE MARKETS

Lead partner: UTS

Partners: UTS, Starling Energy

This project aims to devise efficient strategies for Virtual Power Plants (VPPs) to participate in energy markets considering different market structures, load and generation profiles behind-the-meter of customers, uncertainty, demand response and artificial intelligence techniques.

✓ Contract (Executed)

N2: INCREASING DER HOSTING CAPACITY WHILE REDUCING COSTS AND ENHANCING ENERGY SYSTEM RESILIENCE

Lead partner: Curtin University

Partners: Curtin University

This project will investigate how new technologies and associated business models can be used to accelerate the uptake of Distributed Energy Resources (DERs). This will help to cost-effectively stabilise the grid as it transitions to decentralised energy generation and storage.

◌ In progress

PhD candidates
2021-23

Student Name	Martin Egan
Industry PhD project	How can the "customer first" and iterative approaches of successful Australian and International start-ups be applied to help the energy transition?
University and Industry Partners	UTS and Solar Analytics
Start date	August 2021
End date	August 2024
Supervisors	Dr Samantha Sharpe (UTS) and John Laird (Solar Analytics)

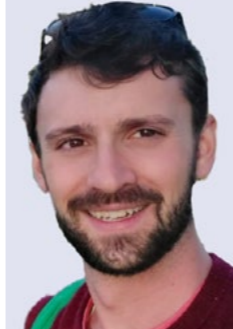|	
Student Name	Derick Rudson Goncalves de Lima
Industry PhD project	Optimal planning and operational strategy for biogas power generation system design in wastewater treatment plants (WWTPs)
University and Industry Partners	UTS and Sydney Water
Start date	December 2021
End date	December 2024
Supervisors	A/Prof Li Li (UTS) and Glenda Stowell (Sydney Water)

Student Name	Bowen Zhang
Industry PhD project	Data innovation for zero carbon buildings
University and Industry Partners	UTS and Buildings Alive
Start date	January 2022
End date	January 2025
Supervisors	Dr Hongda Tian (UTS), Hao Huang and Craig Roussac (Buildings Alive)

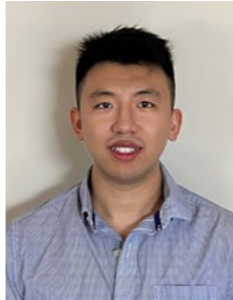|	
Student Name	Cynthia Coyne
Industry PhD project	Off-grid Indigenous community microgrids
University and Industry Partners	Griffith University and Western Power
Start date	February 2022
End date	February 2025
Supervisors	Dr Cara Beal (Griffith University) and Craig Julian (Western Power)

Student Name	Aleksandra Van Hummel
Industry PhD project	Developing an Australian Trust Index
University and Industry Partners	QUT and Essential Energy
Start date	May 2022
End date	May 2025
Supervisors	Prof Rebekah Russell-Bennett (QUT) and Matt Newey (Essential Energy)

|	
Student Name	Mohammed Zeehan Saleheen
Industry PhD project	Designing distributed renewable micro-grids for reliability
University and Industry Partners	Monash University and Planet Ark Power
Start date	September 2022
End date	September 2025
Supervisors	Dr Hao Wang (Monash University) and Dr Bevan Holcombe (Planet Ark Power)

|	
Student Name	Xian-Long Lee (Johnson)
Industry PhD project	Smart Charging Strategies for EVs in Smart Grids
University and Industry Partners	Monash University and Enzen
Start date	September 2022
End date	September 2025
Supervisors	Dr Adel N Toosi (Monash University) and Ian McLeod (Enzen)

Student Name	Benjamin James
Industry PhD project	Increasing DER hosting capacity while reducing costs and enhancing energy system resilience
University and Industry Partners	Curtin University and Planet Ark Power
Start date	October 2022
End date	October 2025
Supervisors	Prof Peter Newman and Dr Charlie Hargroves (Curtin) and Richard Romanowski (Planet Ark Power)

|	
Student Name	Ramith Deelaka Wimalaratna
Industry PhD project	Innovative tariffs and demand response potential for residential and industrial customers
University and Industry Partners	Griffith University and Ausgrid
Start date	October 2022
End date	October 2025
Supervisors	Dr Alexandr Akimov and Dr Shyama Ratnasiri (Griffith University) and Oliver Morgan-Williams (Ausgrid)

Student Name	Kaige Wang
Industry PhD project	Maximising renewable energy for water corporations through machine learning, peer-to-peer trading and demand management
University and Industry Partners	RMIT University and Sydney Water
Start date	December 2022
End date	December 2025
Supervisors	Dr Rebecca Yang and Dr Kazi Hasan (RMIT) and Ruben Muller (Sydney Water)
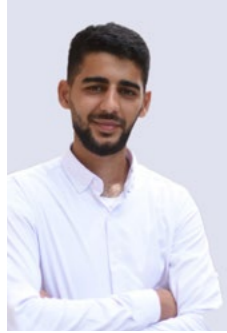
Student Name	Asaad Makhalfih
Industry PhD project	Coordinated dynamic hosting capacity with photovoltaics, storage batteries and electric vehicles using artificial intelligence-based techniques
University and Industry Partners	UTS and Zepben
Start date	February 2023
End date	February 2026
Supervisors	Prof Jahangir Hossain and Dr Ibrahim Ibrahim (UTS) and Bill Tarlinton (Zepben)
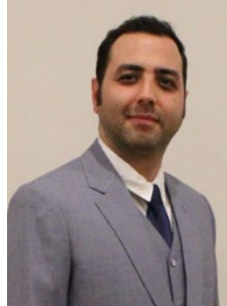
Student Name	Javad Salehpour
Industry PhD project	Artificial Intelligence for management of electric vehicles and vehicle-to-grid (V2G) resources optimization
University and Industry Partners	UTS and Planet Ark Power
Start date	May 2023
End date	May 2026
Supervisors	Prof Jahangir Hossain (UTS) and Dr Bevan Holcombe (Planet Ark Power)
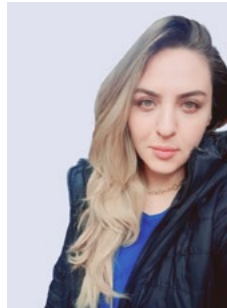
Student Name	Mahsa Saghaei
Industry PhD project	Fast-track to Net Zero carbon buildings
University and Industry Partners	UNSW and Buildings Alive
Start date	May 2023
End date	May 2026
Supervisors	Dr Mike Roberts (UNSW) and Craig Roussac (Buildings Alive)

Student Name	Rubaiath E Ulfath
Industry PhD project	Optimising the total cost of owning and operating centralised chilled water plants
University and Industry Partners	RMIT University and Exergenics
Start date	June 2023
End date	June 2026
Supervisors	Dr Ben Cheng and Dr Toh Yen Pang (RMIT) and Richard Phillips and Iain Stewart (Exergenics)

Our
impact

Energy is the key enabler of our economy, its businesses and communities.

FY23 saw a continued and growing desire to move toward cleaner energy supply, driven by economics and social need. Australia continues to lead the world in the adoption of domestic solar photovoltaic (PV) panels and has seen a rapid increase in the uptake of electric vehicles.

The adoption of these new technologies challenges our traditional supply-demand models. At RACE for 2030, we are focused on enabling these flexible clean energy options in our local communities, businesses and precincts. In 2022-23, we funded over 21 projects with a total value of $23M. These investments will lead to real-world reductions in greenhouse gas emissions and energy supply costs.

Figure 1 shows that our investments to date are predicted to save over 13.76Mt CO_2 emissions by 2034 (from our target of >15Mt CO_2 in 2034). At the same time, we predict actions from our investments to date will save end-users over $0.98 billion by 2034 (from our target of $6.2 billion in 2034). The financial savings relative to greenhouse gas savings are expected to improve over time as the grid becomes more decarbonized and the cost effectiveness of actions improve over time.

Figure 1

Cumulative Emissions Reduction 2020 – 2034
Target vs Projected to date (Sept 2023)
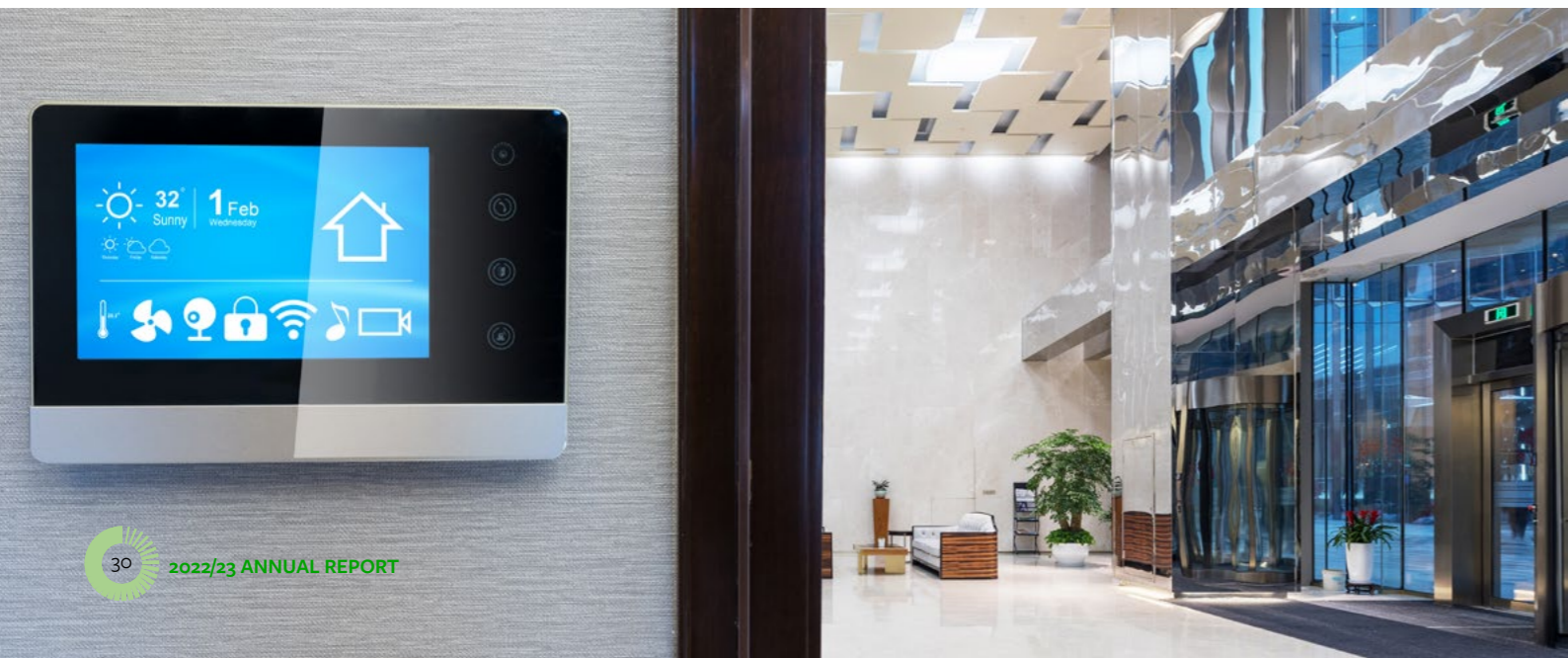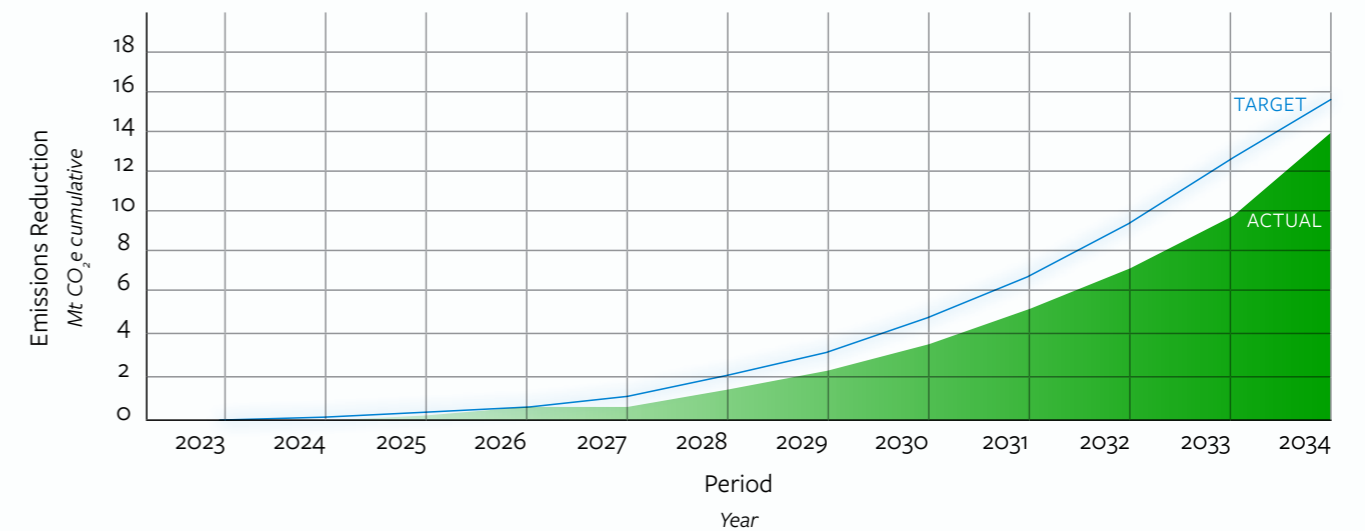
Our
board

Louise Sylvan
AM FAICD
CHAIR

Louise has been the Chair of RACE for 2030, since the CRC's inception. She brings vast experience in the energy sector. Louise also holds the position of Adjunct Professor at the University of Sydney, is Chair of Energy Consumers Australia, a Non-Executive Director of The Australian Centre for Social Innovation (TACSI) and a Member of the Advisory Group of the Net Zero Australia project.

Previously, Louise was CEO of the Australian National Preventative Health Agency, a Commissioner of the Productivity Commission; Deputy Chair of the Australian Competition and Consumer Commission, as well as President of Bush Heritage Australia. She was also a Non-Executive Director of Social Enterprise Finance Australia, Impact Investing Australia and the Australian Risk Policy Institute.

Dr Katherine Woodthorpe
AO FAICD
DEPUTY CHAIR

Katherine is an experienced Chair and Non-Executive Director, having served on boards since 2003 across a variety of organisations including listed entities, government and for-purpose organisations.

She has a strong track record in a broad range of innovation-dependent industries including healthcare, renewable energy and environmental and climate science. She has been cited in various media sources as one of Australia's most influential people in innovation and is the President of the Academy of Technological Sciences and Engineering. Amongst her current appointments in the energy/climate field, Katherine is the incoming Chair of deep-tech incubator Cicada Innovations and is a Director of Anteotech Ltd. She was previously a Director of ARENA.

Simon Smith
BOARD MEMBER

Simon has extensive experience in government decision making, policy development, regulatory reform and organisational leadership. He has served in CEO and Secretary positions of large NSW public sector entities across industry policy, vocational education, environment, finance and first minister's portfolios.

Simon is currently employed as Chief Operating Officer of the ASX listed PEXA Group, which provides the digital services used by lawyers, conveyancers and banks to settle over 80% of Australian property transactions.

Ivor Frischknecht
BOARD MEMBER

Ivor is an experienced CEO and Non-Executive Director working at the intersection of energy and climate, innovation and investment.

He was the inaugural CEO of the Australian Renewable Energy Agency and oversaw its $2.1 billion portfolio for six years, during which it invested in more than 350 ground-breaking clean energy projects. He is also Non-Executive Director of CleanCo Queensland and advises the Victorian Government's $1.3B Solar Homes Program and Kilara Capital.

Catherine Cooper
LLB GDLP FAICD
BOARD MEMBER

Catherine is an experienced Non-Executive Director having served on a significant number of boards for more than 20 years.

Her career highlights include the establishment of a national joint venture Rural Bank, being named a Telstra 'Business Woman of the Year' finalist twice, inclusion in an international management program, and winning a position in the ASX Top 200 Chairman's Mentoring program run by the AICD.

Catherine's current and past board roles include Energy Consumers Australia, Beston Global Foods (ASX), Deputy Chair of Australian Eggs RDC, Wine Australia RDC, Animal Health Australia, Energy Advocacy Panel Member, Chair of SA EPA, Director of Grains Australia and Commissioner of the Australian Fisheries Management Authority.

Catherine is highly experienced in research development, strategy, evaluation and achieving commercial adaptation outcomes. A significant part of her board portfolio is with national RDC and CRC organisations. She also has well established strategic governance and risk management skills.

James Colbert
BOARD MEMBER

James has been working in global corporates and start-ups for 15+ years, where he has gained deep and extensive strategy, commercial and technology experience.

He has served as APAC Regional Director for global leader Schneider Electric and has been at the forefront of the energy transition with technology and large generator/retailers.

James is currently a partner with KPMG in management consulting where he advises and supports businesses across energy, mining and property on strategy and technology. He also sits on the Board Advisory Panel for Energy Consumers Australia and is the former Chair of the International MicroGrid Association.

Our
leadership team

Jon Jutsen
CHIEF EXECUTIVE OFFICER

Jon has been a leader in energy and carbon management for over 40 years.

Jon led the bid team for the CRC before becoming the inaugural CEO in March 2020. Prior to that, he co-founded and led the Australian Alliance for Energy Productivity for nearly 10 years. He also founded and led successful consulting company Energetics for more than 30 years. While there, he established an energy tech start-up with venture capital funding, which he took to the US and ran for four years. Jon has also been a Director on the Board of the Australian Renewable Energy Agency (ARENA), EEC and several other energy and sustainability organisations. He has also led development of several energy innovations, including the development of one of the first on-line energy and sustainability information systems and One2Five management diagnostics.

Jon is a Chemical Engineer with a Masters degree in Energy Technology. He was named one of the '100 Most Influential Engineers in Australia', is a Fellow of the Academy of Technological Science and Engineering, received a Millennium Medal and was named 2019 Energy Efficiency Champion.

Thushy Sathi
CHIEF OPERATING OFFICER

Thushy has more than 20 years' experience in senior management and leadership roles across IT, education and not-for-profit sectors.

Prior to joining RACE for 2030, Thushy was the CFO of the Food Agility Cooperative Research Centre. He was also Managing Director of Access Macquarie Limited (a subsidiary of Macquarie University), where he launched a number of successful digital platforms including Mindspot, Australia's first online anxiety clinic. Thushy has also held board positions with Risk Frontiers and Australian Proteome Analysis Facility. He has also held senior commercial roles at HP and National ICT Australia.

Thushy is a qualified CPA, a graduate of the Australian Institute of Company Directors and has a Master of Commerce from Macquarie University.

Dr Bill Lilley
CHIEF RESEARCH OFFICER

Bill is a proven multi-disciplinary leader with more than 20 years' experience in research and industry.

Bill delivered CSIRO's 'Intelligent Grid' research program, which showcased the value of distributed energy for Australia. He was a principal advisor on the Federal Government's 'Smart Grid Smart City' initiative which determined the cost benefits of a commercial scale rollout of smart grid technologies and consumer applications in Australia. Prior to joining RACE for 2030 in March 2023, Bill spent the past decade working for Saudi Aramco. While there, he led work on a national energy strategy and acted as head of power and water planning for the Ministry of Energy.

Bill has a PhD in Environmental Science and a Bachelor of Science (Honours) both from the University of Newcastle.

Vivian Mohan-Ram
GENERAL MANAGER, RESEARCH

Vivian is responsible for managing RACE for 2030's day-to-day research operations, legal affairs and the delivery of the CRC's milestones to the Commonwealth.

Prior to joining RACE for 2030 in 2020, Vivian was the Director of Consulting, Education and Training at a higher education subsidiary. During her tenure, she pursued funding opportunities, negotiated funding terms, managed the delivery of externally funded projects and held positions on various advisory committees.

Vivian holds a degree in Mechanical Engineering from the University of New South Wales.

Alison Brown
HUMAN RESOURCES MANAGER

Alison Brown is a dynamic and resourceful Human Resources Manager, with more than 15 years' experience managing staff and establishing efficient, effective and business-aligned HR programs. Alison is skilled in interviewing, recruiting, employee relations, performance management and strategic implementation of HR policies.

Prior to joining RACE for 2030, she gained extensive experience across various industries including FinTech, banking, law and professional services in the UK and Australia. She has a deep knowledge of HR practices in the world of Cooperative Research Centres, having worked with various CRCs in recent years.

Alison holds a Bachelor of Human Resource Management from the University of South Australia.

RACE for
2030
RELIABLE
AFFORDABLE
CLEAN
ENERGY

Australian Government

Department of Industry,
Science and Resources

AusIndustry
Cooperative Research
Centres Program