NEWCASTLE INSTITUTE FOR ENERGY AND RESOURCES

ANNUAL REPORT 2018 – 2019

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

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GET MORE OUT OF OUR ANNUAL REPORT

This annual report features QR codes. To access further information related to NIER's initiatives download a 'QR scanning' app to your mobile device.

Thankyou to everyone who has contributed to and cooperated in the development of this report.

WORLD-CLASS RESEARCH | INDUSTRY COLLABORATION | INNOVATIVE SOLUTIONS

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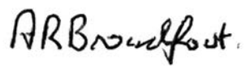
FOREWORD

At the University of Newcastle, we are renowned for our commitment to collaborative research, multidisciplinary innovation and the translation of new knowledge to improve social, economic and environmental outcomes. We are recognised as a world-class research intensive university with a strong and vibrant research culture and relevance to regions, both nationally and internationally.

At NIER, we take pride in our contributions to the University's research excellence. In delivering on the University's decadal strategic plan, NeW Futures 2016-2025, NIER continues to facilitate activities that enable our research community to drive impact through transformative partnerships that ultimately contribute to greater resilience for a better tomorrow. Building on established strengths, our research agenda has expanded under the Global Impact Cluster for Energy, Resources, Food and Water (GIC ERFW) to tackle important challenges beyond energy and resources, to food, agribusiness and water.

There are many achievements captured in this Annual Report that highlight a productive year at NIER. Through our affiliated initiatives including the GIC ERFW and its Pacific Node, the NSW Energy and Resources Knowledge Hub, and the University's first Doctoral Training Centre, the collective capacity of academics, partners and stakeholders is harnessed to achieve a shared vision. Our success is testament to the dedication of both academic and operational teams within NIER, the Faculties and the Research and Innovation Division to working collaboratively to make a difference.

It is with great pleasure we present to you the Annual Report for 2018-2019.



PROFESSOR ALAN BROADFOOT,
EXECUTIVE DIRECTOR

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GOVERNANCE & MANAGEMENT

Both internal and external stakeholders are engaged in the management and governance of NIER and its broader initiatives. Collaborative guidance is provided to the Institute and its research centres and groups through Advisory Boards, Management Committees, Leadership Committees and Steering Committees across a range of functions, including research strategy and direction, infrastructure and space management, and health and safety.

Valuable insight into industry engagement strategies, trends and priorities is provided by the Institute's overarching Advisory Board, a cooperative network of industry sector representatives and University Executive. Chaired by Dr Mirjana Prica, Managing Director of Food Innovation Australia Ltd (FIAL), the Advisory Board has been instrumental over the past year in initiating and shaping our Research Roadmaps aligned to sector priorities, guiding the development of our strategic objectives and operational plans, and providing advice and feedback on our direction and performance.

"The industry-led engagement model of NIER/GIC ERFW is a great platform for facilitating collaboration between researchers and industry to deliver multidisciplinary and impactful solutions on critical global issues."

- Dr Mirjana Prica, Chair
NIER/GIC ERFW Advisory Board

ADVISORY BOARD

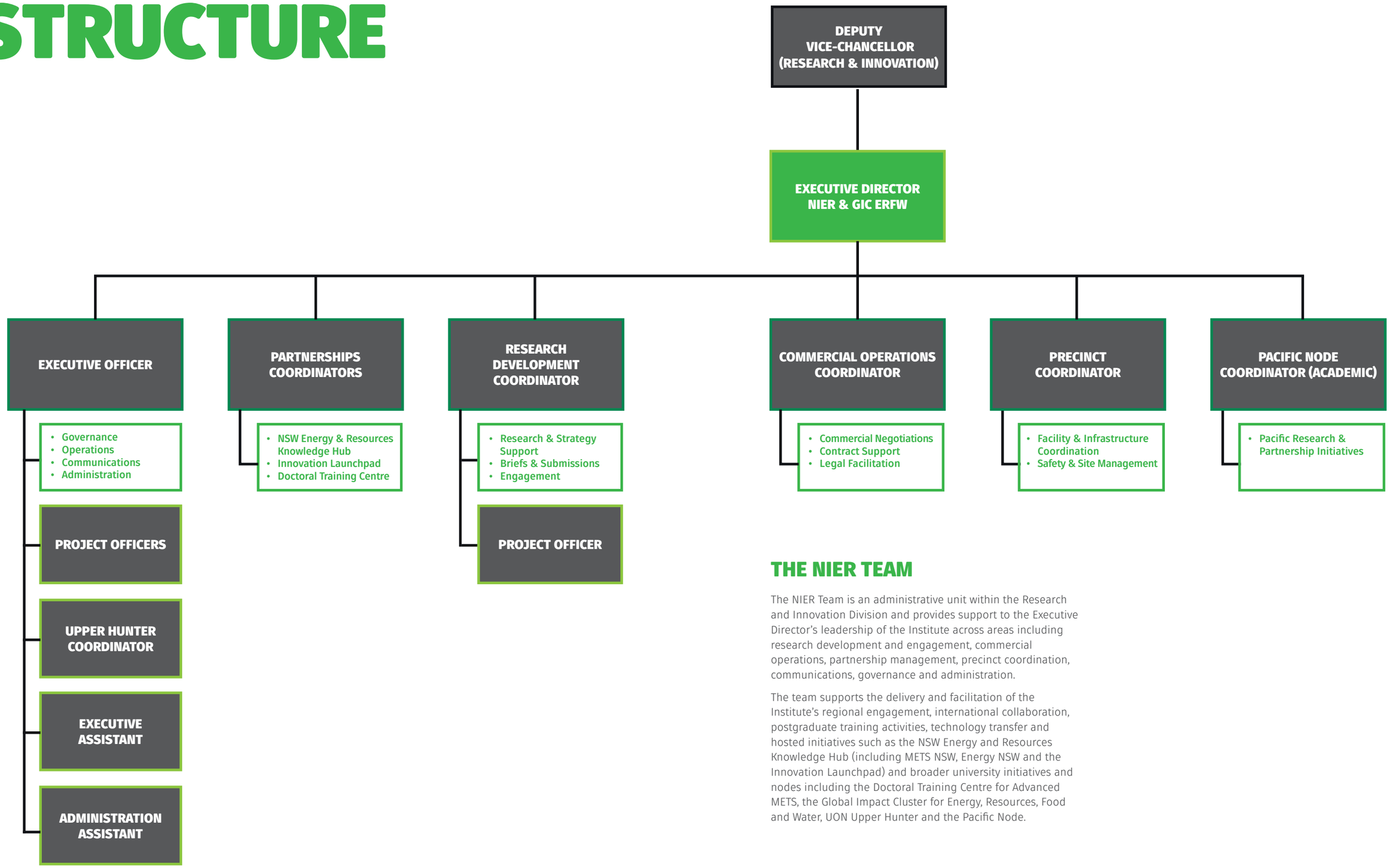
- Dr Mirjana Prica, Managing Director, Food Innovation Australia Ltd
- Mr John Richards, Chairman, Bloomfield Group
- Ms Louise Cordina, CEO, Cordina Group
- Mr Kim Hockings, Principal Technical Marketing & Coal Technical Marketing, BHP Billiton
- Mr Rod Naylor, National Water Lead, GHD
- Ms Clare Sykes, former General Manager International Markets, METS Ignited
- Mr Rob Cooper, Communications Manager, AGL Macquarie
- Mr Darren Cleary, Chief Investment Officer, Hunter Water
- Prof Deborah Hodgson, Acting Deputy Vice-Chancellor, Research & Innovation, UON
- Prof Brett Ninness, Pro Vice-Chancellor, Faculty of Engineering & Built Environment, UON
- Prof Lee Smith, Pro Vice-Chancellor, Faculty of Science, UON
- Prof Alan Broadfoot, Executive Director, NIER & GIC ERFW, UON

Appreciation is extended to former Advisory Board members for their contributions:

- Dr Rod Lukatelich, Board Member, CRC CARE
- Mr Ric Gros, former CEO, METS Ignited
- Ms Kate Coates, former General Manager, AGL Macquarie
- Dr Jim Bentley, former Managing Director, Hunter Water Corporation

Additionally, we would like to acknowledge the members of our committees who assist us to enhance the frameworks that support research, operations and safety within the Institute.

ORGANISATIONAL STRUCTURE



THE NIER TEAM

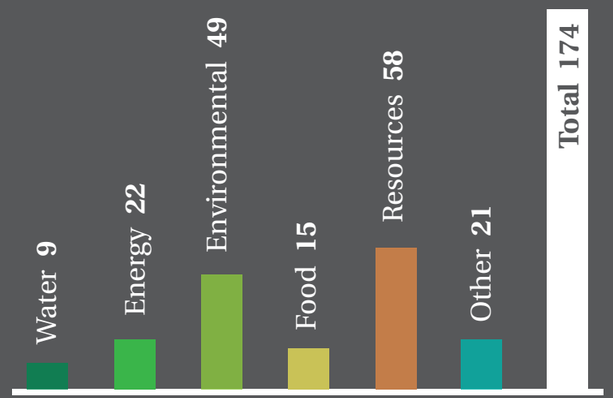
The NIER Team is an administrative unit within the Research and Innovation Division and provides support to the Executive Director's leadership of the Institute across areas including research development and engagement, commercial operations, partnership management, precinct coordination, communications, governance and administration.

The team supports the delivery and facilitation of the Institute's regional engagement, international collaboration, postgraduate training activities, technology transfer and hosted initiatives such as the NSW Energy and Resources Knowledge Hub (including METS NSW, Energy NSW and the Innovation Launchpad) and broader university initiatives and nodes including the Doctoral Training Centre for Advanced METS, the Global Impact Cluster for Energy, Resources, Food and Water, UON Upper Hunter and the Pacific Node.

NIER BY NUMBERS

JULY 2018 - JUNE 2019

Grants by Sector



19
Research Centres & Groups

124
Engaged UON Researchers

249
PhD Students Supported by NIER Centres

167
Active Industry Partners

17
International Partners

3.8 ha
Precinct Size

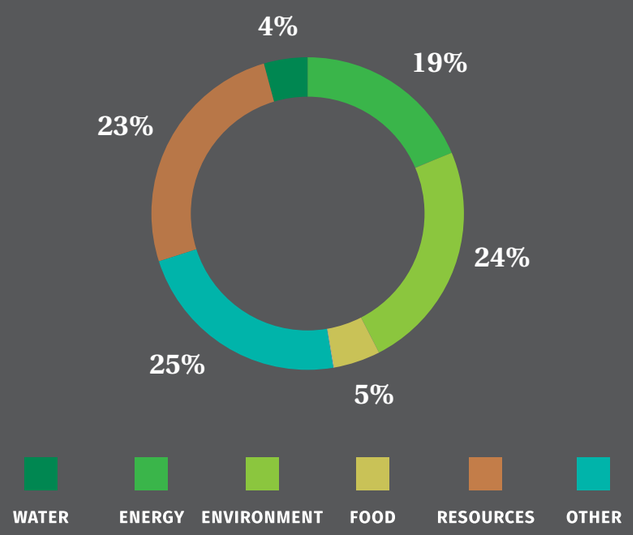
22%
Repeat Clients

360+
Precinct Occupants

2
Global & Regional Nodes

5
Industrial Workshops

Income by Sector



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HIGHLIGHTS

This section highlights a number of key initiatives demonstrating the strategic and operational objectives that have been met throughout the reporting period beyond business as usual.

Our achievements include engaging in broader research reach through our Global Impact Cluster, celebrating the inaugural cohort of the University's first Doctoral Training Centre, expanding the NSW Energy & Resources Knowledge Hub's platform to connect and drive innovation, enhancing regional transitions through Upper Hunter partnerships, and extending the precinct's infrastructure through the construction of custom-designed glasshouses.

These market-driven initiatives speak to the capacity of the Institute to engage, develop, foster and support research activities, partnerships and facilities that will have impact through innovation, knowledge mobilisation, technology development and a shared commitment with our partners.

GLOBAL IMPACT CLUSTER FOR ENERGY, RESOURCES, FOOD & WATER

The Global Impact Cluster for Energy, Resources, Food and Water (GIC ERFW) builds on NIER's strength in energy and resources to incorporate research capacity in water, food and agribusiness.

The GIC ERFW is an enabling platform, expanding the University's presence across targeted sectors, building greater opportunity for impact through industry engagement, international collaboration and research translation.

The broader collective reach of academics and partners of the GIC ERFW has evolved a number of exciting initiatives:

ADVANCING SOLUTIONS TO SECURE OUR ENERGY FUTURE

Australia's energy sector is being challenged by a paradigm shift in electricity generation. This disruption extends beyond generation to supply networks and the mechanisms used to retail electricity.

As industry pivots towards a greater reliance on non-network solutions, such as distributed renewable generation, energy storage and smart grid technologies, there is a clear and identifiable need to pursue research to advance technologies and workforce expertise to manage the efficient integration of new energy systems.

Recognising this need, we have committed to the establishment of a dedicated centre and research agenda for advanced energy integration. With a national focus, this initiative will be delivered through the NUW Alliance – a collaborative framework between the Universities of Wollongong, New South Wales and Newcastle to drive innovation, create solutions in areas of shared interest, and deliver practical benefits in NSW and beyond.

UNIVERSITY GUIDES RESEARCH FOR A RESILIENT FOOD AND AGRIBUSINESS SECTOR

Supporting a competitive food and agribusiness sector through best practice industry-academia engagement has been a major focus this year. In partnership with Regional Development Australia Central Coast NSW and Central Coast Industry Connect, the University is drawing on its critical mass in food, marine and plant science, nutrition, and health, to build the Central Coast's reputation as an internationally renowned centre of excellence in food innovation.

A Food and Agribusiness Research Roadmap has been developed as a guiding document to support competitiveness in the food and agribusiness sector by offering:

- A pathway for the delivery of research and education programs to meet industry needs and deliver greater competitiveness
- A framework from which researchers and business can align and coordinate their efforts to increase impact
- Programs to address future workforce needs and priorities to enhance career opportunities for graduates and postgraduates

ENHANCING REGIONAL CAPABILITY IN THE PACIFIC

Working with regional partners, the University is delivering co-operative solutions to environmental, social and economic challenges faced by Pacific island communities through a newly established Pacific Node. Hosted by the Secretariat of the Pacific Regional Environment Programme (SPREP) in Apia, Samoa, the Pacific Node provides a flexible framework to enhance research capacity supporting regional priorities in the following areas:

- Climate change resilience
- Ecosystem and biodiversity protection
- Waste management and pollution control
- Environmental governance
- Health, nutrition and food security

The research program consists of strategic activities including targeted PhD scholarships to Pacific Islanders, research collaborations aligned to the environmental protection priorities, and research training programs to assist in the transfer of new knowledge to practice. The development of the Pacific Node, and our attendance at important global symposiums such as the Clean Pacific Roundtable, strengthens the University's commitment to contributing solutions to environmental protection in the Pacific region.

DOWNLOAD THE FOOD AND AGRIBUSINESS ROADMAP

newcastle.edu.au/food-agribusiness-roadmap

DOCTORAL TRAINING CENTRE

FOR ADVANCED MINING EQUIPMENT, TECHNOLOGY & SERVICES

The Doctoral Training Centre (DTC) for Advanced Mining Equipment, Technology and Services (METS) draws on existing capacity and research excellence established through NIER to foster collaborative PhD projects that will support the METS sector into the future. This is the first DTC established by the University of Newcastle.

An industry-led training program targeting specific areas of research and emphasising transferable skill development, the METS DTC provides the framework for the creation, development and production of new ideas, technologies and products in the METS sector.

The METS DTC is providing students with an industry embedded learning experience while also offering specific training workshops to develop work-ready graduates who possess strong technical abilities, business and leadership skills. Embedded industry learning offers a unique combination of scientific rigour, creativity and innovation.

The METS DTC has successfully increased the number of collaborative research projects being undertaken within the METS industry, with a diverse range of projects being completed by the 2019 student cohort mentored by highly skilled researchers and industry partners. These projects address challenges across a broad spectrum of areas including soil remediation and improvement, economic analysis of material handling systems, and development of new technologies to predict impact wear.

"The DTC is the best way to bridge the gap between academic knowledge and real-life industry challenges. This PhD model brings together the best of both worlds: the University's research infrastructure and highly qualified academic staff with industry partners who know how best to apply the academic knowledge developed through a Higher Degree."

- METS DTC Student

The success of the METS DTC is strongly linked to a well-functioning administrative support structure. Stakeholder engagement is led by an Advisory Committee, chaired by industry representative, Dr Tobias Krull, Global Product Manager, METSO. The Committee is charged with providing oversight and strategic direction around the implementation of the operational framework to ensure that the METS DTC achieves its objectives and realises its benefits for both students and industry. Through the Committee, the academic program is guided by Academic Convenor, Associate Professor Ken Williams, and Deputy Academic Convenor, Dr Jessica Allen, while student representation is provided by Ms Priscilla Freire.

THE METS DTC IS SUPPORTED BY

- Metso
- METS Ignited
- AMIRA International
- Jord International
- Bengalla Mining Company
- BHP WAIO (Western Australia Iron Ore)
- Control Systems Technology
- Muswellbrook Shire Council
- TUNRA

"The DTC allows industry to utilise an extensive set of multidisciplinary skills within the University to steer and facilitate research relevant to the company."

- Industry Partner

Our gratitude is extended to Professor Lucy Johnston, former Dean, Graduate Research, for her expertise, guidance and collaboration through the establishment of the University's first DTC.

VIEW THE METS DTC BROCHURE

newcastle.edu.au/mets-dtc

NSW ENERGY & RESOURCES KNOWLEDGE HUB

The NSW Energy and Resources Knowledge Hub is supporting strong links between industry, research organisations and government to drive innovation and growth for Australia's energy and resources sector.

Funded by the NSW Department of Industry, and coordinated and resourced through NIER, the Knowledge Hub is facilitating connections and sharing knowledge to solve problems, support business and facilitate skill development and economic growth for NSW.

The Knowledge Hub has recently opened the Innovation Launchpad, providing a collaborative testing facility to foster and commercialise innovation. The Innovation Launchpad is supporting small and medium-sized enterprises (SMEs) through improved industry-academia linkages, and opportunity for accelerated technology transfer at the NIER Precinct. The benefit goes beyond supporting businesses; the Innovation Launchpad is working to bring new technologies and services into the market to increase enterprise and create jobs for NSW.

"The Knowledge Hub is an invaluable resource for SMEs who want to be part of our region's economic diversification story. It provides insight into future opportunities for the energy and resources sector and helps businesses keep up to date with changing and emerging technologies."

- Bob Hawes, CEO
Hunter Business Chamber

The Knowledge Hub provides a toolkit of resources and services to support the evolution of the energy and resources sector trends, industry news and events. Collaborative events are delivered throughout NSW and provide face-to-face opportunities for interaction, connection and innovation around priority industry subject areas.

For more information on the Knowledge Hub's innovative networks and platforms for engagement, strategic knowledge sharing and events, visit the website below.

VIEW THE HUB WEBSITE

ENERGY & RESOURCES KNOWLEDGE HUB

energyinnovation.net.au

HUNTER REGION ENGAGEMENT

UON Upper Hunter was established as a regional node in partnership with Muswellbrook Shire Council. It is acknowledgement of the University's commitment to supporting regional development.

The facility, administered by NIER, provides a supporting platform for the delivery of regionally relevant research and engagement activities, including entrepreneurial and business workshops and events delivered through the Integrated Innovation Network (I2N).

UON Upper Hunter gives students access to opportunities to develop applied research skills and gain experience through placements across a wide range of industries. Office and meeting facilities enable collaboration with local industry and business.

Throughout the year, our presence in the region has evolved some key projects delivering innovative research and opportunities for economic growth and diversification.

TAILINGS TO TOPSOIL

A multidisciplinary team including Muswellbrook Shire Council, the NSW Department of Primary Industries, Bengalla Mining Company and Jord International is working to address the challenges of tailings dam management. The project optimises existing processes and technologies and utilises tailings emplacement technology for agricultural use. It is a cost-effective solution to minimise resource use and reduce or eliminate tailings dam requirements and associated risks. Through the Doctoral Training Centre for Advanced METS a number of postgraduate students are working on this project on topics including innovative analysis of tailing characterisation for topsoil improvement and hydraulic and retention properties of engineered soils for mine rehabilitation.

ETHTEC BIOREFINERY

Work commenced this year on the first bio-renewables research facility of its kind in the southern hemisphere. The Ethtec Hunter Pilot Biorefinery will develop environmentally sustainable processes to produce biofuels and other renewable chemicals from agricultural and forestry waste. Made possible with funding through the NSW Government's Growing Local Economies Fund, the Biorefinery project is a partnership between Ethanol Technologies (Ethtec), Muswellbrook Shire Council and NIER. The project has the potential to revolutionise energy production, capturing more value from agricultural and forestry waste streams, and bringing new and innovative skills to the Hunter region.

HUNTERWISE

The HunterWiSE Outreach Program, initially implemented in the Muswellbrook region, provides female students the opportunity to work alongside STEM (Science, Technology, Engineering and Mathematics) professionals from the University to solve local community issues whilst developing skills in STEM. The goal of the program is to increase the number of females participating in STEM and entering into STEM-related industries. With regional partners including Hunter Water, Glencore, Muswellbrook Shire Council, GHD, RMS and Newcastle Coal Infrastructure Group, HunterWiSE is led by a network of dedicated female academics and is an initiative of the University's Athena SWAN SAGE pilot. The program's success has seen it roll out into other schools within the region.

FAMILY ACTION CENTRE

With a strong presence in the Hunter region, the Family Action Centre actively contributes to community health, wellbeing and education. An initiative of the Centre is the Muswellbrook Healthy & Well program, which is delivered in partnership with Bengalla Mining Company and the Centre for Rural and Remote Health. The program involves the implementation of a community-wide health promotion campaign around healthy eating and physical activity. The Centre has also proposed a Learning Hub aimed at incorporating undergraduate students from a variety of health professional disciplines in community placements in Muswellbrook.

VISIT UON UPPER HUNTER'S WEBSITE

newcastle.edu.au/upperhunter

GLASSHOUSE PROJECT

With a focus on productive system design, increased energy efficiency and flexibility for future expansion, the new purpose-built facility comprises five individual glasshouse spaces, each constructed to meet certification compliance for a Physical Containment Level 2 (PC2) Plant Facility.

Accompanying spaces within the facility include dedicated plant growth rooms for cabinet experiments, sterilisation and decontamination areas.

A significant infrastructure achievement has been the construction of an additional glasshouse facility at the NIER Precinct, alongside existing industrial infrastructure and technical laboratories.

Collectively, the glasshouse facilities enable researchers to safely pursue a wide range of plant-oriented manipulations including work with Genetically Modified Organisms (GMOs), through to approved arrangements with quarantine related materials. The glasshouses support research centres and groups focused on critical environmental and plant science research.

The Global Centre for Environmental Remediation (GCER) is developing better ways to clean up a range of contaminants including petroleum and mining waste and by-products; long-lived chemicals found in food packaging, fabric treatments and firefighting foams, and heavy metals from past and present industrial activities from soil, water and air.

The Centre for Plant Science is discovering physiological and molecular mechanisms that regulate nutrient transport and the development of specialised transport cells in plants, as well as investigating a molecular genetics approach for biofuel production, sugar metabolism, plant development and environmental stress adaptation.

The glasshouses are critical to supporting the extended research agenda of the Global Impact Cluster for Energy, Resources, Food and Water in food, agribusiness and environmental services sectors.

VIEW THE UNIVERSITY'S LATEST INFRASTRUCTURE PROGRAMS

newcastle.edu.au/projects

CASE STUDY: SOIL REMEDIATION IN ACTION

The toxic element arsenic can be a naturally occurring contaminant of soil and water in areas where significant volumes of rice are cultivated and exported for consumption across the world. Over 490 million metric tons of rice was consumed globally in 2018/19[1]. Intake of arsenic from rice is an important route of human exposure, especially for people consuming large amounts of contaminated rice in their diet. As such, mitigation measures to reduce the accumulation of arsenic in rice are urgently needed.

Research being facilitated at NIER by the Global Centre for Environmental Remediation, has investigated the agronomic approach to reducing uptake of arsenic by rice, via different water management practices.

This comprised controlled experiments whereby growing rice was subject to either:

- **Practice One: cycles of flooding with (arsenic) spiked water, soil allowed to dry, then flooding with water again.**
- **Practice Two: rice being subject to continually flooded conditions with spiked water throughout entire growth period.**

Lower concentrations of arsenic uptake were observed in cultivated rice grains using management Practice One, than those observed using Practice Two. Results demonstrated a 17% to 35% reduction in arsenic levels using irrigation Practice One with suitable rice species. Furthermore, the Practice One strategy produced a 7% to 38% increase in grain yields.

[1] https://www.statista.com/statistics/255977/total-global-rice-consumption/

INDUSTRY ENGAGEMENT

NIER's industry-engaged model creates the platform to develop collaborative research partnerships and strategic initiatives that respond to sector needs.

Through our research we strive to provide the necessary solutions to help our partners enhance efficiency, productivity and sector competitiveness, with the ultimate outcome being research translation and impact. Our commitment to industry-engaged research is evidenced in these case studies delivered over the past twelve months.

GRID AND MICRO-GRID ENERGY STORAGE PROJECT

A team from the Priority Research Centre for Frontier Energy Technologies and Utilisation has been conducting a research program in collaboration with Jord International Pty Ltd to develop a novel concept for the storage of energy from renewable energy and fossil fuel sources for both grid scale and micro-grid applications. The process, referred to as the pressurised regenerative calcium cycle, will provide the energy sector with a unique solution to the challenge of utility-scale energy storage by establishing a technology platform that shifts energy from the time it is generated to the time it is needed.

The Centre's research team have been able to retrofit and utilise an existing fluid bed reactor at the NIER precinct to conduct proof-of-concept testing as part of Phase 1 of the project. With enthusiasm and discipline that saw this research group receive the 2018 NIER Research Award for Best Practice Industry Engagement, the team have been quickly and meticulously able to finalise Phase 2 of the project – a proposal for the preferred concept design for a demonstration plant.

The next two years will see the team move into Phase 3 of this project, which will include the detailed design, construction and operation of the demonstration plant.

AUSTRALIAN COAL INDUSTRY SEABORNE CARGO PROGRAM

Researchers from the Centre for Bulk Solids and Particulate Technologies, and the Centre for Ironmaking Materials Research are working closely with the Australian Coal Industry to ensure a safe, practical and reliable assessment of the self-heating potential of seaborne coal cargoes.

While there is a long history of research into the self-heating potential of coal, this collaborative project is the first of its kind to receive funding from ACARP (the Australian coal industry's research program) to investigate the self-heating potential of coal during maritime transport.

Research by both centres has included experimentation at NIER's laboratory facilities, field work to monitor a range of coals in situ at mine stockpiles, and on-board vessel monitoring of coal cargoes during delivery to the end user.

With completion anticipated for the end of 2020, this project will culminate in the identification and standardisation of an optimum testing method for industry practitioners and testing laboratories to ensure the continued safe transport of seaborne coal cargoes.

BHP WORK INTEGRATED LEARNING PROGRAM

A work integrated learning program has been initiated by the University's Australian Research Council (ARC) Research Hub for Advanced Technologies for Australian Iron Ore and the Centre for Bulk Solids and Particulate Technologies, in partnership with BHP.

In total, six researchers will participate in the one to six-month placements in the BHP Integrated Planning and Remote Operations team in Perth, and at operational sites in the Pilbarra Iron Ore mining region in Western Australia.

Designed to support industrial training and enhance research collaboration in identified industrial transformation priority areas, these unique integrated placements will provide exposure to high-level business operations and the opportunity for participants to expand their knowledge of materials handling, as well as assist in the translation of iron ore research to enhance the company's productivity and efficiencies.

This successful industry-engaged program looks set to continue well beyond 2019.

MATES IN MINING PROGRAM

With mental health problems costing the Australian Coal Industry over $147 million each year, workplace programs specifically targeting mental health in mining are proving to be a sound investment, both socially and financially for this industry.

One such program that the Centre for Resources Health and Safety has been collaborating on is the MATES in Mining (MIM) Suicide Prevention Program. Originally adapted from the Mates in Construction model, MIM provides a program of training and support that is unique to mining employees and is designed around the culture and issues associated with the industry, such as long hours, shift work, challenges with job security, and the toll these can take on relationships. The MIM program uses peer-based training as a tool to raise awareness around suicide and the contributing risk factors. Support is provided through clear pathways of connection to appropriate resources within the industry or within the local area.

The Centre's research team conducted an extensive period of stakeholder engagement and piloting of the MIM Suicide Prevention Program across mine sites nationally to ensure cultural appropriateness to the industry. Following on from the success of the initial study, MIM has been rolled out more broadly, and the Centre continues to play an important role in analysing the longer-term benefits associated with this workplace mental health program.

VIEW THE UNIVERSITY'S INDUSTRY ENGAGEMENT & IMPACT CASE STUDIES

newcastle.edu.au/research-impact

COMMERCIAL APPLICATIONS

Successful technology transfer and commercialisation of research outcomes has been achieved this year delivering significant benefits to our collaborative industry partners, the economy and the environment.

Through commercial partnerships, NIER researchers are advancing industry's competitive edge in the global market through access to innovative technology, specialist facilities and the collective capacity of technical experts.

DIRECT CARBON FUEL CELL

A Direct Carbon Fuel Cell (DCFC) unit is currently being built onsite at the NIER precinct as a team of researchers from the Priority Research Centre for Frontier Energy Technologies and Utilisation enter the commissioning phase of their project.

The team, led by Professor Scott Donne alongside partner investigator and 2018 recipient of the UON Beryl Nashar Young Researcher Award, Dr Jessica Allen, are set to make a real impact on both the energy sector and the environment. The technology offers an alternate, cleaner method of generating electrical energy that is twice as efficient as coal-fired power stations. The DCFC eliminates the need to combust fossil fuel sources like coal, and instead harnesses energy from electrochemical reactions, converting chemical energy directly to electrical energy.

Once built, the team will commence extensive testing of the unit at NIER as they prepare their DCFC technology for commercial uptake.

REFLUX FLOTATION CELL

Preparations for the full-scale investigation of the Reflux Flotation Cell (RFC) at a Hunter Valley mine site are well advanced.

Invented by Laureate Professor Kevin Galvin, the RFC is set to boost the efficiency of the minerals processing industry by reducing the amount of resources being lost in current extraction processes. The design and implementation team also includes Dr Jamie Dickinson and Dr Simon Iveson.

The project is an example of university, government, and industry collaboration, with significant contributions provided by the equipment manufacturer FLSmidth, other project management and design support by local SME Advitech, and further input from Nalco. The project was made possible with $1M funding from ACARP and the Department of Industry, Innovation and Science's Global Innovation and Linkage Scheme.

Designed to recover valuable particles from mining waste streams that would otherwise be sent to tailing dams, the RFC can process materials at five to ten times the rate of current technologies, providing the industry with an economically viable solution.

The anticipated completion date of the RFC trial plant in the Hunter Valley is 2020.

MINERAL CARBONATION

The success of an initial research pilot plant has allowed the focus of the Mineral Carbonation project to extend into flue gas carbonation with a $2.4M Cooperative Research Centre - Projects (CRC-P) Grant from the Commonwealth Government. This follows ten years of research and development undertaken by joint venture partners, the University of Newcastle, GreenMag Group Pty Ltd, and Orica. Mineral carbonation research at the University is led by Professor Eric Kennedy and Professor Michael Stockenhuber.

Under the new project, the research group are investigating the commercial potential of using mineral carbonation to capture carbon dioxide (CO_2) directly from raw flue gas (an exhaust gas typical of Australian coal-fired power generation) and transforming this CO_2 into stable solid carbonates for use in the construction industry, in materials such as concrete and plasterboards.

After building the pilot plant and performing fundamental research to prove the viability of this project, the research group are now aiming to design a demonstration scale capture and carbonation plant as they continue to develop global partnerships with industry, and progress towards commercialisation activities within the next five years.

ORGANIC PRINTED SOLAR CELLS

In a first for Australia, the Priority Research Centre for Organic Electronics has partnered with CHEP, a Brambles company, in the commercial uptake of organic printed solar cells. An innovation led by Professor Paul Dastoor, organic printed solar cells are electronic inks printed onto sub-millimetre thin plastic sheets using conventional printers.

The local commercial-scale installation of this technology on CHEP's pallet repair facility at Beresfield is a historic step in the evolution of this renewable energy technology, as the Centre transition from their initial lab-scale demonstration phase at NIER, towards their aim of making organic solar cells widely available in the foreseeable future.

This collaboration between the Centre and CHEP signals the emergence of a new renewable energy market in organic printed solar and according to Professor Dastoor is "another example of private enterprise and community leading the charge in adoption of renewables".

A YEAR AT NIER

Highlighting a selection of the successes of researchers, students and staff affiliated with NIER.

JULY 2018

- Laureate Professor Graeme Jameson formally admitted as a Fellow into the Royal Society at the Admissions Day ceremony in London.
- Professor Ajayan Vinu elected as an academician by the World Academy of Ceramics.
- Priority Research Centre for Frontier Energy Technologies and Utilisation's Ventilation Air Methane (VAM) Abatement Large Scale Safety Capture Duct Team awarded an Australian Engineering Excellence Award for the Newcastle region.
- Professor Ajayan Vinu elected as a Fellow of the World Academy of Art and Science.
- Mineral Carbonation International (MCi) awarded Resource Innovator of the year at the Global Raw Material Summit in Berlin.

AUGUST 2018

- Professor Behdad Moghtaderi recipient of an Innovation Award at the Hunter Water Innovation Gala for the 'water from thin air' project - capable of converting the air's humidity to drinkable water.
- Professor Scott Donne awarded a Fulbright Senior Scholarship by the Australia-American Fulbright Commission.
- Professor Brian Kelly recipient of the Bernard Fox Memorial Award by the International Psycho-Oncology Society.
- Dr Siddulu Naidu Talapaneni awarded the title of SciFinder Future Leader by the Chemical Abstracts Services Division of the American Chemical Society.
- NIER team participation in the Clean Pacific Roundtable to discuss pathways to a pollution free Pacific.
- Centre for Resources Health and Safety Memorandum of Understanding signed with SafeWork NSW.

SEPTEMBER 2018

- Professor Behdad Moghtaderi recognised by the Legislative Assembly of NSW Parliament for his contribution to scientific research and technological innovations.
- VAM Abatement Large Scale Safety Capture Duct Team named as a finalist in the Australian Engineering Excellence Awards.
- Dr Jessica Allen recipient of the Beryl Nashar Young Researcher Award at the University of Newcastle's Alumni Awards.

OCTOBER 2018

- Official ministerial opening of the Innovation Launchpad as an initiative of the NSW Energy and Resources Knowledge Hub.
- Professor Behdad Moghtaderi awarded the ExxonMobil Award at the Australian and New Zealand Federation of Chemical Engineers Awards of Excellence.
- VAM Abatement Large Scale Safety Capture Duct Team named as a finalist for the Best Solution of a WHS Risk at the National Safety Council of Australia Foundation's National Safety Awards of Excellence.
- Mohammed Jabbar Ajrash recognised by the NSW Joint Chemical Engineering Committee as a finalist in the Postgraduate Symposium for his research in emerging energy technologies.
- Sam Caldwell recipient of the University's Mechanical & Mechatronics Engineering Postgraduate Research Poster Prize.
- The Global Innovative Centre for Advanced Nanomaterials hosted the 3rd International Conference on Emerging Advanced Nanomaterials (ICEAN).
- Sung Ho Kim awarded the Poster Prize - Materials Horizons at ICEAN.
- Wangsoo Cha awarded the Poster Prize - Journal of Materials Chemistry A at ICEAN.

NOVEMBER 2018

- Priority Research Centre for Frontier Energy Technologies and Utilisation's Hydro Harvest Operation Team recognised as Highly Commended at the Institution of Chemical Engineers Global Awards (Water).
- Mahdi Abolghasemi Highly Regarded in the University of Newcastle's Faculty of Science Best Higher Degree by Research Industry/Research Engagement Award.
- Dr Siddulu Naidu awarded the Discovery Early Career Researcher Award by the Australian Research Council.
- Appointment of the Pacific Node Coordinator to expand research partnerships and initiatives in the Pacific region.
- NIER team production of the Food and Agribusiness Research Roadmap.

DECEMBER 2018

- Associate Professor Anna Giacomini awarded Research Supervisor of the Year at the University of Newcastle's Vice-Chancellor's Awards for Excellence.
- Dr Jessica Allen awarded the Faculty of Engineering and Built Environment Early Career Research and Innovation Excellence Award at the University's Vice-Chancellor's Awards for Excellence.
- Parichehr Paam awarded First Runner Up for Best Student Paper at the 26th National Conference of the Australian Society of Operations Research.
- Professor Ajayan Vinu awarded the Global Initiative Academic Networks Award by the Ministry of Human Resource Development, India.
- Professor Nanthi Bolan honoured on the Highly Cited Researchers List from Clarivate Analytics.

JANUARY 2019

- Professor Ajayan Vinu appointed Adjunct Professor at the Institute of Chemical Technology in Mumbai, India.
- Professor Ajayan Vinu appointed Adjunct Distinguished Professor at the Indian Institute of Technology Bombay, Mumbai, India.
- Professor Paul Dastoor commenced a Leverhulme Trust Visiting Professorship, residing at the University of Cambridge's Cavendish Laboratory.
- Official ministerial launch of stage one of the Hunter Pilot Biorefinery in Muswellbrook.
- Official ministerial launch of the NSW Food and Beverage Manufacturing Industry Development Strategy on the Central Coast as part of the GIC ERFW's involvement in the Central Coast Food Innovation Region Initiative.

FEBRUARY 2019

- Dr Saianand Gopalan recognised as a Member of the Royal Society of Chemistry, United Kingdom.
- Professor Ajayan Vinu recipient of the Council of the Chemical Research Society of India Medal.
- Professor Ajayan Vinu recipient of the Scheme for Promotion of Academic and Research Collaboration Award by the Ministry of Human Resource Development, India

MARCH 2019

- Official welcome of three PhD students from the Pacific region as recipients of scholarships with the Secretariat of the Pacific Regional Environment Programme (SPREP).
- NSW Energy and Resources Knowledge Hub partnered with Australian Energy Storage Alliance to deliver industry forums on commercial battery storage technologies in Wollongong and Newcastle.

APRIL 2019

- Launch of the NSW Energy and Resources Knowledge Hub website.

MAY 2019

- Associate Professor Anna Giacomini awarded the John Booker Medal by the Australian Academy of Science.
- Appointment of the NIER Precinct Coordinator for multidisciplinary precinct management at NIER.
- Commencement of the first cohort of students for the Doctoral Training Centre for Advanced METS.
- Official launch of the partnership between Major Projects Foundation, SPREP and the University's GIC ERFW on environmental remediation projects.

JUNE 2019

- Dr Jessica Allen awarded the Australian Academy of Science's Rod Rickards Fellowship.
- NSW Energy and Resources Knowledge Hub partnered with Regional Development Australia Orana to deliver a Mining, Energy and Transport Industry Forum in Dubbo.

NIER AWARDS

THE NIER HEALTH, SAFETY AND ENVIRONMENT (HSE) AWARDS

As a rapidly expanding industrial research facility, the implementation of a comprehensive HSE Management System (HSEMS) has been a major focus. The HSEMS aligns to the University's health and safety framework, policies and plans, and fosters a culture dedicated to improving the health, safety and welfare of those undertaking work at NIER.

The NIER Health, Safety and Environment (HSE) Awards recognises and reward individuals and research groups who go above and beyond the NIER HSE Management System standards in their everyday workplace practices. The Awards are an annual acknowledgement of best practice and are aligned with the University and NIER's overarching commitment to maintaining a safe workplace.

INDIVIDUAL AWARD FOR EXCELLENCE IN HSE LEADERSHIP AND CULTURE

Jane Hamson
Chemical Engineering

Commended for positive commitment to, and demonstrated leadership in, addressing multi-faceted University HSE demands.

INDIVIDUAL AWARD FOR EXCELLENCE IN HSE PRACTICE

Dr Peter Robinson
Centre for Bulk Solids and Particulate Technologies

Commended for safety orientated leadership skills.

Dr Priscilla Tremain
Priotiy Research Centre for Frontier Energy Technologies & Utilisation

Commended for always leading by example in all aspects of HSE, and for being a mentor for students and staff alike.

GROUP AWARD FOR EXCELLENCE IN TEAM HSE SYSTEMS AND PRACTICE

Mineral Carbonation Research Group

Commended for commitment to, and leadership in, safety; for willingness to seek HSE advice; and, for responsiveness to actions raised during inspections and audits.

THE NIER RESEARCH AWARDS

The NIER Research Awards recognise and reward researchers and postgraduate students for excellence in industry collaboration. Specifically, the Awards highlight examples of solutions-based approaches to working with industry and building collaborative research partnerships, aligned to the mandate of NIER. The Awards also acknowledge research excellence in the areas of energy and resources sustainability, productivity, efficiency and transformation, as well as commitment to the promotion of NIER and its model of engagement.

AWARD FOR HIGHER DEGREE RESEARCH (HDR) STUDENT EXCELLENCE

Lauren North
Centre for Ironmaking Materials Research

"Lauren is bringing unique insights to enhance understanding of the development of coke properties from parent coals. She has brought strong knowledge of data mining techniques, experience in the steel industry, critical thinking skills and willingness to challenge conventional approaches. Lauren is always forthcoming in providing input and support to industry, including delivering briefings to technical people, industry presentations and customer engagements. One very pleasing aspect of working with Lauren has been her dedication to challenging industry people to consider new techniques in place of simply repeating traditional approaches".

Mr Kim Hockings
NIER Advisory Board member

AWARD FOR EARLY CAREER RESEARCHER (ECR) EXCELLENCE

Associate Professor Carole James
Centre for Resources Health and Safety

"A researcher with boundless curiosity, Carole enjoys collaborating with people who share her passions, which include mental health in the workplace and capacity building within community. Carole performs multiple roles across the University and is an outstanding professional, mentor, teacher and colleague. Her work with the Blueprint initiatives has increased the mining industry's knowledge and understanding of mental health and its capacity to address related issues and illnesses and ultimately improve the wellbeing of Australian communities. Carole has long exemplified a level of commitment and influential leadership that can serve as a model for others".

Associate Professor Shane Dempsey
Head of School, Health Sciences
University of Newcastle

AWARD FOR BEST PRACTICE INDUSTRY ENGAGEMENT

The PRC2 Team
Priority Research Centre for Frontier Energy Technologies and Utilisation

"Jord values our collaboration with this project team, where together we have been able to conceive novel approaches to solving practical problems that provide real commercial opportunity. As team leader, Professor Moghtaderi's record of innovation speaks for itself, however the enthusiasm and discipline of the project team has been outstanding. Conducting rigorous research while meeting the occasionally demanding expectations of an industry partner is never easy, but the project team achieved just that, with each phase completed thoroughly and reported meticulously".

Dr John Warner
Head of Technology
Jord International

NIER CENTRES & RESEARCH GROUPS

- ARC Research Hub for Advanced Technologies for Australian Iron Ore
- Priority Research Centre for Advanced Particle Processing & Transport
- Priority Research Centre for Frontier Energy Technologies & Utilisation
- Priority Research Centre for Organic Electronics
- Global Centre for Environmental Remediation
- Global Innovative Centre for Advanced Nanomaterials
- International Centre for Balanced Land Use
- International Collaborative Centre for Carbon Futures
- Centre for Bulk Solids and Particulate Technologies
- Centre for Multiphase Processes
- Centre for Frontier Geoscience
- Centre for Ironmaking Materials Research
- Centre for Optimal Planning & Transport
- Centre for Resources Health & Safety
- Centre for Social Research & Regional Futures
- Centre for Water, Climate & Land
- Centre for Water
- Applied Electrochemistry Group
- Food Science Group

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