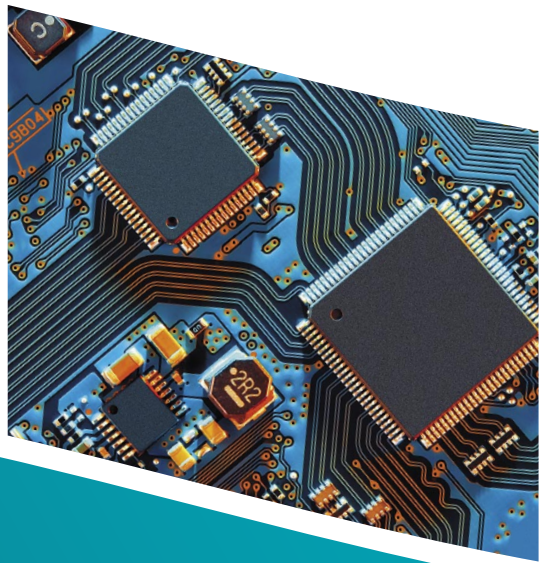
Federation University

Research Centres

Centre for New Energy Transition Research (CfNETR)



Preparing for the new energy of tomorrow, today

Established in 2022, the Centre for New Energy Transition Research (CfNETR) responds to the pressing need for research, training and skills development in new energy.

This need is particularly urgent in regional Australia, where legacy modes of power generation are being joined by multimodal and widely distributed forms of new energy generation, transmission and storage.

CfNETR aims to develop innovative, reliable and quality solutions to provide both utilities and policymakers with technology options to deliver economic and sustainable energy to the community.

The Centre works closely with the community, industry and government organisations to advance Net Zero Carbon initiatives for 2050 and achieve a 100% renewable-powered economy. It focuses on the energy and climate-related issues associated with regional and remote communities in light of the Australian Government's commitment to a stronger and sustainable economy for regional Australia.

The principle objectives of the Centre are to:

- align with the efforts of key new energy players to help overcome issues related to new energy production, storage, distribution, connection standards, policies and management
- increase opportunities for regional students to undertake research alongside other universities and local industries focused on new energy
- prepare graduates that are relevant to employers in the new energy sector via meaningful industry placement
- ensure postgraduate students are working with industry to solve critical problems in the lifecycle of new energy
- develop demonstration and pilot projects in partnership with industry that help to develop solutions that have the potential to be commercialised and/or upscaled

CfNETR'S RESEARCH STREAMS

CfNETR's objectives are aligned with its four research streams:

MICROGRIDS AND RENEWABLES

This stream focuses on enabling technologies for smart control of microgrids, and innovative solutions for renewable energy integration.

FUTURE GRID AND COMMUNITY ENERGY

This stream focuses on future energy needs such as smart grid management and security, and the resilience of the power network.

FUTURE FUEL AND HYDROGEN ECONOMY

This stream focuses on addressing future fuel needs such as low-emission fuel production and storage and capture technologies.

NET ZERO INITIATIVES

This stream focuses on Net Zero initiatives such as optimising water and energy use and minimising human impacts.

AUSTRALIAN GOVERNMENT FUNDING FOR CfNETR

In 2021, the Ministers for Education and Regional Education (Tudge/McKenzie), announced $2.43 million in funding to establish the Centre for New Energy Transition Research at Federation University. The Centre is supported by Swinburne University, AusNet/ Mondo, API, EQUIS, C4NET and other industry partners.

Research with **real-world impact**

Our focus is on applied research that makes a difference in the communities we serve. The following case studies present just some examples of how this Centre's research is having a positive impact in the world.

Case study:
Research project to explore potential for water sector in energy market

A new research project will help the water sector take advantage of opportunities in the Australian energy market as it undergoes rapid change.

The Centre for New Energy Technologies (C4NET), with support from Gippsland Water and Grampians Wimmera Mallee Water (GWMWater), is funding the project, titled INdustrial and commercial demand FLEXing to Increase Overall beNefit (INFLEXION), and involves researchers from Federation University and RMIT University.

Researchers will work with the Victorian water corporations to collate and map data to enhance the integration of water and electricity networks; forecast and optimise energy consumption at water and wastewater treatment plants; and identify opportunities to provide ancillary services to the energy market.

Federation University researcher, Dr Rakibuzzaman Shah, said the project would provide energy savings and a clearer pathway to engaging energy businesses for the water corporations involved. It would also lay the groundwork for others in the water sector to learn from the study and leverage their own energy management and renewables projects to provide reliable services and better value to their customers.

The project will also help water corporations to reduce their carbon emissions, as part of their commitment to the Victorian Government's target of net zero emissions by 2050. The research project is expected to take about 18 months and will be delivered in four distinct phases.

GWMWater and Gippsland Water will each provide energy use, water demand, flow rate, reservoir level, infiltration and evaporation data in its various forms and using different software environments. Researchers will map the characteristics to better understand the most appropriate artificial intelligence techniques to use to build an intelligent water network.

Case study:
Overcoming hydrogen's burning issue

A hydrogen project in the Latrobe Valley that is tapping into the abundant reserves of brown coal long used to produce electricity could be a game-changer for energy generation in Australia and internationally.

Federation University Australia researchers were awarded $1.5 million in funding to support the project, partnering with Australian Carbon Innovation to evaluate the performance of a hydrogen production plant that is now successfully producing hydrogen gas. The research is evaluating the gasification of Victorian brown coal for hydrogen production as an alternative to combustion in a traditional boiler to produce energy.

A key component of any future hydrogen production from brown coal gasification is the efficient capture and storage of carbon dioxide (CO2 by-product) that will ensure the hydrogen is low in greenhouse gas emissions and will complement intermittent renewable hydrogen.

Associate Professor Vince Verheyen said reliance on renewables to generate hydrogen would mean the transition from a carbon-based energy economy to one that is hydrogen-based would be a long way off. However, if the plant gets to full commercial scale, hundreds of high-value jobs will be created. The hydrogen production and CO2 capture/storage facilities are large chemical plants using cutting-edge technology and will employ many skilled people.

The gasification pilot plant, located at AGL's Loy Yang facility, is the first of its size in the world, built to produce and transport clean hydrogen from the Latrobe Valley to Japan via a hydrogen energy supply chain. The project, worth about $500 million, is being delivered by a consortium of Japanese companies – including Kawasaki Heavy Industries (KHI), J-POWER, Iwatani Corporation, Marubeni Corporation and Shell – with the support of the Victorian, Commonwealth and Japanese governments and AGL.

Centre Leadership

CfNETR has a centre director and advisor as well as leadership teams for each of its four research streams.

Professor Nima Amjady

DIRECTOR | CENTRE FOR NEW ENERGY TRANSITION RESEARCH (CfNETR)

In July 2022, Professor Nima Amjady joined Federation University, where he is currently working as Professor, Renewable Energy Technologies, and Director of Centre for New Energy Transition Research.

Professor Amjady's research interests include power system operation and planning, microgrid operation and planning, forecast processes of power systems and microgrids, renewable energies, storage systems, and applying artificial intelligence techniques to power systems.

Since joining Federation University, Professor Amjady has successfully applied for several grants and has currently secured approximately $2.8 million in funding. Professor Amjady has published 213 articles in peer-reviewed ISI-cited journals and has 53 conference presentations and chairmanships. His publications have attracted more than 14,000 citations (Google Scholar), with an H-index of 65.

Professor Amjady has 16 patents registered in Iran's patent office and one US patent. He has been selected as among the top one per cent of scientists in the world by Essential Science Indicators eight times between 2015-2022. He is also listed in Stanford University's Top 2% Scientists in the World. Professor Amjady is an Institute of Electrical and Electronics Engineers (IEEE) Fellow, Power and Energy Society liaison editor for IEEE Press, and Editor of IEEE Transactions on Power Systems, IEEE Transactions on Sustainable Energy, and IEEE Power Engineering Letters.

Professor Nima Amjady received his Bachelor of Science, Master of Science, and PhD degrees with honours in electrical engineering from Sharif University of Technology, which is the first-ranked university of Iran, in 1992, 1994, and 1997, respectively. After PhD graduation, he worked as Assistant Professor (from 1997 to 2002), Associate Professor (from 2002 to 2007) and Professor (from 2007 to 2022) in Semnan University of Iran.

Professor Syed Islam

CENTRE ADVISOR | CENTRE FOR NEW ENERGY TRANSITION RESEARCH (CfNETR)

Professor Syed Mofizul Islam is an internationally renowned researcher in the field of renewable energy technologies and is listed in Stanford University's Top 2% Scientists in the World.

Professor Islam has published over 350 peer-reviewed papers in his areas of expertise, including renewable energy, condition monitoring of transformers, wind energy conversion systems, grid integration of renewable energy sources and smart power systems. He is a chartered engineer in the United Kingdom and a chartered professional engineer in Australia.

Professor Islam successfully applied for $2.43 million from the Department of Education Skills and Employment to establish CfNETR and has secured over $18 million in funding over his career. He is current Chair of the Australasian Universities Committee for Power Engineering (2020-2023) and has served on a number of high-profile governing and academic boards and committees. He is an Institute of Electrical and Electronics (IEEE) Power & Energy Society Distinguished Lecturer. He was a founding member of the steering committee of the Australian Power Institute and the WA Electric Energy Society of Australia board.

Professor Islam has been invited as a keynote speaker and visiting professor internationally. He was a member of the research team developing a pathway to roadmapping Smart Grid in the Sultanate of Oman and has extensive experience in international collaboration in both education and research with institutes and researchers in China and other countries.

Professor Islam was a founding Editor of the IEEE Transactions on Sustainable Energy and an Associate Editor of the Institution of Engineering & Technology Renewable Power Generation journals.

Research Stream Leaders

MICROGRIDS AND RENEWABLES	FUTURE GRID AND COMMUNITY ENERGY	FUTURE FUEL AND HYDROGEN ECONOMY	NET ZERO INITIATIVES
Associate Professor Jiefeng 'Jerry' Hu	Dr Rakibuzzaman Shah	Associate Professor Surbhi Sharma	Dr Savin Chand

Federation University

Find out more

For research queries and to find out more about CfNETR's research, visit the Centre website: **federation.edu.au/cfnetr**

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