



Our vision and mission

Electricity comprises around 20% of current global energy consumption and is set to rise substantially in the coming years. The International Energy Agency (IEA) anticipates electricity will account for 27% of energy use by 2030 and will likely exceed 50% by 2050. This is largely due to increasing 'electrification', in which fossil fuel energy sources are replaced by renewable electricity technologies.

Electrification will therefore play a critical role in the complete decarbonisation of most economic sectors, particularly the space heating and transportation sectors. Our vision is to develop an economically efficient and socially just pathway for wide-spread electrification that relies on the intelligent use of distributed energy resources in homes, commercial buildings and vehicles.

Our approach

The Net Zero Initiative brings together experts across the sciences, engineering, policy, business and law to develop novel electrification technologies as well as relevant policy and social licence frameworks. This approach will facilitate the affordable, resource-wise integration of electrification into existing power grids and markets.

Our research

A key Enabling Research Theme of the Net Zero Initiative (NZI) is 'Emissions Avoidance through Zero Emissions Energy', which is dedicated to facilitating the rise of renewable energy technologies. Under the pillar 'Electrification', our researchers are developing methods and tools for aggregating and controlling massive distributed energy resources, turning them into flexible virtual power plants.

In addition, we are developing technologies for the efficient grid and market integration of renewable energy sources that utilise green fuels such as hydrogen and ammonia. By modelling customer driving patterns and behaviour in transportation and logistics systems we are also facilitating large-scale electrification of transportation. The key research challenges we are addressing include:

- Grid integration of massive customer energy resources;
- Developing new grid structures for the integration of diverse energy technologies;
- Developing a regulatory and market framework for a renewable electric power system;
- Meeting resource scarcity and circular economy constraints.

Meet our research experts

Our interdisciplinary research team leverages the outstanding capabilities and infrastructure, covering all the important aspects of electrification.

Experts working under this pillar include:

Centre for Future Energy Networks

A/Professor Gregor Verbic: Specialises in grid and market integration of energy resources,

Dr Jeremy Qiu: Specialises in electricity, natural gas, hydrogen and transportation systems

Dr Sinan Li: Specialises in energy efficiency and power electronics.

A/Professor Jin Ma: Specialises in dynamics and control of future power systems.

School of Electrical and Information Engineering

Professor Philip Leong: Specialises in computer systems engineering.

School of Civil Engineering

Professor David Levinson, Dr Emily Moylan: Specialise in transport engineering.

The University of Sydney Law School

A/Prof Penelope Crossley: Specialises in energy and resources sectors law.

The University of Sydney Business School

Professor Michael Bell: Specialises in transportation logistics.

School of Chemical and Biomolecular Engineering

Professor Ali Abbas: Specialises in the circular economy.

School of Aerospace, Mechanical and Mechatronic Engineering

Professor Ben Thornber: Specialises in wind farm digital twins.

School of Aerospace, Mechanical and Mechatronic Engineering

A/Professor Matt Cleary: Specialises in combustion/utilisation of green fuels.

Contact us

For further information or to discuss in greater detail, please contact:

Net Zero Initiative

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Meet our research experts

School of Project Management

Dr Mahshid Tootoonchy: Specialises in operations and supply chain management.

How your business will benefit

By partnering with us, your business will be able to:

- collaborate with leading academic and industry experts from the University of Sydney to address the challenges faced by your business;
- help shape the next generation of postgraduate students with skills relevant for your business needs;
- host one of our talented PhD students, who will be placed in your business for up to one year; and
- benefit (pending eligibility) for the Australian Government's R&D Tax Incentive Scheme.

Past and ongoing projects

Modelling and analysis of renewable energy grid:

this project will develop a planning and operational model for green energy hubs.

Optimal coordination of microgrids in distributed energy resources applications:

this project will develop energy management solution for grid-connected microgrids.

CONSORT: Consumer Energy Systems Providing Cost-Effective Grid Support Future Grid Cluster:

this project developed an innovative automated control platform and new payment structures to enable consumers with battery systems to provide support services to a constrained electricity network.

CSIRO Future Grid Cluster: this project developed models for the market, policy and stability analysis of future grid scenarios.



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