Electrical Engineering
and Computer Science

The University Of Queensland
AUSTRALIA

Power, Energy and Control Engineering





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UQ Power, Energy and Control (PEC) Engineering

Academic staff



Professor Tapan Saha

BSc Eng., M.Tech., PhD, Grad. Cert. (HE), FIEAUST, CPEng, Life Fellow IEEE, RPEQ

Leader PEC Discipline, UQ Solar and UQ Industry 4.0 Energy TestLab, and Director of Australasian Transformer Innovation Centre

Tapan's research interests include the integration of renewable energy to the national grid and the condition monitoring of electrical equipment.



Professor Mithulananthan Nadarajah

B.Sc. (Eng.), M.Eng, PhD, Grad. Cert. (HE), SMIEEE

Professor

Mithulan's research interests are grid integration of renewable energy, battery energy storage and electric vehicle charging stations.



Professor Frederik Geth

B.Sc, M.Sc, PhD (KU Leuven), SMIEEE

Professor

Fred's research interests are in helping power systems deal with low-carbon technologies such as electric vehicles and battery storage through bespoke physics-based optimization models.



Associate Professor Rahul Sharma

B.Tech, M. Eng Sc (Research), PhD, SMIEEE

Associate Professor

Rahul's research interests include control systems, system modelling, fault diagnosis, real–time optimisation, monitoring of large solar farms and control applications to power systems and vehicle electrification.



Associate Professor Richard Yan

BEng, MEng, PhD, SMIEEE, CENg, FIEAUST, RPEQ

Associate Professor

Richard's research areas are solar PV and wind technology, power transmission and distribution system analysis, and network operation and control.



Associate Professor Chandima Ekanayake

BSc Eng, Tech. Lic., PhD, SMIEEE

Associate Professor

Chandima's research interests are condition monitoring of power apparatus, alternatives for insulating oil, performance studies of HV insulators, high voltage engineering and impact of renewables on grid assets.



Associate Professor Hui Ma

B.Eng, M.Eng, M.Eng (research), PhD, SMIEEE

Associate Professor

Hui's research interests include modelling, sensing, signal processing and machine learning applications in power system, high voltage engineering and electrical insulation, and wireless sensor networks.



Dr Feifei Bai

B.Eng., PhD, SMIEEE

Senior Lecturer

Feifei's research interests include solar PV integration to the power grid, PMU applications in distribution power networks, data–driven power system modelling and inter–area oscillation damping control.



Dr Yi Cui

B.Eng, M. Eng, PhD, SMIEEE

Senior Lecturer

Yi's research interests focus on power and energy systems cybersecurity, big data technologies, renewable energy integration, smart grid analytics, and power transformer insulation diagnostics.



Dr Tingting He

B.Eng., PhD, SMIEEE

Senior Lecturer

Tingting's research interests include model predictive control for power converters, renewable energy integration into the power grid, bidirectional power control for electric vehicles, and sustainable energy applied in traction power supply systems.



Dr Wayes Tushar

B.Sc, PhD, SMIEEE

Senior Lecturer

Wayes' main research interests include energy and storage management, peer–to–peer energy trading, renewable energy, smart grid, design thinking, and game theory.

Research Staff



Dr Ramesh Naidu Bonu
Research Fellow

Ramesh's research expertise includes renewable energy integration studies, resiliency framework for distribution networks, and power management of microgrids.



Dr Ge Zhang
Research Fellow

Ge's research interests include control design for large-scale inverter-based resources, stability analysis of hybrid renewable energy zones , and phasor measurement unit applications in smart grids.



Dr Zicheng Pen
Research Officer

Zicheng's research focuses on applying artificial intelligence to power systems, with particular interest in PMU-based anomaly and fault detection, real-time grid monitoring, and edge AI for intelligent power devices.



Dr Licheng Wang
Research Fellow

Licheng's research interests include low-inertia power system operation and control, distribution system voltage regulation, and the modelling and control of grid-forming and grid-following converters.



Mr Alvee Ahnaf Mir
Research Officer

Alvee's research interests include delivering field-tested artificial intelligence services to the energy industry, that detect underperformance and guide asset management through financial analysis of preventative maintenance.

Emeritus Honorary/Adjunct Professors



Emeritus Professor Mat Darveniza

PhD (London University, UK)



Honorary Prof Jovica Milanovic

PhD (The University of Newcastle, Australia)



Honorary Prof Iqbal Husain

PhD (Texas A&M University, College Station)



Honorary Prof Ian Hiskens

PhD (University of Newcastle, Australia)



Honorary Prof Junwei Lu

PhD (Kanazawa University, Japan)

Adjunct Associate Professors

Dr Olav Krause (Grid Qube)

Dr Nilesh Modi (Bespoke Energy)

Dr Daniel Eghbal (Energy Queensland)

Adjunct Lecturer/Fellows

Mr Yu Su (Powerlink)

Dr Nadali Mahmoudi (EPEC)

Dr Umberto Cella (Gransolar)

Dr Phuong Nguyen (Powerlink)

Dr Mehdi Mosadeghy (Noja Power)

Dr Mejbaul Haque (Energy Queensland)

Dr John Atherton (Akaysha Energy)

Dr Jacob Pallot (Schneider Electric)

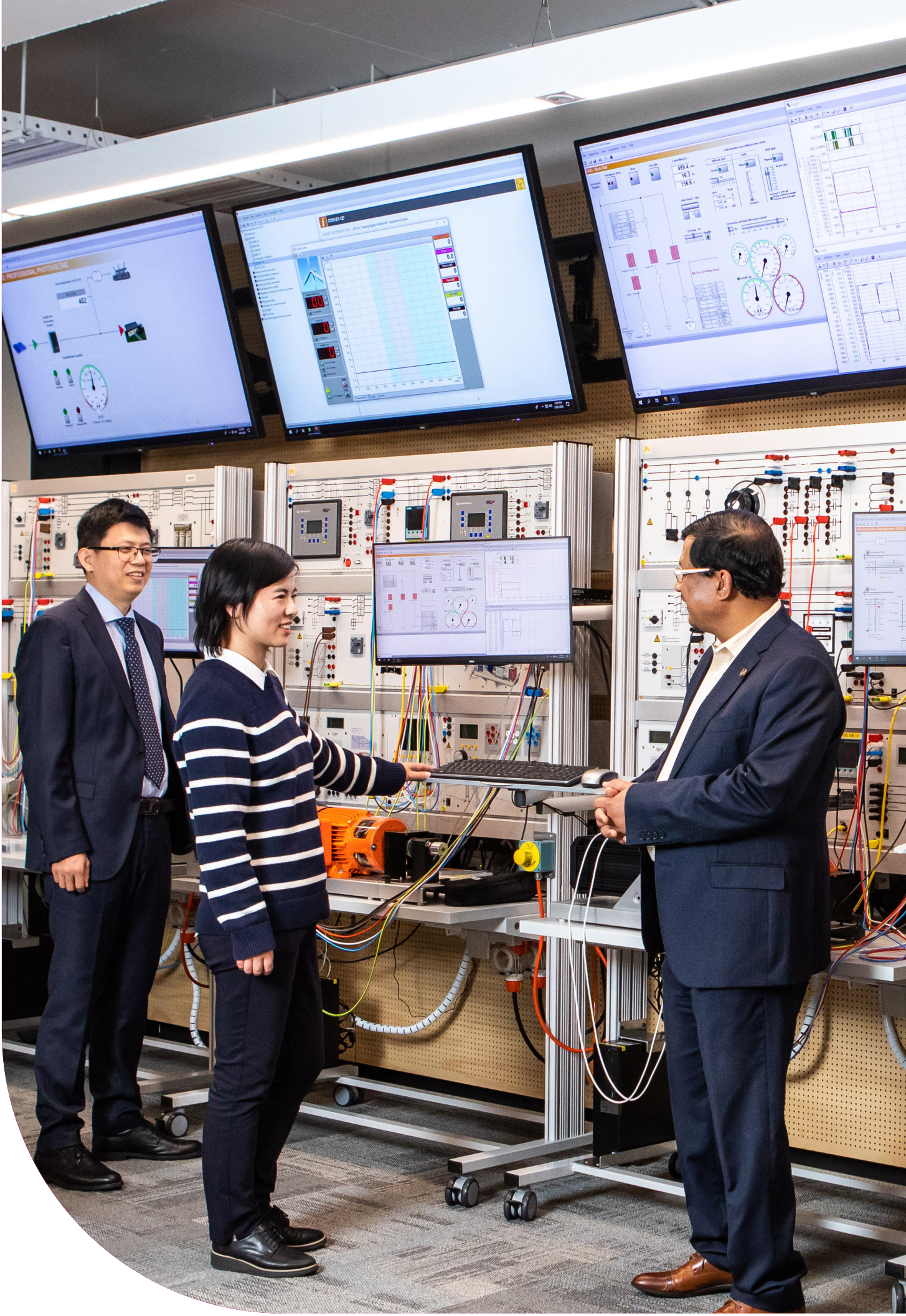
Technical staff

Joseph Zhou (Supervisor of Power research labs)

Damien Waites (Lab Technical Support)

Operations and Research Administrative Office

Mrs Manasa Arani Krishna



Welcome Message from the Head of School

The School of Electrical Engineering and Computer Science at The University of Queensland is recognised for cultivating a community of research leaders, industry experts and innovators who are advancing the frontiers of engineering and technology.

Our academics are internationally regarded for their contributions across power and energy systems, control engineering, robotics, artificial intelligence and future digital infrastructure. This research excellence underpins a teaching environment that is rigorous, industry-engaged and informed by the latest discoveries, ensuring our graduates learn from professionals who are actively shaping global progress in their fields.

Through strong partnerships and a commitment to impact, the school continues to deliver solutions that support a sustainable, secure and technology-enabled future. Power, energy and control engineering research activities are centred on Grid integration of renewable energies, Electrical asset condition monitoring and life assessment, Control applications in power engineering, and Energy management, microgrid and cyber physical systems.



Professor Michael Bruenig
Head of School
Electrical Engineering and Computer Science

Welcome Message from PEC Discipline Leader

The Power, Energy, and Control (PEC) Engineering Research Group focuses on key areas including grid integration of renewable energy, electrical asset condition monitoring and life assessment, control applications in power engineering, and energy management involving microgrids and cyber-physical systems.

Power systems worldwide are undergoing unprecedented transformation, driven by the urgent transition toward net-zero emissions. The rapid growth of renewable generation alongside the retirement of fossil fuel–based synchronous generators has created a critical need to enhance the planning, operation, and stability of future power systems, particularly within the Australian National Electricity Market. Our research is strongly aligned with addressing these challenges, with a focus on analysing and predicting the dynamic behaviour of modern power systems to ensure reliable and secure operation. In this context, power system stability analysis tools and advanced control methodologies for inverter-based resources remain central research priorities. Our researchers collaborate closely with industry stakeholders, including network operators, renewable energy developers, market operators, consultants, and funding bodies such as the ARC, ARENA, and other government agencies.

A substantial part of electricity infrastructure in Australia and globally is ageing, requiring advanced and innovative approaches to asset management. Our research is industry-oriented and aims to deliver next-generation condition assessment techniques supported by accurate modelling and diagnostic tools for critical assets such as power transformers and underground cables. The Australasian Transformer Innovation Centre (TIC), established in 2017 within the School of Electrical Engineering and Computer Science, plays a key role in this domain. TIC focuses on transformer asset management and the application of biodegradable insulating oils in transmission and distribution networks. The Centre integrates cutting-edge research, industry expertise, and professional training to support sustainable and efficient operation of transformer fleets. Researchers in this area engage closely with industry specialists as well as leading academic partners in Australia and internationally.

The PEC Research Group has a strong track record in translating research outcomes into commercial impact through successful start-ups. Intellectual property developed in transformer condition monitoring and life assessment was licensed to AURTRA, which was subsequently acquired by Schneider Electric in 2022. Our ARENA-funded work on improving visibility in low- and medium-voltage distribution networks led to the establishment of GridQube, supporting utilities with advanced monitoring solutions. Furthermore, our patented innovations in solar farm fault detection and diagnostics underpin SolarisAI, a venture focused on large-scale solar assets. SolarisAI combines fundamental power systems engineering with artificial intelligence to deliver transparent, physics-informed diagnostics, enabling operations and maintenance teams to accurately identify root causes of underperformance, including soiling and hardware faults.

The PEC Research Group is deeply committed to addressing industry-driven challenges and maintains strong collaborative partnerships both nationally and internationally. We actively engage with organisations such as the Australian Power Institute, CIGRE Australia, IEEE Power and Energy Society, Electrical College of Engineers Australia and Energy Networks Australia, reinforcing our role in advancing innovation and capability in the energy sector.



Professor Tapan Saha
Discipline Leader Power, Energy and Control Engineering



Research and Discovery

Power, Energy and Control Engineering research has long been a strength of The University of Queensland

ARC Discovery Project

A Reliable and Secure Net-Zero Power System for Australia (2026-2029)

Power and energy engineering experts from UQ School of Electrical Engineering and Computer Science are addressing one of the biggest challenges of Australia's energy transition through a $1.14 million Australian Research Council (ARC) Discovery Project.

By 2050, Australia's electricity grid will be dominated by variable renewable energy sources such as solar and wind, supported by energy storage technologies including pumped hydro and batteries, as part of the transition to net zero emissions. However, unlike traditional fossil-fuel generators, renewable energy sources do not inherently provide system stability, and their variability and distributed nature make coordination more complex. This creates significant challenges for maintaining grid security, including the risk of unstable oscillations and potential system disturbances.

This project aims to address these challenges by developing advanced, data-driven mathematical models and stability analysis tools for renewable generators, particularly within Renewable Energy Zones (REZs). By enabling better coordination and control of large-scale renewable integration, the research will support the secure, reliable, and affordable operation of a decarbonised power system. The outcomes will facilitate smoother connection of renewable generators, reduce the risk of major outages, and deliver broad economic, social, and environmental benefits, positioning Australia as a global leader in electricity system innovation.

Chief Investigators: Prof Tapan Saha, Associate Prof Richard Yan and Dr Feng An

Post Doctoral Research Fellow: Dr Ge Zhang

PhD students: Moumita Routh, Sarthak Dash, Subrata Sarker

Stability analysis of power system with massive power electronic devices

The decarbonisation of Australia's power systems is to integrate massive renewable energy sources which are interfaced with many power electronic devices (PEDs). The fast and complex dynamics of PEDs have significantly changed the nature of the power system, which limits the applicability of existing tools and methods to assess its stability. The goal of this project is to gain a comprehensive insight into the stability of a futuristic power system with high penetration of PEDs. The intended outcomes will be a model and data jointly driven methodology for high–efficient and real–time stability assessment. The methodology developed in this project will support Australia's transition to a stable, secure, and low–carbon power grid

Funding: Australian Research Council Discovery Project

Researchers: Dr Guo Chen; Professor David Hill, Professor Mithulananthan Nadarajah

Project Partners: University of New South Wales, Sydney, Monash University, Melbourne

Grid Enhancing Technologies Project: Oscillation localisation and visualisation

As Australia's electricity network incorporates increasing levels of inverter-based renewable energy resources (IBRs), power oscillations are becoming a growing challenge for maintaining system stability and reliability. This project aims to develop practical oscillation source localisation and visualisation tools that leverage existing network monitoring infrastructure to identify and isolate the sources of

oscillations in real time. The intended outcome is a validated online platform that enables network service providers to quickly detect unstable IBRs, mitigate oscillation impacts, enhance grid visibility and stability, and support the accelerated integration of renewable energy. The project will be validated through hardware-in-the-loop experiments at UQ and real network data provided by Powerlink Queensland, with potential application across Australian electricity networks to reduce renewable energy curtailment, minimise commissioning delays and support Australia's net-zero emissions transition.

Funding: Department of Industry, Science and Resources, Australian Government

Project Lead: EPEC Engineering Pty Ltd (Dr Simon Willis)

Researchers: Dr Feifei Bai, Dr Yi Cui, Associate Professor Richard Yan, Professor Tapan Saha

Research Organisation: UQ

Project Partner: Powerlink Queensland

ARENA 2025

Hybrid Renewable Power Plant Controller Design and Pre-commissioning

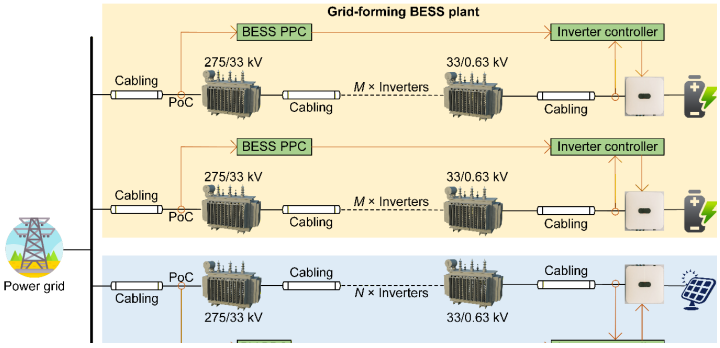
Australia's transition to net-zero emissions is driving the rapid deployment of hybrid renewable power plants (HRPPs) that combine solar generation and battery energy storage systems. While these plants can improve system strength and operational flexibility, the coordination of grid-forming (GFM) and grid-following (GFL) controls remains a significant technical challenge, often resulting in commissioning delays and operational risks. This ARENA-funded project, led by UQ in collaboration with EPEC Group and industry partners, aims to develop a systematic controller design and stability assessment methodology for large-scale hybrid renewable generators. Using real-time frequency-scan techniques and a hardware-in-the-loop (HIL) testing platform, the project will enable controller validation prior to site commissioning. The outcomes will provide practical tools for controller design, stability assessment and pre-commissioning, reducing project risk, accelerating grid connections and supporting the reliable integration of renewable energy into Australia's power system.

Researchers: Associate Prof. Richard Yan, Prof. Tapan Kumar Saha, Dr. Feifei Bai, Dr. Ramesh Bonu, and Dr. Licheng Wang

Funded by: Australian Renewable Energy Agency (ARENA) Advancing Renewables Program

Joint Lead Organisations: UQ, EPEC Group

Partner Organisations: Powerlink Queensland, Australian Energy Market Operator, SMA Australia, United Green



Hybrid Renewable Power Plant controller design

International Collaboration Network on Renewable and EV Grid Integration

International Clean Innovation Researcher Networks (ICIRN) Project (led by RMIT)

This project will establish a collaboration network between Australian researchers and an estimated 20 international researchers from the UK, USA, and EU. The researchers will collaboratively tackle some pressing challenges of renewable-rich power grids. The project will develop AI-based technologies for the efficient integration of renewables, such as rooftop photovoltaics, batteries, and electric vehicles, within the electricity grid. It will also develop a decision support tool to help customers make optimal decisions to invest in electrification and decarbonisation technologies. The project outcome will help to support increased uptake of renewables and support electric vehicles, whilst maintaining the reliability and security of the grid.

Funding: Funded by the Department of Industry, Science and Resources, Australian Government, International Clean Innovation Researcher Networks (2023-2027)

Researcher: Dr Feifei Bai

Partners:

- Industry: Beyond EV, SpendWatt, Cirka Group
- University: RMIT University, Monash University, University of Sydney, La Trobe University

International Collaborations:

- Industry: Innovating Governance, Oxford Sustainable Development Enterprise
- University: Cardiff University, Teesside University, Texas AM University, Universidad Politécnica de Madrid, University of East Anglia, University of Portsmouth
- Association: International Association for the Advancement of Innovation

International Clean Innovation Researcher Networks (ICIRN) Project

Accelerating Australia's Power System Transformation: Develop innovative solutions to the critical challenge of network instability caused by power oscillation introduced through renewable energy integration into the electricity grid.

Funding: Commonwealth Government of Australia's Department of Climate Change, Energy, the Environment and Water under the International Clean Innovation Researcher Networks (ICIRN) program. This project is led by the CSIRO, in collaboration with Monash University and UQ.

Industry: Financially supported by Iberdrola Australia and technically support provided by TransGrid and Energy Queensland.

Chief Investigators: Prof Tapan Saha, Associate Professor Richard Yan and Dr Feifei Bai

Post Doctoral Research Fellow: Dr Feng An

PhD student: Ting Kai Chia (Adrian)

The rapid integration of variable renewable energy-based generators (VREGs) into electricity grids is accelerating, but it introduces challenges in the form of oscillations, periodic energy exchanges that can destabilise the system. These oscillations limit renewable energy deployment by reducing generation output or delaying project commissioning, imposing technical and financial burdens on developers. To address this, the project brings together researchers from the USA (University of Tennessee, Knoxville), the UK (The University of Manchester), India (Indian Institute of Technology, Delhi), and industry partner Iberdrola Australia to develop advanced techniques for detecting oscillation sources using VREG measurements. This effort will support faster, more reliable renewable integration, contributing to Australia's goal of achieving net-zero emissions by 2050.

The project's core objective is to build a high-calibre research network focused on solving grid instability caused by oscillations linked to renewable energy integration. By developing methods to accurately identify the origins of these oscillations, the initiative seeks to enable more effective mitigation strategies.

Australia's Economic Accelerator (AEA Ignite) project

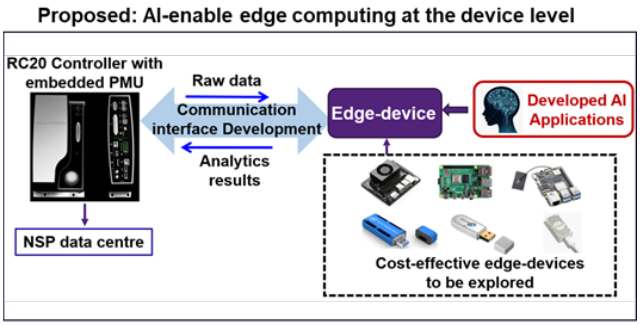
A New Generation Power Grid Monitoring Device: Integration of AI-Enabled Edge Computing Technologies

This project develops an Australian innovation, a new generation of power system monitoring device prototype, enabling intelligent computing technology at a local device level. Current power system monitoring devices only have the measuring capability and send everything back to a data centre managed by network service providers for data processing and analytics. Extensive real-time data from high precision monitoring devices introduces high costs to network service providers for data communication, data management, and centralised computation. To address these limitations, the proposed technology will perform data analytics in real-time at the device level. The extracted useful information will be sent to network service providers with a clear picture of what is happening on the grid. This will make it easier to detect network faults and respond quickly to problems.

Funding: Australia's Economic Accelerator (AEA) Ignite (2026-2027)

Researchers: Dr Feifei Bai, Dr Yi Cui, A/Prof Ruifeng Yan

Partner: NOJA Power



A New Generation Power Grid Monitoring Device: Integration of AI-Enabled Edge Computing Technologies

Australia's Economic Accelerator (AEA Innovate) project

AI Driven Diagnostics and Predictive Maintenance of solar farms using Solaris^{AI} Platform (AI Innovate) project

This project aims to advance SolarisAI, an AI-based solar farm O&M platform, by deploying it across commercial solar farms to demonstrate its ability to enhance reliability and performance through underperformance detection and predictive maintenance, reducing global solar farm losses, which exceed $28 billion annually.

Funding: Australia's Economic Accelerator Innovate Program (AEA Innovate)

Researchers: Rahul Sharma, Tapan Saha, Shijie Xu, Alvee Mir, Nazeef Hameed, Anant Mathur, Amitai Rosenbaum, Paul Butler (SolarisAI Pty Ltd)

Monitoring and fault diagnostics of large-scale solar farms using Solaris^{AI} O&M system

This project is about development of AI based tools for advanced diagnostic of faults and under performance issues in large solar farms. These tools are packaged as a solar farm monitoring system called SolarisAI. The SolarisAI O&M system is based on the physics associated with solar PV cells, their current–voltage characteristics and experimental observations. The technology is designed around the relationship of string current level fault types, fault location, number of panels per string and the panel types. It creates base and progression performance distribution mappings using advanced AI tools to foresee where maintenance work needs to be prioritized to minimize system unavailability times. The O&M platforms use advanced algorithms to help reduce the number of losses in grid–connected PV systems. The system can be used at sites without additional hardware by monitoring groups of PV panels at the array level. The system monitors fault detection, equipment under performance, PV soiling levels and performs predictive maintenance using AI.

Researchers: Associate Professor Rahul Sharma, Professor Tapan Saha, Paul Butler (SolarisAI Pty Ltd)

Funding: Uniseed Ventures, ARENA, UQ Solar, UniQuest, Weidmuller Australia

Industry Partners: Edify Energy, Weidmuller Australia, Uniseed Ventures

Industry Chair

UQ–Springfield City Industry Chair in Energy: Prof. Frederik Geth

The UQ–Springfield City Industry Chair in Energy is primarily responsible for further developing and building on existing relationships with both industry and community partners in Springfield. Whilst Prof. Fredrik Geth is primarily research–focused academic, he also has a strong focus on engagement, as well as innovative thinking to build creative energy–based initiatives with industry, government, and the Springfield group.

Prof. Frederik Geth will lead a sustainable program of applied and translational engineering research in the application of big energy data and AI applied to Distributed Energy Resources Management and will provide senior leadership with a strategic vision for developing and implementing research strategies, building research capability and capacity, and demonstrating impact.

Prof. Frederik Geth will also play a pivotal role in turning the proposal of the Living Laboratory into a tangible reality, making significant strides toward the development and implementation of the Laboratory in Springfield. Prof. Frederik Geth is working closely with researchers from the Power, Energy and Control (PEC) Engineering discipline – one of the leading power engineering research groups in Australia collectively comprising of more than sixty academic staff, researchers, and PhD students – dedicated to deliver cutting–edge technology solutions for the energy industry and community.



Professor Frederik Geth



Knowledge Sharing Workshops by UQ

Insights from a Successful Workshop, February 16, 2026: Addressing Power Oscillations from Inverter-Based Resources

As the global energy transition accelerates, the integration of large-scale inverter-based resources (IBRs) into electricity grids presents both significant opportunities and complex challenges. A key issue arising from this transformation is the emergence of power oscillations, which, if not properly managed, can compromise system stability and reliability. Identifying the root causes of these oscillations is therefore critical to maintaining a resilient and secure power network. In response to this challenge, researchers from UQ have established a strong collaborative framework with leading industry stakeholders and international academic experts. Notable partners include Iberdrola Australia, TransGrid, Energy Queensland, CSIRO, and globally recognised institutions such as the University of Manchester, the University of Tennessee at Knoxville, and the Indian Institute of Technology (IIT) Delhi. Together, these collaborators are working to develop innovative and cost-effective methodologies for oscillation source identification.

On 16 February 2026, the UQ team hosted a highly successful workshop, bringing together more than 60 delegates from 19 industry organisations and six universities. The event was opened by Professor Michael Bruenig, Head of the School of Electrical Engineering and Computer Science at UQ and focused on recent advancements in understanding and mitigating power oscillations associated with IBRs. The program featured insightful presentations

and discussions from leading experts across industry and academia, including representatives from Powerlink, CSIRO, AEMO, Iberdrola Australia, EPEC Group, and Monash University, alongside an expert contribution from Professor Jovica Milanović of the University of Manchester. Participants engaged in in-depth technical discussions, integrating field data and analytical modelling to identify instability sources and explore effective mitigation strategies. Delegates also toured UQ's Renewable Energy Lab and Industry 4.0 Energy TestLab, both of which offer state-of-the-art facilities for testing and validating advanced grid technologies. The success of the workshop underscores the importance of collaborative, cross-sector engagement in addressing the complexities of modern power systems and advancing the safe and sustainable integration of IBRs.

Continuing Professional Development (CPD) Courses for Industry Professionals

PEC Discipline has delivered 4 CPD courses in 2024 at the Industry 4.1 Energy TestLab. First CPD on the fundamentals of power systems focuses on the theoretical background information necessary along with the "hands-on" experience through industry standard simulation platforms and experimental test benches to understand the fundamentals of power systems. The second CPD focused on the renewable energy integration, which brought industry professionals together for dialogue and knowledge sharing to better understand the renewable energy technologies and their integration regarding renewable generator modelling, control techniques, frequency and voltage regulation aligning with grid codes. Both CPDs are aimed at engineers/ professionals from both electrical and non-electrical background working on power systems, specifically for the personnel from industries aligned with power system planning, operation, management, and maintenance. We have hosted thirty-three Australian professional engineers from a wide variety of electricity industry organisations. We hosted fifteen power and energy professional from Bangladesh for a Specialised Technical Training on Power Grid Analysis and renewable energy integration. We have provided hands on training with lectures and laboratory demonstrations along with site visits of UQ Gatton Solar research facility and Warwick Solar farm. In addition, we collaborated with our industry partners for this specialised technical training. Energy Queensland Engineers provided three specialist lectures on their activities in DER and BESS management. Powerlink provided a site visit to a modern substation and explained their work in monitoring and protection. Siemens and DIgSILENT presented two specialist lectures for developing user defined models in PSS/E and Power factory respectively. Course lecturers were Prof Tapan Saha and Associated Professor Richard Yan. Hands on laboratory experiment and software-based simulations were conducted by Dr Ramesh Bonu and Dr Feifei Bai.

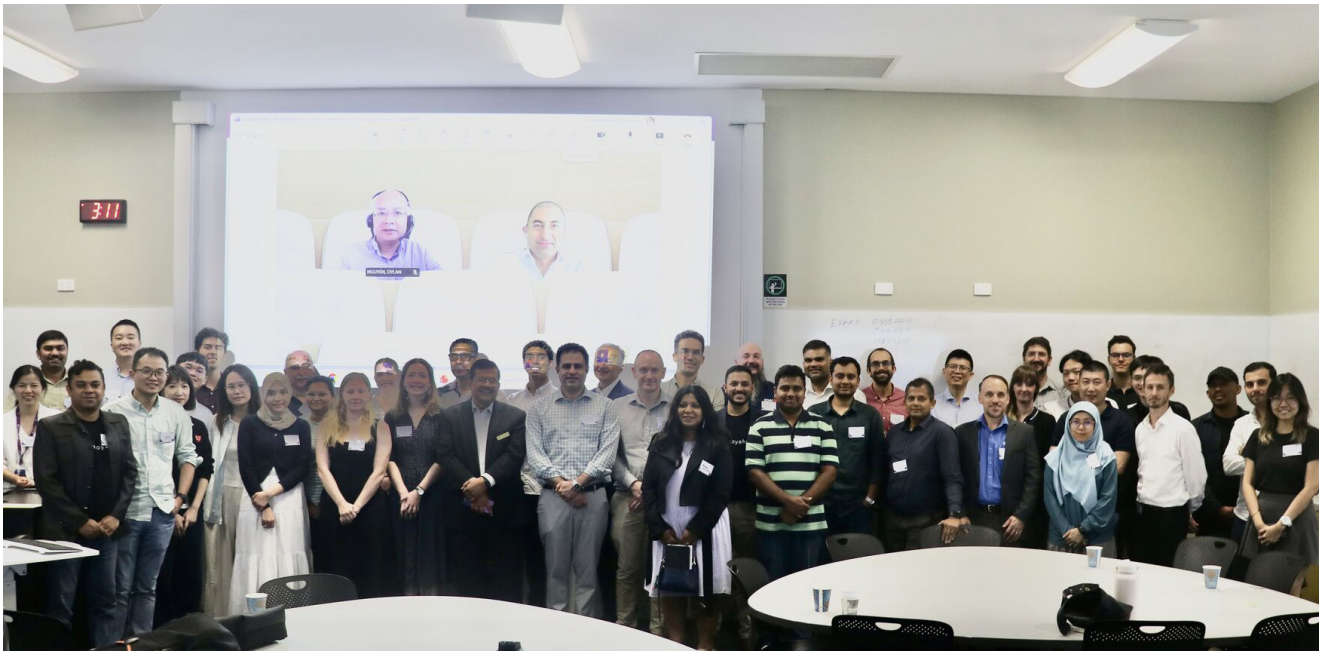
Professional Development Course (CPD) – Transformer Innovation Centre

One of the key aspects of the TIC, is the delivery of high-quality industry relevant CPD courses to the power industry. We offer basic transformer courses that deal with transformer theory, design, and applications. More advanced transformer courses are offered that include design, operation, maintenance, test, servicing, and life cycle management of the transformer itself as well as related components such as bushings and tap changes. These CPD courses are delivered by transformer experts drawn from the manufacturers, testing and service companies, utilities, and universities.

The format of these courses were face-to-face presented in Brisbane, Australia. Where possible the laboratory facilities at The University of Queensland were utilised for hands on demonstrations of various techniques and principles discussed during the lectures. In these one or two day face-to-face intensive CPD courses, the attendees were given an overview on how to make the best use of their transformer assets. The course was set up to be delivered jointly by industry experts and academic staff, where the delegates enjoy the best of both worlds in course relevance, depth, and structure. In general, academic staff discussed the fundamental background to the various concepts while industry staff showed how to apply these concepts to real-life situations providing insights into industry best practice.



Continuing Professional Development Courses for Industry Professionals



Workshop: Addressing Power Oscillations from Inverter-Based Resources, February 16, 2026

Indian Government's Scheme for Promotion of Academic and Research Collaboration (SPARC): Powering the Future Together- Driving Renewable Energy Innovation: UQ and India's two premier Institutions-IIT Kanpur and IIT Kharagpur

The transition to a low-carbon energy future extends beyond the deployment of new technologies; it requires their effective integration into existing power systems. Through SPARC, the School of Electrical Engineering and Computer Science at UQ is partnering with IIT Kanpur and IIT Kharagpur to advance this objective. As part of this collaboration, Professor Tapan Saha, an expert in Electrical and Energy Engineering, along with postdoctoral fellow Dr. Ramesh Naidu Bonu, recently (January 2026) visited India to deliver a series of three-day short courses and workshops at both institutions. These events brought together faculty, students, researchers, and industry professionals to explore key areas such as solar and wind energy systems, microgrid operations, vehicle-to-grid integration, and grid-scale energy storage.



The UQ–IIT partnership represents a sustained and multifaceted collaboration that extends beyond knowledge exchange, encompassing joint research initiatives, academic visits, and cooperative work on renewable energy integration, microgrids, electric vehicle systems, and cyber-resilient energy networks. Professor Saha emphasised the value of this collaboration, noting that it enables the integration of Australian and Indian expertise to address large-scale renewable energy challenges and advance practical solutions for the energy transition. Professor Prabodh Bajpai of IIT Kanpur underscored its impact on academic and research development, highlighting the opportunities it provides for students and researchers to engage with international expertise and gain practical insights into modern grid technologies. Professor Ashok Kumar Pradhan of IIT Kharagpur aptly summarised the partnership's broader significance, noting that this Indo-Australian collaboration exemplifies how international cooperation can deliver practical, implementable solutions to support a decarbonised energy future.

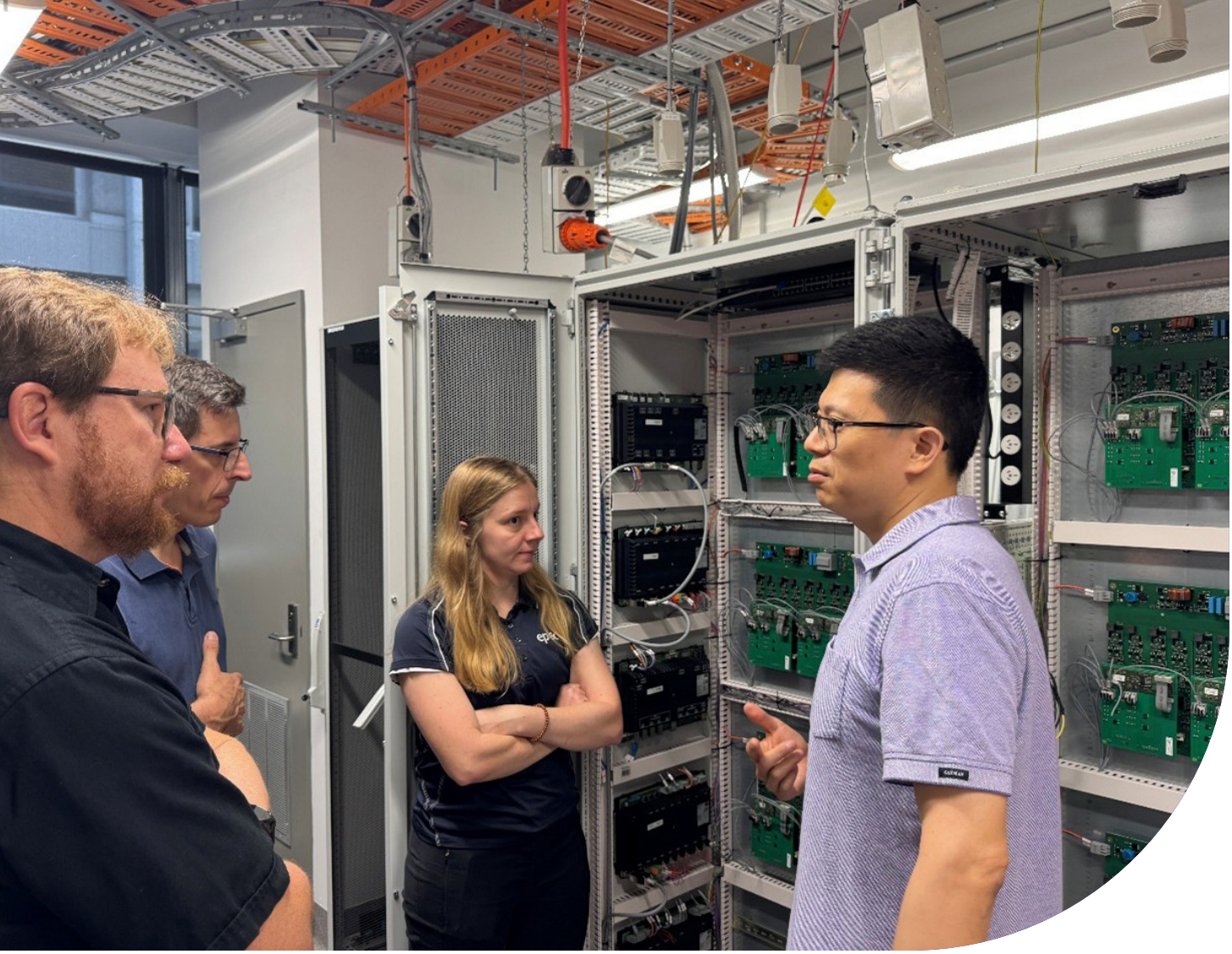
Thanks to our host Professor Prabodh Bajpai at IIT Kanpur and Associate Professor Ashish R. Hota and Professor Ashok Kumar Pradhan at IIT Kharagpur for organising the trip. Associate Professor Rahul Sharma and Dr Wayes Tushar also visited IIT Kanpur and IIT Kharagpur in 2025 as part of this SPARC project.

Visits at Jadavpur University campuses at Kolkata, West Bengal India

As part of Prof Tapan Saha's Indo-Australia SPARC (Scheme for Promotion of Academic and Research Collaboration) project visit to IIT Kanpur and IIT Kharagpur in India, Tapan had a brief stopover in Kolkata. During this visit, he was invited by Jadavpur University's Salt Lake campus and the main campus to deliver presentations on 'energy transition' to their students and staff.



The presentation at Jadavpur University Salt Lake Campus was hosted by Tapan Saha's former Postdoctoral Fellow, Professor Prithwiraj Purkait, while the presentation at the main campus was hosted by Dr Arpan Pradhan. Both sessions were attended by a large number of students and staff. .



Research Projects

Digital twin of power transformer

The increasing integration of renewable energy creates highly variable loading conditions that challenge monitoring of ageing transformers. This study proposes a digital twin framework combining physics-informed neural networks (PINNs) and reduced-order modelling (ROM) for transformer condition assessment. The PINN integrates operational data with thermal physics to improve transformer top-oil temperature predictions. The ROM approach enables rapid prediction of internal thermal fields, supporting practical real-time transformer monitoring and digital twin development.

Funding support: Australasian Transformer Innovation Centre

Researchers: Professor Tapan Saha, Associate Professor Hui Ma, Associate Professor Chandima Ekanayake, Mr. Abhinav Bhattarai (PhD student)

Industry Partners: AusNet

Application of multimodal sensors to reduce transformer failures

This project develops an intelligent framework for power transformer condition monitoring using multi-modal sensing. It integrates moisture, temperature, vibration, and partial discharge measurements to provide a comprehensive and real-time assessment of transformer health. Compared to traditional single-parameter monitoring, this approach improves diagnostic accuracy and supports predictive maintenance. The project ultimately aims to enhance transformer reliability, extend asset lifespan, and enable data-driven asset management for modern power systems.

Funding: Schneider Electric (Australia) Pty Limited

Researchers: Associate Professor Chandima Ekanayake, Associate Professor Hui Ma, Professor Tapan Saha

Industry Partners: Schneider Electric (Australia) Pty Limited

AI-Driven Diagnostics to Enhance OLTC Reliability in Australia's Renewable-Rich Power Networks

This project develops an AI-enabled online diagnostic system for on-load tap changers (OLTCs) in power transformers. By integrating vibro-acoustic sensing, arcing detection, digital signal processing, and machine learning, the system continuously assesses OLTC health and detects early-stage deterioration. Designed for renewable-rich power networks, it enables predictive maintenance, reduces outage risks and asset replacement costs, and improves transformer reliability. The project will deliver a field-deployable prototype, validated diagnostic algorithms, and a pilot-grade AI engine for utility applications.

Researchers: Associate Professor Hui Ma, Associate Professor Chandima Ekanayake, Professor Tapan Saha

Industry Partners: Schneider Electric (Australia) Pty Limited

Effect of renewables on transformers

Increasing penetration of inverter-based renewable energy sources introduces supra-harmonics (2-9 kHz) that can significantly increase transformer losses and accelerate insulation ageing. This project investigates the impact of supra-harmonics on transformer thermal performance and lifetime using field measurements. It aims to quantify the influence of high-frequency harmonics on hot-spot temperature and loss-of-life, providing improved thermal assessment and lifetime prediction frameworks for transformers operating in renewable-rich power networks.

Funding support: Australasian Transformer Innovation Centre

Researchers: Associate Professor Chandima Ekanayake, Associate Professor Hui Ma, Professor Tapan Saha, Mr. Anuradha Abeysekara (PhD student)

Industry partners: Powerlink, Energy Queensland

Investigation of transient over voltage of transformers at modern substations

This project investigates the effectiveness of existing transformer protection measures against transient overvoltages in modern power grids. It examines the conditions that generate overvoltages, develops enhanced models to simulate their propagation through transformers and network components, and analyses transformer-network interactions in modern substations.

Funding support: Australasian Transformer Innovation Centre

Researchers: Associate Professor Hui Ma, Associate Professor Chandima Ekanayake, Mr Shijie Yao (PhD student)

Industry partner: Powerlink

Operational modal analysis of in-service distribution transformers under mixed-grid conditions

This project develops a vibration-based condition monitoring framework for in-service distribution transformers using Operational Modal Analysis (OMA). By analysing transformer vibrations under operating conditions, including load variations, solar PV fluctuations, and battery energy storage cycling, the project identifies modal parameters that indicate mechanical integrity. Field validation across field transformers demonstrates that real-world grid dynamics provide sufficient excitation for reliable modal identification, enabling non-intrusive online monitoring and supporting predictive, condition-based asset management of transformer fleets

Researchers: Associate Professor Chandima Ekanayake, Associate Professor Hui Ma, Mrs Amita Singha (PhD student)

Industry partners: Energy Queensland

Mitigation of power transformer failure due to corrosive sulphur

This project investigates the impact of corrosive sulphur in transformer insulating oils on the reliability of OLTC selector switch contacts. It examines silver sulphide formation and its effects on contact resistance, thermal behaviour, and transformer performance. Through laboratory studies, thermal modelling, field condition monitoring, and risk assessment, the project aims to understand degradation mechanisms and failure risks.

Researchers: Associate Professor Chandima Ekanayake, Associate Professor Hui Ma, Professor Tapan Saha, Mr Adam Suleiman (Industry PhD student)

Industry partners: AusNet

Preparing electrical assets for climate extremes and of AI-induced stressors

This project develops predictive asset management frameworks to improve the resilience of electrical infrastructure against climate extremes and AI-induced energy demand volatility. By integrating climate-informed, physics-assisted, and data-centric learning, it will model asset degradation, detect emerging faults, and assess risks under compound stressors. Advanced ageing models, federated learning, and hybrid physics-AI approaches will enhance condition assessment and forecasting and strengthening the reliability of future energy systems.

Researchers: Associate Professor Hui Ma, Associate Professor Chandima Ekanayake, Professor Tapan Saha

Weak transient event identification in power grid under limited data

This project develops an interpretable and data-efficient framework for identifying weak transient events in power distribution networks, including high-impedance faults, incipient faults, and switching operations. As inverter-based renewable resources increase waveform complexity, traditional detection methods become less effective. The project combines learnable wavelet-based signal processing, physics-guided feature extraction, and advanced machine learning to improve event identification under limited data conditions. By leveraging synchro-waveform measurements and hybrid physics–AI models, it aims to enhance situational awareness, improve fault detection accuracy, reduce equipment and wildfire risks, and support the reliable operation of modern distribution networks.

Researchers: Associate Professor Hui Ma, Associate Professor Chandima Ekanayake, Mr Taolue Shen (PhD student)

Enhancing situational awareness in power distribution systems with low observability

This project develops physics-guided, data-efficient state estimation techniques to enhance situational awareness in power distribution networks with limited observability. By integrating graph neural networks, power system physics, and transfer learning, it improves monitoring under sparse sensor coverage, noisy measurements, topology changes, and cyberattacks.

Researchers: Associate Professor Hui Ma, Associate Professor Chandima Ekanayake, Mrs Junjia Yan (PhD student)

Life-Aware modelling and optimisation of electric vehicle batteries

This project develops a life-aware framework for electric vehicle (EV) battery health prediction and energy management. It integrates advanced state-of-health (SOH) forecasting, degradation attribution, and lifetime-loss quantification to understand how operating conditions affect battery ageing. The project further incorporates battery health costs into household, fleet, and community level charging and discharging optimization. By combining interpretable machine learning with intelligent energy management, it aims to improve battery utilisation, support V2G and V2H applications, reduce lifecycle costs, and enhance the integration of EVs as flexible energy resources in future smart grids.

Researchers: Associate Professor Hui Ma, Associate Professor Chandima Ekanayake, Mr. Yuanchang Liu (PhD student)

Enhancing Power Grid Cybersecurity through Decentralised PMU Data Authentication

This project investigates how decentralised, on-device deep learning can authenticate Phasor Measurement Unit (PMU) data to improve power grid security and reliability. PMUs provide high-precision data on key operational parameters, but current standards lack robust security, making them vulnerable to spoofing attacks. By integrating advanced methods for extracting spatial signatures and employing computational intelligence, the project seeks to enhance the security and reliability of PMU data. Expected outcomes include improved power system stability, enhanced cybersecurity, and significant benefits to the economic, environmental, and social well-being of Australia.

Funding: Funded by UQ EAIT New Staff Start-Up Grant (2025-2026)

Researcher: Dr Yi Cui

Symposium on Power System Resilience: Renewable Energy Integration, Control, and Security

This project will support co-hosting the UQ Global Partnerships Symposium on "Power System Resilience" in China. It will be hosted one day before the premier power engineering event IEEE PES International Meeting, which attracts global experts with over 1000 attendees. The symposium will gather 50 academics from Australia, China, Singapore, Japan and other countries. The project supports experts developing demonstration activities and materials to enhance the symposium and then attend and participate. It will strengthen UQ's Asia-Pacific energy leadership with global strategic partners.

Funding: UQ Global Partnerships Funding Scheme (2026-2027)

Researchers: Dr Yi Cui, Dr Feifei Bai, Dr Naipeng Dong, Dr Miaoqiang Lyu

Partner: Shanghai Jiao Tong University, Fudan University, Nanyang Technological University, The University of Tokyo.

A New Generation Power Grid Monitoring Device: Integration of AI-Enabled Edge Computing Technologies

This project develops an Australian innovation, a new generation of power system monitoring device prototype, enabling intelligent computing technology at a local device level. Current power system monitoring devices only have the measuring capability and send everything back to a data centre managed by network service providers for data processing and analytics. Extensive real-time data from high precision monitoring devices introduces high costs to network service providers for data communication, data management, and centralised computation. To address these limitations, the proposed technology will perform data analytics in real-time at the device level. The extracted useful information will be sent to network service providers with a clear picture of what is happening on the grid. This will make it easier to detect network faults and respond quickly to problems.

Funding: Australia's Economic Accelerator (AEA) Ignite (2026-2027)

Researchers: Dr Feifei Bai, Dr Yi Cui, A/Prof Ruifeng Yan

Partner: NOJA Power

International Collaboration Network on Renewable and EV Grid Integration

This project will establish a collaboration network between Australian researchers and an estimated 20 international researchers from the UK, USA, and EU. The researchers will collaboratively tackle some pressing challenges of renewable-rich power grids. The project will develop AI-based technologies for the efficient integration of renewables, such as rooftop photovoltaics, batteries, and electric vehicles, within the electricity grid. It will also develop a decision support tool to help customers make optimal decisions to invest in electrification and decarbonisation technologies. The project outcome will help to support increased uptake of renewables and support electric vehicles, whilst maintaining the reliability and security of the grid.

Funding: Funded by the Department of Industry, Science and Resources, Australian Government, International Clean Innovation Researcher Networks (2023-2027)

Researcher: Dr Feifei Bai

Partners:

- Industry: Beyond EV, SpendWatt, Cirka Group
- University: RMIT University, Monash University, University of Sydney, La Trobe University

International Collaborations:

- Industry: Innovating Governance, Oxford Sustainable Development Enterprise
- University: Cardiff University, Teesside University, Texas AM University, Universidad Politécnica de Madrid, University of East Anglia, University of Portsmouth
- Association: International Association for the Advancement of Innovation

Network-aware coordination of distributed energy resources and battery storage management for demand response under the dynamic operating envelopes framework

This project aims to develop control schemes that enable dynamic operating envelopes–aware demand response and battery storage management in low-voltage distribution networks. The project investigates demand response capacity, battery charging and discharging strategies, and customer adoption of dynamic operating envelopes through comprehensive socio-economic analyses in Australian suburbs.

The proposed control schemes ensure privacy and separation between end-users, distribution network service providers, and demand response aggregators, while supporting coordinated operation aligned with policy frameworks. The schemes also consider the role of behind-the-meter battery energy storage systems in improving network flexibility, managing peak demand, supporting export/import limit compliance, and maximising the utilisation of distributed energy resources.

The proposed approaches are being validated through software-in-the-loop studies using real-time digital simulators. Compared to current industry practices where static import/export limits are imposed on household connections, the adoption of dynamic operating envelopes, together with coordinated battery storage management, can maximise the utilisation of behind-the-meter distributed energy resources in low-voltage distribution networks.

Researchers: Associate Professor Rahul Sharma, Professor Tapan Saha, Mr Shakil Mirza (PhD Student)r

Renewable Energy Integration with Electric Vehicle Technology for Energy Sustainability, Climate Change and Smart Mobility

This research presents a comprehensive framework for integrating renewable energy technologies mainly solar PV and EVs which serves as a strategic enabler of energy sustainability, climate change mitigation, and smart mobility. A critical dimension of the research is the interaction between renewable energy systems and the increasing adoption of EVs, which introduce complex load dynamics and bidirectional energy flows employed in energy trading, which critically challenge conventional grid operations. The project will investigate the implications of high EV penetration on grid stability, distribution system performance, and energy market structures. Further, central to this research is the development of a robust Multi-Criteria Decision Analysis (MCDA) framework to evaluate and prioritize renewable energy technologies across techno-economic, environmental, policy, and social dimensions.

Researchers: Prof. Hari Om Bansal, Dr. Puneet Mishra, Dr. Rajvikram Madurai Elavarasan, Professor Mithulananthan Nadarajah

Funding: SPARC, India, until May 2028

Project Partners: Griffith University and BITS-Pilani, India

Cost-Reflective Battery Energy Storage System Integration to Address Emerging Distribution Network Challenges

This research investigates how grid-scale battery energy storage systems can improve distributed energy resource integration in Queensland under high rooftop solar PV penetration. Using high-resolution data from Southeast Queensland, it evaluates the technical and economic viability of substation-level battery energy storage systems for mitigating reverse power flow and identifies gaps between network value and existing market incentives. Building on these findings, the research quantifies network-support benefits within the Distribution Use of System framework and develops a dynamic tariff model that incentivises BESS participation in network-support services, improving distributed energy resource integration, reducing network stress, and deferring network augmentation.

Researchers: Dr Wayes Tushar, Assoc. Prof Rahul Sharma and Ms Ruwini Gamarachchige (PhD Student)

Energy Donation: Conceptualising energy as a socially redistributable resource

This project explores energy donation as a novel pathway to improve energy equity in the transition to distributed renewable energy systems. It investigates how surplus electricity from distributed energy resources (DERs), particularly rooftop solar, can be voluntarily donated to households experiencing energy deprivation rather than being solely consumed or traded. Drawing on theories of energy justice, behavioural science, and donation studies, the research examines the motivations, attitudes, and behaviours that influence energy-rich households to donate surplus energy. The outcomes will establish a behavioural framework for energy donation, informing policies and programs that promote more inclusive, equitable, and socially just energy systems.

Researchers: Dr Wayes Tushar, Mr Toky Faisal (former M.Sc student)

Partner: Nanyang Technological University, Singapore; The University of Exeter, UK

Commercialisations

Our research discipline has a long history of successful commercialisations. During the last ten years, we have been involved with 3 SME/start–up establishments.

AURTRA

Based on 25 years of transformer research at UQ, IPs developed by Prof Tapan Saha, Dr Dan Martin, Dr Hui Ma and Dr Chandima Ekanayake were licensed to a start–up AURTRA. AURTRA was established in 2016 upon a foundation of hardware and software technology transfer from UQ for transformer monitoring and asset management. After five years of strong performance and successful commercial usage of their developed technology in many utilities locally and internationally, AURTRA was acquired by French multinational Schneider Electric in a multi–million–dollar deal in 2021.

Details about this can be obtained from:
news.uq.edu.au/2022-04-05-french-multinational-acquires-uq-startup-established-monitor-power-networks

SOLARIS^{AI}

Solaris^{AI} is a solar farm operations and maintenance (O&M) platform that originated through PEC research at UQ. The development began as a PhD project supervised by Associate Professor Rahul Sharma and Professor Tapan Saha, followed by a series of research projects that ultimately led to the formation of Solaris^{AI} Pty Ltd to bring the platform to industry.

The platform's key goal is to enhance solar farm reliability by turning operational data into actionable insights. Ongoing R&D continues to add cutting-edge features such as predictive maintenance, supported by AEA Innovate funding, with additional backing from Uniseed and UniQuest extension funds. Solaris^{AI} is now deployed on commercial solar farms and is led by Associate Professor Rahul Sharma.

Details about Solaris^{AI}:
uniquest.com.au/available_technology/solaris–ai



Continuing Professional Development Courses for Industry Professionals



Solaris^{AI} platform

GridQube

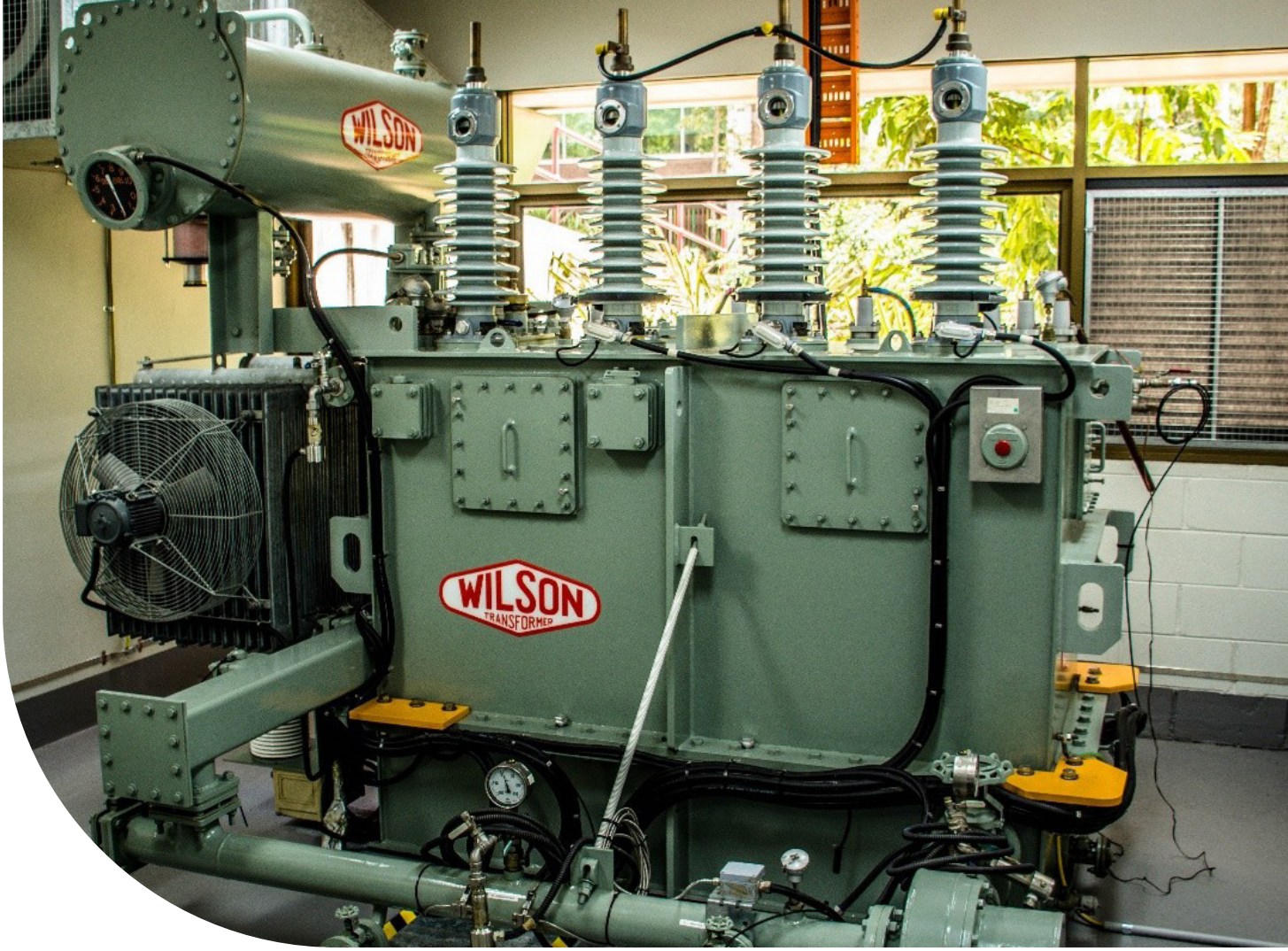
Researchers within the PEC Engineering Discipline at UQ, led by Dr Olav Krause, have played a key role in delivering both an ARC Linkage Project and an ARENA-funded initiative titled "Increasing Visibility of Distribution Networks to Maximise PV Penetration Levels." This work was undertaken in close collaboration with a broad range of industry partners, including Energy Networks Australia (ENA), the Australian Power Institute (API), Energex, United Energy, TasNetworks, Springfield Land Corporation, and Aurecon. Known as the Solar Enablement Initiative (SEI), the project focused on developing an advanced Distribution System State Estimation (DSSE) capability—an improved visibility tool designed to provide scalable, real-time insights into electricity network performance. By enhancing network visibility, the SEI enables more informed decision-making and helps avoid overly conservative constraints on new solar PV connections and export limits, thereby supporting increased renewable energy integration into the Australian grid.

The SEI delivered several significant outcomes, including a PV Connection Assessment Tool, Capacity Constraint Analysis, and Capacity-Constrained Optimisation, all of which are integrated into an automated framework driven by network state estimation. Building on the success of this research, GridQube was established in 2019 to commercialise the DSSE technology developed at UQ. Today, the GridQube DSSE platform is deployed at scale across Australian distribution network service providers (DNSPs) and successfully tested with additional utilities. Dr Olav Krause, now Chief Technology Officer and CEO of GridQube and a former UQ academic, continues to collaborate closely with PEC researchers to advance cutting-edge applications in this domain.

Details about GridQube can be obtained from: gridqube.com/about

Recently completed projects and their funding sources

1. Synchrophasor measurement data applications for distributed energy resource connection and distribution system management (ARENA Project)
2. Monitoring and management system for smart distribution networks (ARC Linkage Project 2013–2018)
3. Peer–to–peer energy trading schemes for sustainable cities, advance Queensland research fellowship (2017–2020)
4. Enabling high photovoltaic penetration in power distribution networks (2018–2020)
5. High–precision condition monitoring of critical equipment in modern distribution networks
6. Advance Queensland industry research fellow project 2019–2021
7. Addressing challenges for the future grids – harmonics standardisation, ARC future fellowships (2016–2020)
8. Preventing transformer failures caused by silver sulphide (2017–2020)
9. Power quality monitoring of grids with high penetration of power converters, ARC linkage project (2018–2020)
10. Sustainable operation of transformers with better understanding of technical and economic constraints (ARC linkage project 2014–2019)
11. Development of smart power transformers with intelligent monitoring, diagnostic and life management systems (ARC linkage project)
12. Investigation of stability and power quality issues from the wide spread photovoltaic integration into electricity distribution networks, (ARC linkage project)
13. Evaluation of the impact of demand response program on transmission network planning (TransGrid)



The Australasian Transformer Innovation Centre

Since its launch in 2017, the Australasian Transformer Innovation Centre (TIC) has been offering innovative research projects and continuing professional development (CPD) courses. These courses are purposely tailored for the Power industry's future needs and are delivered by acclaimed transformer experts from the power industry and academia. The courses offered at the TIC bring a total focus on best practice asset management and high performance. Member organisations of the TIC reap the benefits of this focus through a skilled workforce, reduced costs, increased asset performance, enhanced reliability, and asset management breakthroughs.

Our mission is to improve power and instrument transformers asset performance through innovative research and development, enhance skills development through education and training, and deliver industry driven projects through partnerships with industry. The TIC will help achieve this through the provision and distribution of research findings together with professional development courses. The research and education opportunities that the Centre's industry-led approach create will enable its members to develop the knowledge and skills necessary to achieve their professional goals, improve the productivity of their organisations and provide thought leadership within their industry.

Our vision is to be recognised as a global knowledge leader of substation plant and equipment through excellence in research, education, and training. This is to be achieved through collaboration between industry, researchers, and educators.

Our capabilities: The TIC has access to many resources within UQ including services of various expertise ranging from engineering to economics, the TIC is therefore capable of providing a broad range of services to various industries.

The following table gives a high-level list of the resources and capabilities available to the TIC and its members.

Facility	Description	Details
Transformer lab	Purpose built test transformer.	• 3phase 22kV/4.5kV/415V 468kVA • Imbedded winding fibre optic temperature probes. • Dynamic Ratings temperature, bushing and PD monitors. • Vaisala moisture probes.
HV lab	• HV AC. • High frequency high voltage. • Impulse voltage and current.	• 300kV 18kVA AC dielectric test set. • 450kVA/300kV Variable frequency series resonant test set. • 400kV Lightning impulse voltage generator. • 100kA Lightning impulse current generator.
Condition monitoring equipment	• Frequency Domain Spectroscopy (FDS) measurement. • Polarisation/Depolarisation current (PDC) and Return Voltage measurement. • FDS and PDC Combined measurement. • Frequency Response Analysis (FRA) measurement. • Partial Discharge Measurement (IEC60270, HFCT, UHF). • Moisture measurements by capacitive sensor. • Temperature and water content of insulation by fibre optic sensors. • Temperature rise measurement. • Vibration measurements	• DAX300/350 - INSULATION DIAGNOSTIC ANALYZER (Megger) + Megger VAX230 HV Amplifier. • DIRANA - FDS-PDC+ dielectric insulation analyser – (OMICRON) • FRAx150 (Megger). • MPD 600 (Omicron) for PD measurements. • UVS610 + UHF 620 + MPD 600 (Omicron) for UHF PD measurement. • HFCT140 HC (HVPD) + high speed data acquisition system NI PXIE, 4CH, 5 GS/S, 1.5 GHz Digitizer ((National Instrument). • Thermal Imaging: (FLUKE). • Capacitive moisture Sensor (Vaisala). • Fiber Bragg Grating Measurement system. • Acoustic Sensors.
Artificial insulation ageing	• Thermal and electrical ageing facilities for solid and liquid insulation ageing.	• In house PLC controlled temperature ageing set up and accessories.

Researchers: Professor Tapan Saha (director), Dr Chandima Ekanayake (deputy director), Dr Hui Ma

Contact: transformer@eecs.uq.edu.au

CPD Courses Offered by TIC

Impact of renewables on electrical network asset performance

- Grid visibility, advanced demand response
- Ageing status of assets and current trends of condition monitoring
- Impact of harmonics on asset
- Impact of renewables on aged assets
- Maintenance programs in a new paradigm of renewables
- Changes to the operational landscape due to renewables.

This two–day technical seminar was presented by several industry professionals as well as several academics that focused on the future of asset condition assessment in a renewable dominated and aged power system:

Presenters: Olav Krause (GridQube), Terese Milford (Energy Queensland), Seamus Allan (Dynamic Ratings), Brian Sparling (Dynamic Ratings), and Bhaba Das (Hitachi Energy), Marius Jansen (Optimised Network Equipment), Greg Caldwell (Energy Queensland), Chandima Ekanayake (UQ), Inocencio Grilo Solteiro and Carl Beste (Hitachi Energy), Dan Warn (Energy Queensland), Fraser Hampton and Andrew Wheatlan (SA Power Networks) and Tim Farrel (Reinhausen).

Oils for application in transformers and tap changers

Understand the basic principles of oil, its manufacture, specifications, and properties.

- Learn the basics of oil storage, precautions for transformer/tap changer filling.
- Become familiar with oil sampling and testing for condition monitoring purposes.
- Be exposed to the experience of transformer manufactures and utilities when it comes to oil and oil testing.

This course explored the theoretical background information necessary to understand the basic chemical structure of oils for application in transformers as well as the testing and specification of these oils. Industry experts discussed the practicalities of using, testing and specifying oils in a modern power system. This course was tailored for procurement, asset strategies, operations and maintenance managers and engineers in generation, transmission and distribution, renewables manufacturing mining industrial and infrastructure organisation.

Course was delivered by: Philippe Reboul (Molekulis), Tony Tuong Ngo (Powerlink Queensland), Tara–lee MacArthur (Energy Queensland), Damien Kruger (Energy Queensland) and Anupam Dixit (UQ)



The Australasian Transformer Innovation Centre members

































PEC discipline industry collaborations (present and past)

Energy Queensland

Australian Energy Market Operator (AEMO)

Powerlink Queensland

TransGrid

AusGrid

CS Energy

Stanwell Corporation

Ergon Energy

The Australian Power Institute

CIGRE Australia

TasNetworks

Weidmann

Wilson Transformer Company

TRUenergy Pty Ltd

Vestas International Wind Technology

Hydro Tasmania

United Energy

ABB

Dynamic Ratings

Endeavour Energy

SA Power Networks Siemens

University collaborations (present and past)

University of New South Wales, Queensland University of Technology

Jadavpur University, IIT Delhi, IIT Kharagpur, IIT Bombay

Xi'an Jiaotong University, South West Jiao, Tong University, Hunan University

The University of Manchester, University of Oxford

The University of Tennessee, University of Texas, University of Michigan, Princeton University

TU Dortmund University, Germany

AIT, Bangkok

SUTD, Singapore

Competitive Fellowships

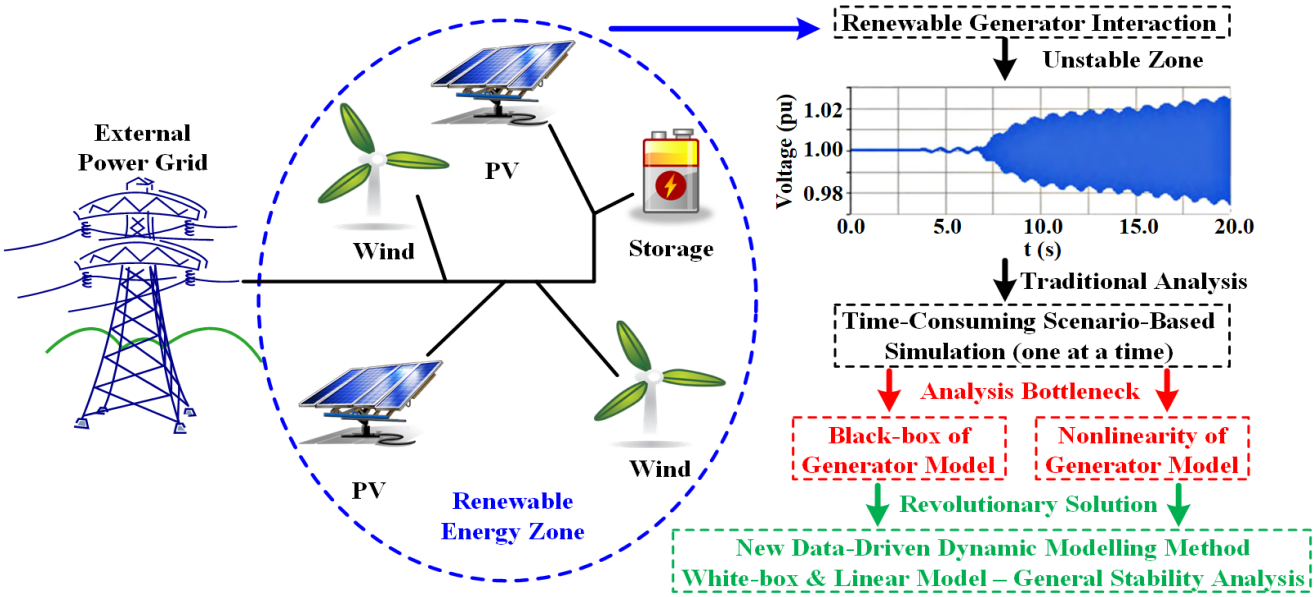


Associate Professor Richard Yan

ARC Future Fellowship

Project Title: Ensuring renewable energy zone stability with a new data-driven modelling approach

This project aims to develop an innovative data-driven modelling method for renewable generators. Currently, the stability of modern renewables can only be analysed via time-consuming scenario-based simulations, and there is a lack of effective means to holistically assess system stability. This project expects to generate for the first time clear renewable generator models through measurements and partially known information from generator manufacturers to replace the existing black-box models. Expected outcomes include a new data-driven modelling method of renewables, which will significantly benefit the energy industry by increasing power grid stability, ultimately boosting investment in and uptake of renewable technologies and products.



Teaching and Learning

The Power, Energy and Control (PEC) discipline at The University of Queensland delivers a comprehensive and industry aligned power engineering curriculum, taught by experienced academics.

Coursework

Our staff contribute specialist courses in power systems and broader power engineering areas within the Electrical Engineering programs, equipping students with strong theoretical foundations and practical skills relevant to modern energy systems.

Key courses include:

- ELEC3310 – Energy Conversion and Utilisation
- ELEC4310 – Power Systems Analysis
- ELEC4302 – Power Systems Protection
- ELEC4410 – Advanced Electronic and Power Electronics Design
- ELEC6320 – Modern Asset Management and Condition Monitoring in Power System
- ELEC7309 – Power System Planning and Reliability
- ELEC7310 – Electricity Market Operation and Security
- ELEC7313 – Renewable Energy Integration: Technologies and Technical Challenges
- ELEC7051 – Transformer Technology Design and Operation (offered in odd numbered years)

These courses are strongly supported by state of the art teaching laboratories, providing students with hands on experience, exposure to industry standard tools, and practical problem solving skills. This integrated approach ensures UQ graduates are industry ready and well prepared to contribute to the rapidly evolving power and energy sector.

Further information about the lab facilities can be obtained from:

eecs.uq.edu.au/research/power-energy-and-control-engineering/facilities#7

Scholarships

API Power Up Program

The UQ Power, Energy and Control Engineering discipline is one of the founding university partners of the API's Undergraduate Power Up Program. This is a collaborative program between the API, universities and industry that has supported hundreds of outstanding power engineering undergraduates during their university course encouraging them to study and pursue subjects to pursue a career in the power engineering industry.

The Australian Power institute is helping the next generation of the workforce by developing their skills and opening pathways to industry by connecting students with industry leaders and other power passionate peers to help them build their network.

Additional information can be obtained from:

api.edu.au/power-up-program

UQ Graduate School Postgraduate Scholarships for HDR Students

The UQ Graduate School offers a number of scholarship opportunities that provide financial support for Higher Degree research students tuition fees, living costs and travel to enable research candidates to focus on their research and achieve the best results.

Further details about the scholarship can be obtained from:

scholarships.uq.edu.au

ES Cornwall Scholarships

The ES Cornwall Memorial Scholarship was established in 1956 as a memorial to Edward Satchwell Cornwall, general manager and director of the Southern Electric Authority of Queensland.

The UQ Power, Energy and Control Engineering discipline is proud to be an integral part of managing the ES Cornwall Memorial Scholarship, which for more than 60 years has underpinned the early career development of aspiring industry engineers though supporting and mentoring their overseas employment in the electric power industry. The scholarship enables graduates to gain experience abroad in the electricity industry and is open to engineering graduates from all Queensland Universities.

Program Development

Master of Power Grids

PEC Discipline is in the process of launching a new Master of Power Grid program to cater to the upcoming skills requirements needed to support the energy transition in Australia and abroad. The project is intended to provide technical skills training in power system analysis, power electronics, data analytics, electricity market fundamentals and the use of machine learning.

The program will be run in an intensive mode to cater to domestic students while also being compliant with international student requirements. It will provide flexible pathways through shorter options such as the Graduate Certificate and Graduate Diploma.



The 35th IEEE PES Australasian Universities Power Engineering Conference (AUPEC 2025)



National and International Collaborations

The Power, Energy and Control Engineering discipline has strong links with the local electricity industry and active research collaborations with a number of national and international universities

International collaboration with IIT Kanpur and IIT Kharagpur, India: Solar PV based hybrid microgrid system for efficient building energy management

The growing integration of renewable energy sources into distribution networks has accelerated the adoption of microgrids, particularly Hybrid AC/DC microgrids, as many modern loads, storage systems, and renewable sources operate on DC. The project "Solar PV based hybrid microgrid system for efficient building energy management" focuses to develop technologies for the efficient and reliable operation of a Hybrid Microgrid (HMG) and validate using an existing system in an academic building at IIT Kharagpur.

It aims to implement a real-time optimal energy management system integrated with building energy management to enable active and reactive power scheduling, voltage and frequency regulation, and seamless islanding and resynchronisation through a hierarchical decentralised control structure. The project will also establish adaptive real-time strategies to maintain stability and power quality, along with a predictive and transactive control testbed for end-to-end automation.

Optimal coordination of subsystems, including battery storage, PV units, and loads, will be achieved using a decentralised, game-theoretic, price-based framework.

This project was funded by the Government of India under the Scheme for Promotion of Academic and Research Collaboration (SPARC). This project involved researchers from UQ (Prof Tapan Saha, Assoc. Prof Rahul Sharma, Dr Wayes Tushar and Dr Bonu Ramesh Naidu), IIT Kanpur (Prof Prabodh Bajpai) and IIT Kharagpur (Prof Ashok Kumar Pradhan and A/Prof Ashish R. Hota).

Collaboration activities: As part of the project, two HDR students—Mr Abhishek Mishra (IIT Kharagpur) and Mr Krishnakant (IIT Kanpur)—visited UQ for three months in 2024 to contribute to the project activities.

In 2025, Assoc. Prof Rahul Sharma and Dr Wayes Tushar visited IIT Kanpur and IIT Kharagpur to deliver two-week tutorials and workshops. Prof Prabodh Bajpai attended AUPEC 2025 in Brisbane, where he presented outcomes from the project.

In 2026, Prof Tapan Saha and Dr Bonu Ramesh Naidu visited IIT Kanpur and IIT Kharagpur to conduct two-week tutorials and workshops.

UQIDAR

The University of Queensland–IIT Delhi Academy of Research (UQIDAR) is a transnational collaborative joint–PhD program that supports research in multi–disciplinary areas. The Power, Energy and Control Engineering (PEC) discipline academics are involved in this joint PhD programs. Through this program, Prof Tapan Saha has established strong collaboration with Prof. Sukumar Mishra Prof. Ashu Verma and Prof. Nilanjan Senroy. They have successfully supervised three PhD students to heir completions. UQIDAR students supervised by PEC are Dr Akshay Bhyri, Dr Arnab Bhattacharjee and Dr Bhamidipati Venkata Suryakiran.

UQ-DTU

The PEC group has established a strong research partnership with the Technical University of Denmark through the UQ-DTU Strategic Research Partnership, with two PhD candidates enrolled at each university. Mr Ashan Bandara was recruited at UQ to work on weak-grid stability of Hybrid Power Plants, while Ms Fatemeh Shahnazian was based at DTU, working on the Control Architecture of the Hybrid Power Plants. Prof. Tapan Saha (UQ), Assoc. Prof. Ruifeng Yan (UQ), Prof. Poul Sorensen (DTU), and Assoc. Prof. Kaushik Das formed a formidable supervisory team for the two PhD candidates. This collaboration allows participants to gain experience in different research environments, share resources across universities, and build strong collaborations among diverse researchers.

Furthermore, Fatemeh spent six months of her external research stay at UQ, where she learned more about real-time simulations using RTDS in the Renewable Energy Lab. This helped her validate some control algorithms in her simulation model.

Similarly, during Ashan's stay at DTU, he had opportunities to work on dispatch-related instability scenarios in HPP using DTU's expertise. He also visited the Riso HPP Test Facility and trained in the AC/DC Power Lab for real-time simulations. Additionally, he had the chance to collaborate with IEA Task 50, Work Package 4, to develop an open-source model of a dispatcher for an HPP controller. The first two PhD candidates performed very well and established a solid collaboration between the two universities. One conference presentation and journal article have been published as a result of this work, and the relationship is expected to grow further.



UQ Collaborating with API

The API is an Australian National Organisation, strongly supported by the Australian Power Industry and committed to working collaboratively with Australian Power Engineering Universities to ensure that the Power industry has access to the required quantities of power engineering graduates with the necessary engineering skills to meet industry's needs now and into the future.

The API, together with UQ and Powerlink Queensland, established the API/Powerlink Australian Chair in Electricity Transmission at UQ, which ended in 2017.

UQ's Power, Energy and Control Engineering Discipline researchers have closely worked with API Members in the development of research projects nominated by API and Energy Networks Australia. API is a member of UQ's Australasian Transformer Innovation Centre.

University Transformer Research Alliance (UTRA)

The University Transformer Research Alliance (UTRA) was established in 2019 by internationally leading transformer research groups from the UK, Germany, Australia, and China. UQ is a founding member of this virtual alliance. The aim of this alliance is to develop a strategy to advance transformer research in alignment with low carbon Energy requirements. It intends to work closely with the wider transformer community, including manufacturers, power utilities, materials providers, and test/service businesses to deliver fundamental and engineering research and to provide high quality postgraduate education/training of students and engineers. Three associate Members are now added from Malaysia, UK and Canada in this alliance. Current UTRA members include the following universities:

Primary Members :

- The University of Manchester, UK
- The University of Queensland, Australia
- University of Stuttgart, Germany
- Tsinghua University, China
- Xi'an Jiaotong University, China

Associate Members :

- University of Exeter, UK
- Universiti Putra Malaysia, Malaysia
- Université du Québec à Chicoutimi, Canada.

Details information about this collaboration has been recently published in IEEE Power and Energy Society Magazine, which can be obtained from **ieeexplore**.



Industrial Projects

Investigation of loop delays for solar farm controllers via hardware-in-the-loop testing

This research project, funded by EPEC Group, examined the impact of loop delays on the time-domain performance of a 50 MW solar plant and addressed key technical barriers that were affecting its successful commissioning. Researchers at UQ, in collaboration with EPEC Group, developed a pre-commissioning platform—the first of its kind in Australia—that integrates all active components of a solar farm, including the SCADA unit, power plant controller, power quality meter, inverter controller, and data distributor. This platform significantly reduced commissioning time by identifying and resolving potential issues both before and during the commissioning phase. Acting as a digital twin of the plant, it enabled comprehensive system testing and validation, helping to avoid potential losses that could amount to hundreds of thousands or even millions of dollars due to commissioning delays. The outcomes of this work have been preliminarily accepted for presentation at the CIGRE Paris 2026 International Conference.

Researchers: Assoc. Prof. Richard Yan, Dr Ramesh Bonu and Prof. Tapan Saha

Funding Agencies: EPEC Group



HIL Testing using RTDS for New England BESS Project

This consulting project focuses on hardware-in-the-loop (HIL) testing of a large-scale battery plant that incorporates Virtual Synchronous Generator (VSG) control principles. A pre-commissioning platform (as shown in below) was developed using the plant's original equipment manufacturer controllers together with the RTDS NovaCor real-time simulator. Using this platform, key VSG functionalities—such as inertia emulation and governor response—were tested, along with the plant's performance under network faults and frequency playback events. Acting as a digital twin of the on-site battery facility, the platform enabled HIL testing results to be used to support grid-compliance assessments of the actual plant for specific tests, including voltage and frequency playback. Researchers at UQ are also continuing to support the plant developers by identifying and addressing additional performance concerns associated with the system.

Researchers: Dr Ramesh Bonu, Assoc. Prof. Richard Yan and Prof. Tapan Saha

Funding Agencies: Energy Vault Pty Ltd.

Strategic Partnership with Powerlink

UQ and Powerlink Queensland have entered a strategic partnership aimed at developing the next generation of energy leaders. Building on more than 20 years of collaboration, the agreement strengthens the organisations' shared commitment to advancing energy research, innovation, workforce capability, and engineering education. This renewed partnership framework enables both organisations to respond more effectively to the evolving challenges and opportunities within the energy sector.

As part of the strengthened relationship, Powerlink continues to contribute to UQ's research and innovation ecosystem through co-supervised PhD projects, industry placements, and support for key initiatives such as the Australasian Transformer Innovation Centre at UQ. The partnership further reflects a shared commitment to equity, inclusion, and workforce diversity. Through its support of UQ's Women in Engineering initiative, Powerlink is helping to foster a skilled, diverse, and future-ready workforce capable of meeting the needs of the energy transition.

Researcher: Prof. Tapan Saha

Partner Organisation: Powerlink

Iberdola-UQ Partnership Agreement

The University of Queensland and Iberdrola Australia have recently entered into a strategic collaboration agreement to strengthen research, education, and industry engagement. The partnership is designed to facilitate the exchange of knowledge, resources, and expertise between the two organisations and to foster long-term collaboration in areas of mutual interest.

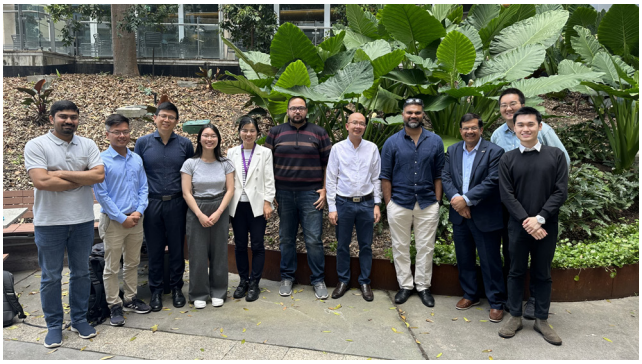
The agreement will support:

- Collaborative research projects;
- Student and staff development opportunities;
- Knowledge sharing and capacity building;
- Delivery of training and educational programs aligned with shared objectives; and
- Promotion of innovation and strategic initiatives.

To achieve these objectives, UQ and Iberdrola Australia will work together on specific projects and commitments that deliver mutual benefits and contribute to advancing the energy transition and sustainable development goals.

Researchers: Prof. Tapan Saha, Assoc. Prof Richard Yan

Partner Organisation: Iberdrola Australia



Iberdola-UQ Partnership

Applications of multimodal sensors for transformer condition monitoring

This project develops an intelligent framework for power transformer condition monitoring using multi-modal sensing. It integrates moisture, temperature, vibration, and partial discharge measurements to provide a comprehensive and real-time assessment of transformer health. Compared to traditional single-parameter monitoring, this approach improves diagnostic accuracy and supports predictive maintenance. The project ultimately aims to enhance transformer reliability, extend asset lifespan, and enable data-driven asset management for modern power systems.

Researchers: Assoc. Prof. Chandima Ekanayake, Assoc. Prof. Hui Ma, Prof. Tapan Saha
Project Partner: Schneider

National and International Visits

2026

In January 2026, Assoc. Prof. Richard Yan visited Northeast Electric Power University (NEEPU) in China for academic collaboration.

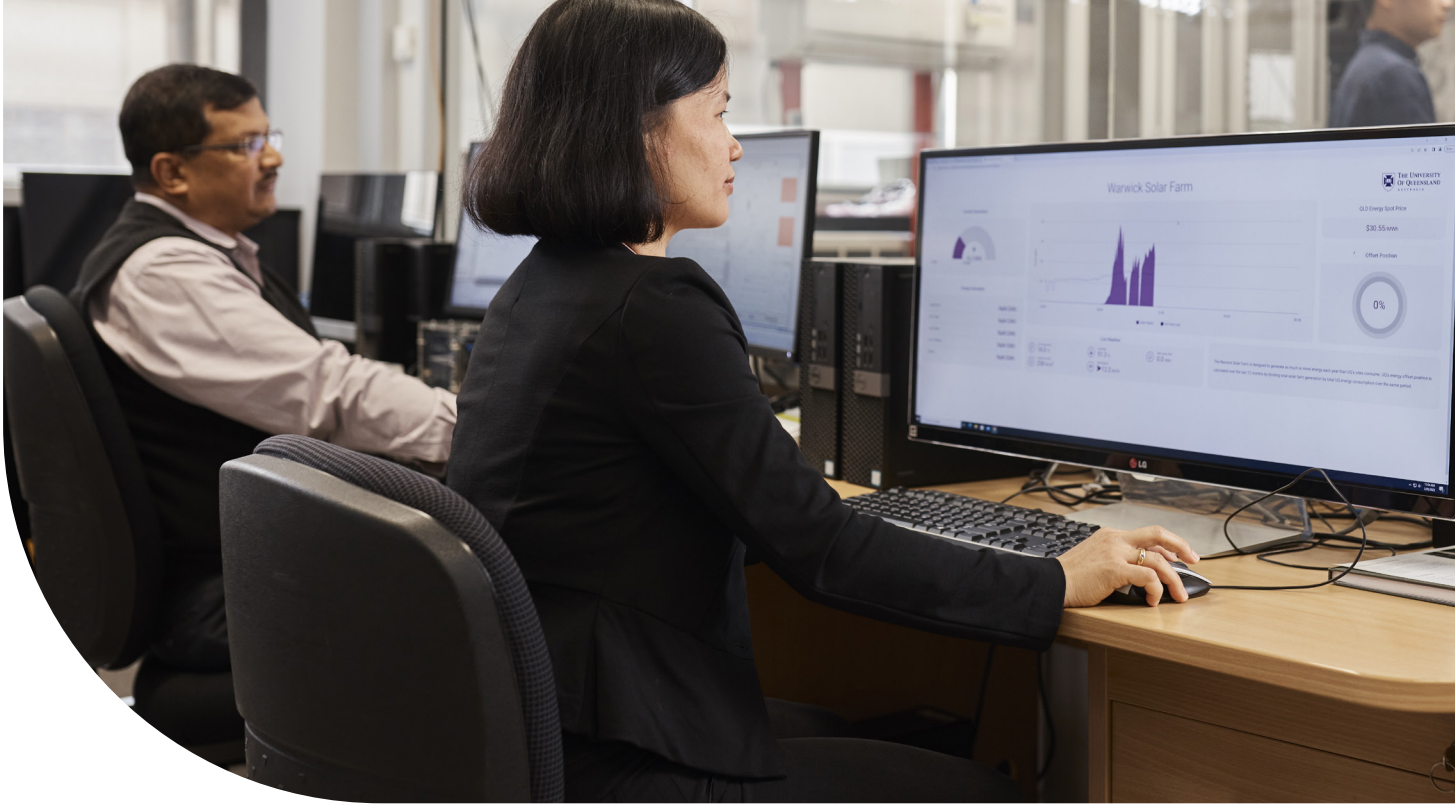
In January 2026, Dr Feifei Bai visited the Research Centre for Grid Modernisation and the Research Centre for Electric Vehicles at The Hong Kong Polytechnic University for international collaboration.

In February 2026, Dr Feifei Bai visited the research and teaching labs at Macquarie University for academic collaboration.

In March 2026, Prof. Frederik Geth visited National Laboratory of the Rockies (NRL) and participated and presented at ESIG Spring Workshop. He gave a talk on Australian experiences in Dynamic Operating Envelope deployment.

2025

In September 2025, Assoc. Prof. Richard Yan visited SMA Australia Eagle Farm inverter integration facility and discuss collaboration details.



Facilities

The teaching and research in Power, Energy and Control Engineering is supported by sophisticated laboratory facilities.

Renewable Energy Laboratory

The PEC Discipline has developed a state-of-the-art renewable energy laboratory with funding from ARENA advancing renewables program, AGL solar flagship education infrastructure fund and UQ.

The lab is equipped with modern renewable energy research facilities including:

- Novacor real-time digital simulator (RTDS)
- Six current and six voltage amplifiers
- Two omicron voltage/current amplifiers
- One Bri-power power amplifier
- Solar and battery emulator
- Two programmable logic controllers
- Three Power quality meters
- Protection relays
- Original equipment manufacturer controllers
- Imperix power electronics testbench
- Programmable RLC load
- Fibre-optic probes and high bandwidth oscilloscope
- Most commercial power system analysis software

Power Systems and Power Quality Laboratory

The power system simulation laboratory (PSS-L) has analytical software tools to simulate, plan, design and control complex interconnected power systems with state–of–the–art solutions.

These analytical tools can solve power system problems in wide range of time frames, from micro seconds to steady state and study impact of renewable energy integration, Custom Power devices, etc. Some of the software tools available at the PSS–L are listed below.

- PSS/E
- DSAT tools
- PowerWorld
- DigSILENT Power Factory
- PSCAD/EMTDC
- PSS SINCAL

Apart from this, the PSS-L's powerful server carries a number of test power systems, at transmission and distribution level. These provide a platform for conducting simulation studies and validating new methodologies.



UQ Industry 4.0 Energy TestLab

The Industry 4.0 UQ Energy TestLab was established in 2020 to help enable the widespread adoption of digital Industry 4.0 technologies into the production and processing of Australia's energy and resources. The University of Queensland was one of six Australian universities selected for the National Industry 4.0 TestLab initiative.

The Industry 4.0 UQ Energy TestLab was established at UQ with funding from Commonwealth of Australia and the University of Queensland. Siemens has provided equipment and software. The Commonwealth of Australia and Siemens are foundation partners of The Industry 4.0 UQ Energy TestLab. The UQ Energy TestLab established UQ as a "living laboratory" in keeping with UQ's objective of being a world leader in carbon neutrality and energy efficiency. UQ TestLab provides UQ researchers with a new and powerful platform for innovative research in power systems analytics and security and demand side management strongly supported by Siemens Energy related software tools. This flagship capability attracts local and international students interested in engineering, energy economics, security, data science, and sustainability.

Facilities include:

- Cyber security test facilities, PLCs: Siemens, Schneider, and Rockwell with Human machine interfaces, and Ruggedcom switches and firewalls
- Opal RT system (Real time Digital Simulation System)
- Siemens Equipment: PSSE®, PSS SINCAL, DIGSI 5, SICAM Toolbox II, SICAM SCC HMI, SIPROTEC 5
- SICAM A8000 Microgrid Controller
- Lucas Nülle Machines: Synchronous machine, Wind power plant, PV emulator and inverter, Transmission systems, Battery energy storage,
- Energy Meter, SCADA systems

The research focus of the Industry 4.0 UQ Energy TestLab spans power and energy systems, microgrid, energy management, and cyber security. It has facilities and capabilities for conducting research in power and energy system analytics, microgrid control, energy management, artificial intelligence, and critical infrastructure cyber security automation.

The Lab is equipped with power system hardware and software provided by world–leading manufacturers, Siemens, and Lucas Nülle, which form the perfect platform for teaching. It offers a unique experience for students, as they're able to combine theory from lectures with practical skills developed in this real–life learning environment.



TestLab hosted many national and industry delegates to demonstrate our works in renewable energy dominated power systems. We have conducted numerous continuing professional development courses for the industry with more than 100 participants. The courses we have offered are (i) Fundamentals of power systems (ii) renewable energy integrations to the grid. We have also hosted a team of Bangladesh Engineers for a weeklong training in power systems.

Intelligent Plant Diagnosis Laboratory

A well–equipped insulation diagnostics laboratory, which is very actively used for insulation degradation and over–stress measurements.

This lab includes a lightning impulse voltage generator, single impulse current generator, 450kVA 300kV variable–frequency resonant high–voltage testing system and 18kVA 300kV AC Dielectric Test Set, Recovery Voltage and Polarisation/Depolarisation current measurement system, frequency domain dielectric spectroscopy equipment with HV variable frequency power supply, Partial Discharge Measurement System, thermal imaging camera and Frequency Response Analyser. Intelligent Plant Diagnostic laboratory has a special accelerated ageing experimental facility at Long Pocket.

This laboratory is suitable for long term ageing experiments under controlled moisture and temperature for transformers and other insulation materials.

Conference and Industry Engagement

AUPEC 2025

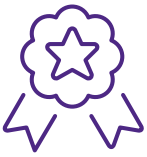
The 2025 IEEE PES 35th Australasian Universities Power Engineering Conference (AUPEC) at UQ, was organised by the Australasian Committee of Power Engineering (ACPE). Since 2024, AUPEC has become a conference financially and technically sponsored by IEEE Power and Energy Society-PES along with ACPE's strong involvement. This was the third time (2004, 2016 and 2025) AUPEC was held at UQ, with a strong support from the local organising committee comprising members from seven Queensland Universities and industry members from Powerlink, Energy Queensland, Noja Power, EPEC Group, Australian Energy Market Operator (AEMO), and Stanwell Corporation Limited. The conference received a very positive response from the authors around the region and also globally. After a blind peer review process, 108 full papers and 68 abstracts were presented at the conference.

The 2025 AUPEC theme was 'Resilient Energy Systems: Strengthening the Future Grid for a Sustainable World'. Many leading power engineering researchers from the academia and industry practitioners presented and discussed the latest developments on this theme, which is of critical importance to the Net-Zero transition in electricity industry. Authors and delegates came from at least ten countries (including from Australia, Japan, Denmark, Germany, Oman, China, Chile, Nigeria, Malaysia and India).

The conference received strong financial support from the universities and industry, which included Gold Sponsorships from Noja Power, The University of Queensland & Manitoba Hydro International, silver sponsorships from EPEC Group, APP Vision and Iberdrola Australia. Conference Dinner Co-Sponsorships from EPEC Group and Powerlink Queensland, Welcome Reception Co-Sponsorships from EPEC Group and ConsultJR, Keynote Speaker Sponsorship from CRC RACE for 2030, Exhibition Booth Sponsorships from OPAL-RT Technologies and Rohde & Schwarz and a Special Sponsorship from the Australian Power Institute (API). Special thanks to IEEE Queensland Section for providing seed money for AUPEC 2025.



Number of awards



Fourteen awards were offered in IEEE PES 2025 AUPEC specifically focusing students, women in power and young professionals, including:

5 Travel Awards,

2 Best Paper Awards,

2 Best Student Paper Awards,

2 Best Paper for Women in Power Awards,

2 Best Paper for Young Professionals Awards, and

1 Best Poster Award.

Professor Tapan Saha

Professor Tapan Saha is a Life Fellow of the Institute of Electrical and Electronics Engineers (IEEE), the highest grade of membership awarded by IEEE. This distinction recognises his outstanding research impact and significant industry contributions within one of the world's largest and most prestigious professional organisations in electrical and electronic engineering.

Professor Saha has served as a Professor of Electrical Engineering since 2005. Over his distinguished academic career, he has authored more than 690 publications in high-impact journals and peer-reviewed international conferences. He has collaborated extensively with leading researchers and has played a pivotal role in mentoring the next generation of engineers and scholars, including over 90 current and former Higher Degree by Research (HDR) students and more than 30 postdoctoral fellows.

His research excellence has attracted over $58 million in competitive funding from prominent national bodies such as the Australian Research Council (ARC), the Australian Renewable Energy Agency (ARENA), the Queensland State Government, and Commonwealth Government agencies, as well as direct support from the Australian electricity supply industry. Professor Saha has also been instrumental in strengthening academia–industry collaboration, establishing two Professorial Chairs at The University of Queensland (UQ) with joint funding from Powerlink, the Australian Power Institute, Springfield City Group, and UQ.

Professor Saha's contributions have been widely recognised through numerous prestigious awards and leadership roles, including:

- Editor-in-Chief, IEEE Transactions on Power Delivery (January 2026 – December 2028)
- M.A. Sargent Medal, Engineers Australia (2022), the highest award of the Electrical College Board, recognising long-standing eminence in electrical engineering
- ARC College of Experts Panel Member (January 2020 – March 2025)
- UQ Partnership Excellence Award (2022), awarded for successful commercialisation of transformer condition assessment through collaboration with Powerlink, Energy Queensland, Ausgrid, and TransGrid
- Electrical College Board Member, Engineers Australia (2015–2020)
- ACPE–CIGRE Outstanding Academic Award, recognising exceptional lifetime contributions to electric power engineering, education, and industry engagement
- UQ Research Higher Degree Excellence Supervision Award (2014)
- Australian Learning and Teaching Council (ALTC) Citation (2009), awarded by the Australian Commonwealth Government
- IEEE Power & Energy Society Distinguished Lecturer (2015–2025)
- Professor Saha has demonstrated long-standing commitment to professional service and community engagement. His contributions include:
- Over 28 years of service to the IEEE Queensland Section, including two terms as Chair
- More than 20 years with the IEEE Power & Energy Society Queensland Chapter, including six years as Chair
- Former Chair, IEEE Australia Council
- Service as Student Counsellor for the IEEE UQ Student Branch and UQ PES Student Branch
- Faculty Advisor for the IEEE Eta Kappa Nu (HKN) Mu Kappa Chapter at UQ
- Chair and committee member of the Queensland Electrical Branch of Engineers Australia
- Panel Member for CIGRÉ Study Committees A2 and D1 over many years

Through his sustained excellence in research, leadership, and industry collaboration, Professor Saha has made a profound and lasting impact on the field of electrical power engineering both in Australia and internationally.



Recent Awards

HDR Awards

Best Paper

1. **Yue Qu**
   IEEE PES General Meeting 2025
2. **Baity Nuris Syifa**
   IEEE NE India International Energy Conversion Conference and Exhibition, 2025
3. **Pinto Anugrah**
   IEEE NE India International Energy Conversion Conference and Exhibition, 2025
4. **Ting Kai Chia**
   Best Student Paper Award
   IEEE PES Australasian Universities Power Engineering Conference, 2025
5. **Junjia Yang – Best Student Paper Award**
   IEEE PES Australasian Universities Power Engineering Conference, 2025
6. **Saifullah Shafiq – 2nd Best Paper Award**
   IEEE PES 17th Asia-Pacific Power and Energy Engineering Conference, 2025
7. **Ching Hong Tam – Best Paper Award**
   IEEE PES Australasian Universities Power Engineering Conference, 2024
8. **Pinto Anugrah – 3rd Best Paper Award**
   International Conference on Technology and Policy in Energy and Electric Power, 2024

Best Poster

1. **Saifullah Shafiq**
   IEEE PES 17th Asia-Pacific Power and Energy Engineering Conference, 2025
2. **Amita Singha**
   IEEE PES Australasian Universities Power Engineering Conference, 2025

Best Oral Presentation

1. **Yue Qu**
   3MT Competition at the IEEE PCCC Student Networking Session, IEEE PES General Meeting 2025
2. **Anuradha Abeysekara**
   Annual University Transformer Research Alliance Conference 2024

Travel Award

1. **Yue Qu – PES Travel Award**
   IEEE PES General Meeting 2025
2. **Baity Nuris Syifa – IAS Travel Award**
   IEEE International Conference on Energy Technologies for Future Grids, 2025
3. **Yuli Astriani – IAS Travel Award**
   IEEE International Conference on Energy Technologies for Future Grids, 2025
4. **Saifullah Shafiq – IAS Travel Award**
   IEEE International Conference on Energy Technologies for Future Grids, 2025
5. **Yue Qu – PES Travel Award**
   IEEE PES Australasian Universities Power Engineering Conference, 2024
6. **Taolue Shen – PES Travel Award**
   IEEE ANZSCON: Students and Young Professionals Congress, 2024
7. **Taolue Shen – PES Travel Award**
   IEEE PES 16th Asia-Pacific Power and Energy Engineering Conference, 2024
8. **Anuradha Abeysekara – PES Travel Award**
   IEEE PES Australasian Universities Power Engineering Conference, 2024
9. **Muhammad Naveed Naz – PES Travel Award**
   IEEE PES Australasian Universities Power Engineering Conference, 2024



Outstanding Volunteer Award

1. **Yue Qu**
   Awarded by the IEEE PES Queensland Chapter for outstanding commitment to the chapter, 2024
2. **Taolue Shen**
   Awarded by the IEEE PES Queensland Chapter for outstanding commitment to the chapter, 2024

Other Awards

1. **Ruwini Gamarachchi**
   Maude Walker Scholarship
   Awarded by the School of Electrical Engineering and Computer Science, 2025
2. **Baity Nuris Syifa**
   Essential Energy Innovation Award
   Awarded by Essential Energy during IEEE International Conference on Energy Technologies for Future Grids, 2025
3. **Saifullah Shafiq**
   Maude Walker Scholarship
   Awarded by the School of Electrical Engineering and Computer Science, 2024

Recognitions

1. **Tapan Saha**
   Editor in Chief
   IEEE Transactions on Power Delivery (2026-2028)
2. **Richard Yan**
   Outstanding Editorial Board Member Award
   CSSE Journal of Power and Energy Systems , 2025
3. **Richard Yan**
   Editorial Board Member
   IEEE Transactions on Power Systems

Higher Degree Research Students

Current Students

Mr Abhinav Bhattarai

Mr Adam Suleiman

Mr Ahmed Amirul Arefin

Mr Ameer Kamoona

Ms Amita Singha

Mr Andrie Syatriawan

Mr Anis Ahmed

Mr Anuradha Abeysekara

Mr Ashan Imantha M. H. Bandara

Ms Baity Syifa

Ms Buddhika Chinthani

Mr Fadi Almaghrbi

Ms Gemma Dianne Clayton

Mr Hanjun Jiang

Mrs Hasini De Silva

Mr Jai Flack

Miss Junjia Yang

Mr Kevin G. H. Mangunkusumo

Mr Leo Liu

Mr Md Imranul Hoque

Miss Meaghan White

Ms Michelle Dai

Ms Moumitha Routh

Mr Muhammad Naveed Naz

Mr Pinto Anugrah

Mr Qiu Jin (Wilson)

Mrs Ruwini J. Gamarachchige

Mr Saif Ullah Shafiq

Mr Sen Wang

Mr Shakil Mirza

Mr Shijie Yao

Mr Taolue Shen

Mr Ting Kai Chia (Adrian)

Mr Tiper K. M. Uniplaita

Mr Weibin He

Miss Wenhui Zhang

Mr Xinren Jiang

Mr Yuanchang Liu

Miss Yuli Astriani

Mr Zhe Gao

Completed Students

Dr Adland Pradana

Dr Akshay Bhyri

Dr Ali Nabil H Sunbul

Dr Anupam Dixit

Dr Arnab Bhattacharjee

Dr Ching Hong Tam

Dr Edi Matijevic

Dr Emad Areed

Dr Ge Zhang

Dr Hankun Cui

Dr Jiajie Feng

Dr Jiakang Yang

Dr Junya Luo

Dr Ning Ma

Dr Rajvikram Madurai Elavarasan

Dr Shijie Xu

Dr Surina Binti Mat Suboh

Dr Venkata Suryakiran Bhamidipati

Dr Xin Zhong

Dr Yue Qu

Dr Yunda Xu

Dr Zhong Xia

Current Students



Mr Abhinav Bhattarai



Mr Adam Suleiman



Mr Ahmed Amirul Arefin



Mr Ameer Kamoona



Ms Amita Singha



Mr Andrie Syatriawan



Mr Anis Ahmed



Mr Anuradha Abeysekara



Mr Ashan Imantha M. H. Bandara



Ms Baity Syifa



Ms Buddhika Chinthani



Mr Fadi Almaghrbi



Ms Gemma Dianne Clayton



Mr Hanjun Jiang



Mrs Hasini De Silva



Mr Jai Flack

Higher Degree Research Students



Miss Junjia Yang



Mr Kevin G. H. Mangunkusumo



Mr Leo Liu



Mr Md Imranul Hoque



Miss Meaghan White



Ms Michelle Dai



Ms Moumitha Routh



Mr Muhammad Naveed Naz



Mr Pinto Anugrah



Mrs Punam Pawar



Mr Qiu Jin (Wilson)



Mrs Ruwini J. Gamarachchige



Mr Saif Ullah Shafiq



Mr Sen Wang



Mr Shakil Mirza



Mr Shijie Yao



Mr Taolue Shen



Mr Ting Kai Chia (Adrian)



Mr Tiper K. M. Uniplaita



Mr Weibin He



Miss Wenhui Zhang



Mr Xinren Jiang



Mr Yuanchang Liu



Miss Yuli Astriani



Mr Zhe Gao

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Professor Tapan Kumar Saha
FIEEE, FIEAust, CPEng, RPEQ Leader
Power, Energy and Control Engineering Discipline

Contact
P + 61 7 3365 3962
M +61 422 001 378
E saha@eecs.uq.edu.au
W researchers.uq.edu.au/researcher/83

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