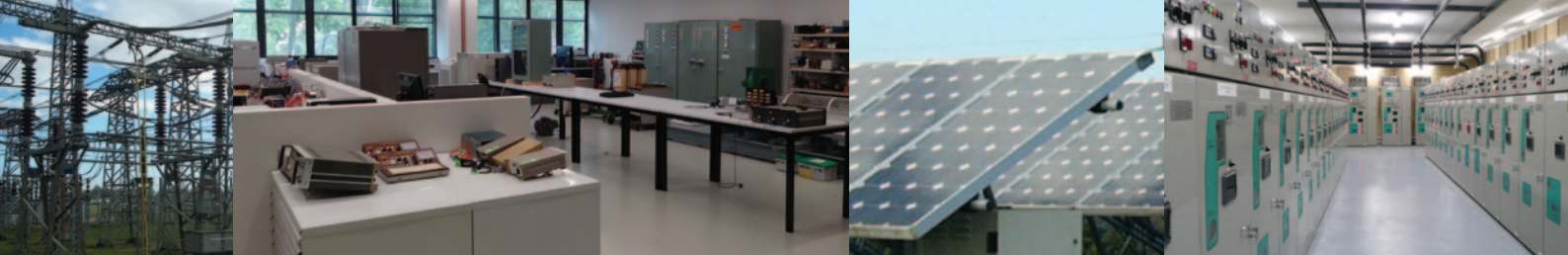


Australian Power Quality & Reliability Centre



About Us

The Australian Power Quality & Reliability Centre (APQRC) at the University of Wollongong is an internationally recognised centre of excellence which supports research, education and consulting in distribution and transmission system power quality, reliability and renewable energy systems.

The original Power Quality Centre was established in 1996 through a joint agreement between the University of Wollongong and electricity distributor Integral Energy. Since then the electricity distribution industry has continued to support power engineering at the University of Wollongong contributing more than \$4 million of sponsorship funds.

The focus of the APQRC is to work in conjunction with industry to improve the quality and reliability of electricity supply for the benefit of all consumers. This focus is achieved through education (undergraduate, postgraduate and continuing), research and consulting activities. APQRC staff are active on a number of peak industry bodies and standards organisations. These include Standards Australia, IEC (International Electrotechnical Commission) and CIGRE (International Council on Large Electric Systems) working groups and the Energy Networks Association (ENA).

Education

Undergraduate Education

The University of Wollongong offers one of the most comprehensive and respected undergraduate degree courses in electrical engineering in Australia. This course is supported through APQRC teaching staff along with access to a modern laboratory for project work.

Postgraduate Education

The University of Wollongong offers a number of postgraduate degrees in power engineering all of which are supported by APQRC staff and facilities. These include the highly specialised modular Master of Electrical Power Engineering degree program along with research degree programs for Masters and PhD studies. Scholarship opportunities exist for students seeking to undertake postgraduate studies.

Continuing Education

The APQRC runs regular continuing education courses. These courses include:

- Technically detailed courses in the areas of power quality, reliability, energy efficiency and renewable energy for professional engineers and technical staff.
- Awareness courses for senior management.
- Review courses for engineering managers.

Research

The APQRC conducts applied research into a wide range of power quality issues including network and equipment performance, monitoring and reporting and standards. Research is also being undertaken in the areas of distribution system reliability and renewable energy system integration.

Key areas of research are as follows:

Power Quality

- Power quality surveying methodology.
- Power quality data compression, analysis, reporting and data mining.
- The impact of distributed generation and renewable energy sources on power quality.
- How to leverage the smart grid paradigm to improve power quality.
- Voltage fluctuations and flicker.
- Voltage unbalance.

- Harmonic management in distribution and transmission systems.
- Interpretation of standards and their development.
- Load control ripple signal amplification and mitigation.
- Power quality instrumentation operation and standards.
- Equipment immunity to power quality disturbances.
- Achievable sag characteristics and limits for distribution systems.
- Database structures for power quality data.

Reliability

- Distribution system reliability improvement.
- Simplifying reliability reporting tools.
- Identifying state-of-art reliability practices.

Distributed Generation

- Distributed generation integration with distribution networks.
- Modelling of renewable energy generation such as wind farms and PV systems.
- Distributed generation in the smart grid.
- Energy storage systems for distributed generation.

Fault Current Limiter and Magnetic Device Design and Analysis

- Applications of high temperature superconductors in power systems.
- Superconducting inductive fault current limiters.

Consulting

The expertise of the APQRC is made available to industry to provide advice and consultancy services. The APQRC has extensive consulting experience and has been engaged by some of Australia's largest manufacturing companies and electricity utilities.

The APQRC provides expert advice and consulting in the following specific areas:

- Investigation and resolution of power quality problems.
- Power quality monitoring for compliance with standards and regulations including harmonic and flicker studies.
- Harmonic and flicker allocation and planning level studies.
- Voltage sag studies.
- Interpretation and implementation of power quality standards.
- Routine power quality monitoring.
- Power quality data compression, analysis and reporting.
- General power monitoring.
- Distribution system reliability.

- Equipment power quality immunity testing to national and international standards.
- Frequency response measurement of voltage transformers.
- Conducted electromagnetic interference (EMI).
- Renewable energy systems integration and power quality.
- Magnetic device design and analysis.
- Application of fault current limiters in power systems.

The APQRC also operates modern Research Laboratory facilities which are available for use by industry. These laboratories contain a range of sophisticated equipment useful for a broad range of research and testing. Hardware is complemented by advanced software packages allowing simulation and analysis.

Key equipment and software available in APQRC laboratories include:

- California Instruments 30 kVA and 5 kVA regenerative programmable arbitrary waveform generators.
- Variable voltage high current DC supplies.
- High current wide bandwidth measurement CTs.
- 100 kW, 4-quadrant dynamic dynamometer.
- dc to 1 MHz 3-phase harmonic analyser.
- Conducted EMI measuring equipment up to 64 A, 3-phase, near field E-H field probes.
- Low frequency magnetic field measuring equipment.
- 100 pF, 100 kV standard capacitor and 1000:1 voltage divider.
- Modern test and measurement equipment including power quality monitors, oscilloscopes, etc.
- 30 kW solar array simulator.
- 4.5 kW electronic loads.
- Various software packages such as PSCAD/EMTDC and PSS/E.
- Energy storage systems for distributed generation research.

Strong Links with Industry

The APQRC has always prided itself in performing research that is highly relevant to the electrical power distribution industry.

The APQRC is privileged to count the following four Honorary Professorial Fellows, who are industry experts, as extended members of staff:

Professor Alex Baitch – BES (Aust) Pty Ltd

Professor Robert Barr – Electric Power Consulting Pty Ltd

Professor Peeter Muttik – Alstom Grid

Professor David Sweeting – Sweeting Consulting Pty Ltd



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