

ThePen

The Newsletter of the
Power Engineering Research
& Consulting Group at
the University of Wollongong

Welcome

Welcome to the first issue of the Pen (power engineering newsletter), the newsletter of the Endeavour Energy Power Quality and Reliability Centre (EEPQRC) at the University of Wollongong. This newsletter highlights the ongoing activities, projects and capabilities of the EEPQRC in providing world class research, consulting and training services to the electricity transmission and distribution industry.

In this issue our technical director, Sarath Perera, talks about the world leading work being undertaken by CIGRÉ working group C4.111 and the coup achieved by the EEPQRC in having that group come to Wollongong to continue work on it's report to CIGRÉ. We also have a story on how the Long Term National Power Quality Survey (LTNPQS) project continues to aid participants with tackling present and future power quality needs. Other highlights of this issue include the commissioning of equipment for solar PV grid integration research.

Our featured student of the month is Brian Perera whose project involves development of analytical tools to help utilities manage high penetration of inverter interfaced distributed generation units with distribution grids.

LTNPQS Tackles the Future of PQ

In a recent discussion paper prepared by Emeritus Professor Vic Gosbell, control of steady state voltage levels and susceptibility of installations to voltage sags were identified as the top two power quality issues for low voltage networks for the next decade. The Long Term National Power Quality Survey (LTNPQS) has been tracking steady state voltage levels along with voltage sag levels for the past decade. This data has allowed LTNPQS participants to have an unprecedented understanding of power quality levels on their networks and across Australia. Data from the LTNPQS has been essential in identifying the most important PQ trends and solutions. With over 2000 sites surveyed and with recent enhancements to the LTNPQS including geographical mapping systems and a fully integrated web based delivery system it is now even easier for participants to manage power quality on their networks. The roll out of smart metering and other future grid technologies will provide more sites for the LTNPQS, further strengthening the project and increasing its relevance to modern distribution network service providers.

For more information on the LTNPQS project please contact Dr Vic Smith:
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From the TDs Desk

EEPQRC hosts CIGRÉ C4.111 Meeting in Wollongong

CIGRÉ working group C4.111 (consisting of 13 experts from around the world) was set up in 2010 to collect and compile the work related to modern lights from a flicker perspective, the impact of voltage fluctuations on non-lighting equipment, possible modifications to currently used flickermeters and possible alternatives, and to establish directions for future research relevant to the subject. The final report of the working group is due to be submitted to CIGRÉ towards the end of 2013.

The working group has so far met 7 times in Europe and the most recent meeting was held at the University of Wollongong from 25 - 28 March 2013. Significant contributions to the report are being made through the power quality research activities related to impact of voltage fluctuations on non-lighting equipment being undertaken by the University of Wollongong's power engineering team.

EEPQRC Services

Consulting

- Investigation and resolution of power quality (PQ) problems
- PQ monitoring for compliance with standards and regulations including harmonic and flicker studies
- Connection agreements
- Harmonic and flicker allocation studies
- Voltage sag studies
- Interpretation of power quality standards
- Routine PQ monitoring
- PQ data analysis and reporting
- General power monitoring
- Distribution system reliability
- Transient and small-signal stability studies
 - Wind integration studies
 - Dynamic modelling and validation of power plants

Continuing Education

- Power quality short courses
- Renewable energy & distributed generation
- Solar PV generation
- Electrical drive systems

Testing

- World class laboratory facilities
- Equipment power quality immunity testing to national and international standards
- Equipment performance testing



Terra SAS Units

Featured Student



Brian Perera
PhD Candidate

Project

Modelling of Inverter Interfaced Renewable Energy Resources to Investigate Grid Interaction.

Project Summary

When multiple power converter interfaced units are integrated into the LV network, there may be operational and control interactions or interferences between these units or with the grid. These interactions and/or interferences may cause unintentional tripping of distributed generation (DG) units, possibly making the grid unstable, or result in the failure to disconnect a unit when it is necessary to do so, creating a hazardous situation. In this research, possible causes for these interactions or interferences will be investigated and mitigation techniques will be proposed for smooth and safe operation of the electricity network.

The analytical tools that will be developed from this research will be of benefit to utilities who are uncertain about the impact high penetration of inverter interfaced DG units will have on the distribution grid. The tools will also enable the development of proper co-ordination and control strategies which should be adopted for voltage control and reactive power compensation.

Terra SAS Units Commissioned

The University of Wollongong has recently commissioned 3 Terra SAS (Solar Array Simulator) DC power supplies. These units are programmable DC sources used for testing photovoltaic (PV) inverters and essentially mimic solar cell operation in the field. Each unit is rated to 5 kW 1000 V DC and can be used individually or in series or parallel combination to give a testing capability up to 15 kW. The units have the following capabilities:

- Ability to simulate dynamic irradiance & temperature across weather conditions
- Ability to vary ramp voltage, temperature or irradiance level over programmed intervals
- Ability to test for inverter Maximum Power Point Tracking (MPPT)
- Provide programmable I-V curves for PV inverter testing
- Simulation of different types of solar cell materials

Combined with the already extensive instrumentation and test facilities available in the University's Power Quality and Renewable Energy Research Laboratory, the Terra SAS units give the University a world class solar power testing facility. A number of novel projects are already earmarked for use with the Terra SAS units including:

- Testing to investigate anti-islanding and safety aspects of multiple inverter operation
- Assessment of inverter high frequency harmonic injection
- PQ related to PV inverter grid integration

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SBRC Nearing Completion

The Sustainable Building Research Centre (SBRC) facility at the University of Wollongong's Innovation Campus is nearing completion with preliminary occupancy proposed for June 2013. The official opening is currently planned for later in the year. The facility is already fitted out with energy efficiency equipment to enable the facility to meet the proposed net-zero energy requirements and complement research activities in the area of sustainability including vertical bore ground source loops and heat pumps, hydronic floor heating, building integrated photovoltaic thermal systems, micro-grid distribution boards, and rain water treatment and collection tanks.

The facility consists of two main sections; industry demonstration area, office and research spaces in the South section, and a high bay test area in the North section. The Power Quality and Energy Efficiency Testing Laboratory (one of the three research lab areas) is nearing completion and will be fitted out with equipment later in the year, along with the renewable and embedded generation electrical equipment testing area in the high bay.

Visit the SBRC website <http://sbrc.uow.edu.au> for more information on facility construction updates, training opportunities in energy efficiency and renewable energy technologies, and research activities.

Upcoming Events

1 - 2 July 2013: Basic Power Quality Continuing Education Course. Click [here](#) for more information.

7 - 8 November 2013: Renewable Energy and Distributed Generation Continuing Education Course.

Contact Us

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