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LTNPQS NEWSLETTER

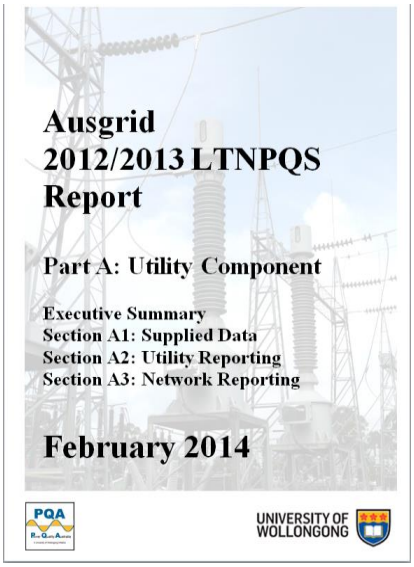
Issue 4 March 2014

2012/2013 Reports Issued

The 2012/2013 LTNPQS report were issued to participants in early March. These reports contain a large number of enhancements to previous reports and provide even further value to participants. Major enhancements for the 2012/2013 reports include:

- Incorporation of statistical methods to determine overall network compliance based on the sample of sites provided to the survey.
- Reporting of individual voltage harmonics to the 25th order.
- Reporting of flicker.

These latest reports represent the most comprehensive and innovative reports which have been issued to date. Participants should be able to use the reports to gain an even deeper understanding of the fundamental PQ performance of their networks.



PQ Challenges for Future Grids

With the rollout of smart grid infrastructure PQ data is now available for a larger number of sites and from more different types of instruments (e.g. smart revenue meters, smart relays, traditional PQ meters) than ever before. The challenges related to methods of storage, analysis and reporting of this data remain as relevant as ever. When very large amounts of data are available, novel methods of analysis and reporting must be developed in order to reduce the large volumes of data to a coherent and understandable form without the loss of important detail. Techniques to accomplish this continue to be researched and developed by PQA and the LTNPQS project continues to provide participants with solutions to these challenges.

In addition to requirements for novel data storage, analysis and reporting techniques, one of the key issues now facing utilities is how many sites are required to provide statistical confidence in results. It is likely that at some stage regulatory authorities will require utilities to prove PQ compliance for their networks. Obviously it is not possible to monitor PQ at every site on a network (especially at LV). As such, methods of sampling and site selection must be developed such that statistical confidence in results of surveying is ensured. There is significant research being conducted into this problem at the University of Wollongong and the results of this research will further enhance the LTNPQS.

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Dr Robert Barr Receives Queens Birthday Honour

PQA staff member Dr Robert Barr has been appointed as a Member of the Order of Australia (AM) for significant service to engineering, particularly electrical energy supply and distribution.

Dr Barr is a visiting professorial fellow of the University of Wollongong (UOW) and founder and Director of Electric Power Consulting Pty Ltd.

APQRC Technical Director Sarath Perera said "This is a great honour for Robert for his contribution to the industry. Robert's services not only extend to the industry but also to power engineering education and training."

Dr Barr has been involved with the electricity supply industry since 1973 and has been a long time supporter, mentor and active contributor to the APQRC at the University of Wollongong. He also regularly presents invited speaker seminars to power engineering students at UOW, lectures at professional development courses provided by the APQRC, and is a lecturer for the Master of Electrical Power Engineering course.

ICHQP 2014

A strong contingent of PQA staff will attend the International Conference on Harmonics and Quality of Power (ICHQP) to be held in Romania in May 2014. ICHQP is the premier international conference in the power quality field and PQA staff will once again showcase the research being conducted as part of the LTNPQS project at the conference. The conference also gives the opportunity for staff to view state of the art research in the power quality field and network with other international practitioners.

The abstracts of the three papers which have been submitted to the conference by PQA staff are given below:

- ***"Assessing Network Compliance for Power Quality Performance"*** **- IEC standards suggest that a network is compliant if 95% of the sites are compliant. In many cases it is only practicable to measure the PQ parameters of some of the sites in a network and to use statistical analysis. The paper examines the minimum number of monitored sites needed to demonstrate compliance with a prescribed degree of confidence - e.g. at the 95% confidence level. Analysis is made of samples extracted randomly from sites included in the Australian Long Term National PQ Survey. The required number of sites is found to vary with the PQ disturbance of concern and is largest with voltage unbalance. In all cases the number exceeds that proposed in CEER guidelines.**

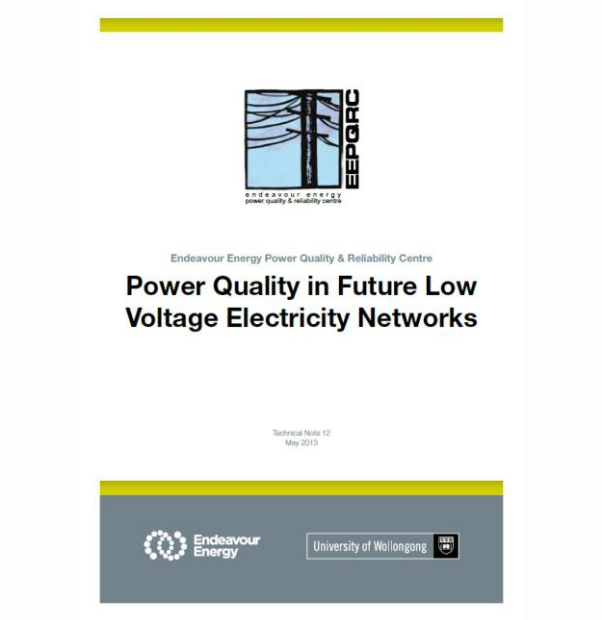
- ***"The Control of Voltage THD in MV Power Systems"*** **- Harmonic standards give limits for individual harmonics and for voltage THD. Guidelines are given for the allocation of individual harmonic current but no allowance is made for the control of THD in IEC standards. The paper shows how voltage THD can be controlled within its limit by means of the authors' previously proposed Voltage droop approach. Two main concepts are required to develop an allocation strategy: (i) WITHD - a modified THD for current in which components are weighted depending on the harmonic frequency, (ii) a diversity law for THD based on the Summation law used for individual harmonics. The proposed allocation strategy gives an additional allocation of WITHD for an installation and is illustrated with a case study. It is shown that a WITHD allocation must be considered for large installations if voltage THD limits are to be met.**

- ***"Power System Harmonic Voltage Limits for the Future"*** **- This paper provides a new methodology for setting harmonic limits in power systems. This approach is designed to replace the existing harmonic limits detailed in IEC 61000.3.6 and IEEE 519. The methodology provides for replacing the ~40 or more individual harmonic with three new limits. The new limits are low frequency weighed VTHD, high frequency weighed VTHD and the even**

harmonic components of VTHD. It is proposed to keep the VTHD limit to make a total of four limits. The four limit types have been selected because they each correspond directly to known critical physical effects on customer equipment and network components that need to be managed. The low frequency weighed VTHD limit is used to restrict harmonic losses in induction motors. The high frequency weighed VTHD is used to restrict harmonic heating in capacitors. VTHD is used to ensure the peak of the voltage waveforms is neither too low nor too high. Even VTHD is used to ensure voltage waveform symmetry and the control of DC currents. Providing a physical basis for each of the four limits removes much of the arbitrariness of the existing IEC 61000.3.6 and IEEE 519 limits. The methodology provides safeguards for customer equipment while giving network owners and customers much greater flexibility for economic mitigation. Indicative limit values have been suggested as a starting point for the further development of this approach.

Technical Note No.12 - 'Power Quality in Future Low Voltage Electricity Networks' published

Newly published Technical Note No.12 – "*Power Quality in Future Low Voltage Electricity Networks*" forecasts how power quality (PQ) issues in low voltage (LV) networks may develop over the next decade or so. It has four sections to cover PQ concepts, PQ disturbances, and possible developments of the network and the future of PQ. The technical note is available under publications at www.elec.uow.edu.au/apqrc/



Want More Information?

If you would like more information on any of the articles published in this newsletter please contact Dr Vic Smith at the University of Wollongong on 02 42214737 or vic@uow.edu.au