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LTNPQS NEWSLETTER

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2011/2012 LTNPQS Proposals Issued

Proposals for the 2011/2012 LTNPQS project are set to be issued in the near future. The proposals are designed to build further on the work completed over the past ten years of LTNPQS implementation. The long term aim of the LTNPQS is to collect representative Power Quality data that is consistent over the full range of values that can be expected across Australia/New Zealand. Over time this data will lead to the development of workable National Power Quality Standards.

The surveys carried out to date have substantially progressed the knowledge, understanding and management of Power Quality in Australia/New Zealand. This project has and will continue to develop new concepts and advanced techniques that will be of assistance to the whole industry.

Improvements and additions to the 2011/2012 LTNPQS project include enhanced functionality of the LTNPQS website and geographical representation of power quality disturbance levels across networks which will allow enhanced visualisation of power quality performance.

PQA Associate Honoured with Award

PQA associate Dr Robert Barr has been awarded the prestigious National Professional Electrical Engineer of the Year Award for 2012. This award is made by the College of Electrical Engineering to an outstanding senior electrical engineer. Robert will be presented with his award at a gala dinner in Sydney in June.

Major Improvements made to Report Delivery

Online Report Delivery and PQ Reporting Functionality

Timely and speedy access to power quality information about your distribution networks is highly desirable when important planning and capital expenditure decisions are to be made. The ability to quickly login to a readily accessible website to retrieve such information can be very beneficial.

Delivery of LTNPQS reports via an online system was a first implemented for the 2009/2010 reports. Since that time development has continued on the LTNPQS online reporting system. The system now contains a range of reporting options which users can tailor to suit their individual needs. Work is continuing on the system in order to achieve a highly flexible system which will cater to the PQ reporting needs of all LTNPQS participants.

Weak Site Survey

A survey of the PQ performance of weak LV sites has been carried out in conjunction with a number of LTNPQS participants. This survey was the first time this type of investigation has been carried out in Australia. Currently, LV LTNPQS sites are dominated by strong sites – those close to transformer terminals. However, most customers are connected out along LV distributors. The survey sought to characterise the PQ performance at weaker LV sites and to determine if there were major differences between PQ levels at strong and weak sites.

A total of 152 weak LV sites were included in survey. It was found that PQ levels at weak sites can differ markedly from levels at strong sites. This was particularly the case for voltage unbalance where compliance with a 2% limit was a major issue at a number of sites. Overall, the survey indicated that monitoring of strong sites is not sufficient to fully characterize the low voltage network and that PQ levels at weak site may be significantly worse than the levels seen at strong sites.

The Problems with PV…

Due to generous grid feed-in tariffs and other government incentives electricity distribution companies are receiving hundreds or even thousands of applications for installation of distributed generation on low voltage networks per week. These distributed generation systems are primarily solar photovoltaic with grid connect inverters.

Power flow equations can be easily used to show that installation of distributed generation can lead to local voltage rise. Factors which affect the amount of voltage rise include the magnitude of the distributed generation system along with the impedance of the network to which it is connected.

The Australian standard for Grid Connection of Energy Systems via Inverters is AS4777-2005. This standard applies to systems of up to 10 kVA single phase or 30 kVA three-phase. This standard defines the grid condition criteria under which an inverter system must disconnect itself from the grid. For grid voltage level, the system must disconnect if the grid voltage exceeds 270 V RMS. AS4777-2005 is currently under review. The grid disconnect voltage of 270 V was not designed to apply to sustained voltage levels, rather it is meant for transient or short term conditions. The current standard is silent on the applicable sustained grid voltage level; however, it is likely that the revised version of the standard will contain an applicable voltage level which will be somewhat less than 270 V RMS.

There are many reports coming from the industry of distributed generations systems disconnecting from the grid due to high voltage conditions. Obviously, if an inverter system disconnects itself from the grid the system will no longer be exporting power to the grid and as such the owner is no longer benefitting from grid feed-in tariffs. Results from the LTNPQS indicate that voltage levels at many low voltage locations are near the upper end of the voltage range during light load conditions. This leaves little margin for voltage rise due to distributed generation systems. These light load conditions generally occur during the daytime which is the very time at which PV systems will be outputting maximum power.

While it may be unlikely that the local voltage is exceeding 270 V, many of the inverter systems currently on the market in Australia have incorrectly programmed grid voltage disconnect thresholds. In many cases, grid disconnect thresholds are set for European (especially German) standards which require disconnection if the grid voltage exceeds 253 V. In Australia, a voltage of 253 V is within the nominal voltage range and will be observed at many sites during light load. As such, it is inevitable that inverters programmed to disconnect at 253 V will disconnect themselves from the network.

If electricity distributors are finding that many distributed generation systems are disconnecting from the grid they should immediately check grid disconnection thresholds. If thresholds are set correctly, and

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legitimately high voltage is the disconnect mechanism, there are few easy solutions. One solution would be to reduce network impedance – a costly exercise.

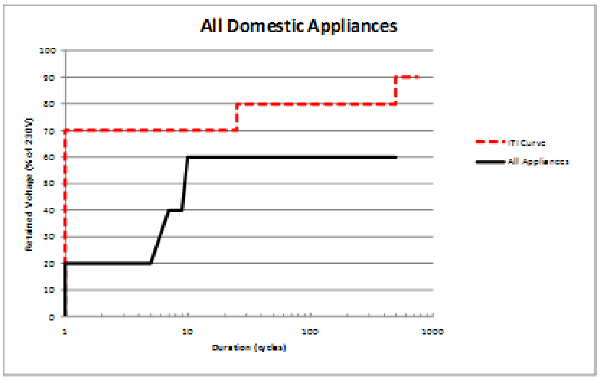
Grid disconnection of distributed energy systems represents a significant challenge for electricity distributors. It is only natural that owners who have invested in distributed generation systems expect a return on their investment when conditions are favourable to generation. However, owners of these systems are generally not conversant with the limitations of the electricity distribution network and there are few controls over connection of distributed energy systems. As such it is difficult to explain to them as to why they are not getting the return on investment that they expect. Overall, there is no easy solution to the problem at present and this is the major issue confronting electricity distributors at present with regard to distributed generation systems.

Development of a 230V CBEMA (ITI) Curve

The ITI, formerly CBEMA, curve was developed by the Information Technology Industry Council of the United States of America. The curve describes an AC input voltage envelope which typically can be tolerated by most Information Technology (IT) Equipment. Although the curve ostensibly applies only to IT equipment it is often used throughout the electricity supply industry to provide an indication of the input voltage tolerance of a wide range of equipment.

In spite of the fact that the curve was designed to apply to equipment supplied at 120 V 60 Hz nominal voltages it is widely used in Australia which has a 230 V 50 Hz system. With the Support of the Australian Strategic Technology Program (ASTP), a study has been undertaken at the University of Wollongong aimed at developing a CBEMA style curve to suit Australian conditions. A range of domestic equipment was tested to determine sag susceptibility. The types of equipment tested were not limited to IT equipment and represent a cross section of appliances likely to be found in most homes.

Overall, results for domestic appliances show that equipment connected to the Australian 230 V network has sag immunity considerably greater than that defined by the ITI Curve. As such, the applicability of the curve for individual pieces of equipment connected to Australian 230 V electricity networks is highly questionable and the need for further work in this area is apparent. The figure below shows the preliminary 230 V equipment sag immunity curve for domestic appliances developed from the study.



230V Equipment Sag Immunity Curve for Domestic appliances