

A word from your president



New Photovoltaics Make Bi-directional Power Flows a Reality

Large subsidies for electricity customers to install and connect new photovoltaic generation into the power grid are driving one of the biggest changes to customer load characteristics since the mass installation of air conditioning. The thousands of photovoltaic panels being connected to the low voltage networks across Australia is catching many Network Service Providers by surprise as they find many megawatts of intermittent, uncontrolled generation being connected to some of the weakest parts of their LV networks.

Bi-directional power flows are becoming more common, especially where large numbers of embedded photovoltaics are concentrated in small areas. The new solar city projects that have been established are examples of what we may expect in the future. This new generation has some special impacts that need to be dealt with. The most common problem being reported is unwanted "voltage rise". The old concept of top down power flows from transmission to conventional loads and the resulting "voltage drop" needs to be rethought to allow for rapidly fluctuating generation and "voltage rise".

Historically in Australia, we have always operated our low voltage network at the top end of the 230volt $\pm 10\%$ IEC range. In many cases, the new photovoltaic generation is pushing customer voltages above the top end of this range causing photovoltaic inverters to trip off line due to over voltage protection operation. As you may expect, new photovoltaic customers/generators are not happy as they see the network as an annoyance, unable to absorb their generation and preventing them from collecting their generation rates of up to 60c/kWh. These are major problems that need urgent attention.

The new photovoltaic phenomena will drive many changes. In my view:

- Australian voltage standards and some regulations require changing to accommodate the new voltage environment.
- Electricity distributors need to lower their supply voltage into the middle of the IEC 230V $\pm 10\%$ range – this will require major effort and come at some cost.
- Distributors need to design and build stronger and lower impedance low voltage networks to incorporate the lower voltage levels and accept the embedded generation – this will also come at some cost.
- Customer voltage complaints will increase as some older voltage sensitive electrical equipment fails to operate in the new lower voltage environment – customers will need to adapt. The wiring rules, AS3000 will need to be amended to put limits on "voltage rises" within installations.
- The over voltage protection on some PV inverter systems will need some fine tuning.

Over the years and decades ahead we are going to see a lot more embedded generation including wind, fuel cells, co-generation and micro hydro. The emphasis on renewables during the federal election campaign keeps highlighting the drivers in place that will cause more embedded generation connections. The photovoltaic phenomena is a new challenge for older networks. These challenges are there for us to identify and meet.

Dr Robert Barr
EESA National President

Bulletin 5, September - October 2010:

Please email submissions by the 8th of October to the Bulletin Editor,
Patrick McMullan on pmcmullan@energy.com.au

Upcoming Events

EESA 86th National Conference & Trade Exhibition

**Watt's up....
future-proofing energy networks**

1 - 3 September 2010

Brochure & Registration Available Now!!! www.tmm.com.au

To Register or to find out more on the National Conference **please go to www.eesa.asn.au or contact The Meetings Manager on 02 9810 7322 or meetings@tmm.com.au**

The 86th EESA National conference will be held at the Australian Technology Park, Eveleigh a location chosen that is easily accessible and convenient for the conference participants. It also allows the conference to display an increasing number of technologies to participants through the exhibition which is sold out. Some 26 exhibitors will be showcasing their latest products with over half being new exhibitors. The utilities attending are drawn from New Zealand, Queensland, Victoria, the ACT and NSW.

The theme for this year's conference "Designing Future Proof Energy Networks" will address the ongoing evolution needed in energy networks and the new drivers emerging that will change its nature and operation. All this in an environment of changing regulatory structures, utility restructuring, a continuing emphasis on overall sustainability, the pick up of intelligent grid applications, a further uptake in embedded generation and an unprecedented public spend by NSW energy utilities to replace aging networks and still cope with ongoing growth in energy demands.

The conference will start with a keynote address looking at the emerging role world wide for international standardisation in the energy sector presented by Dr. Alan Morrison, the current President of the International Organization for Standardization. This will be followed by a series of thought provoking keynote addresses from prominent figures in the electricity supply industry including Peter Birk from EnergyAustralia, Peter McIntyre from TransGrid, Rod Howard from Integral Energy and Ken Stonestreet from Country Energy. Dr. Ralph Craven, the Chairman of Ergon Energy and Bob Simpson from Transpower, New Zealand will also present their thoughts on the complex issues confronting the industry.

Then in the company of fellow utility members there will be one and a half days of industry learning to be enjoyed as current energy concerns and issues are discussed and clarified. Industry experts will provide timely papers and discussions on topics such as HVDC, Smart villages, customers and meters, implementing innovations in substation design, arc flash containment, a renewables and bioenergy update, details of some large ambitious energy projects, climate change and its impact on networks and asset management challenges and solutions.

The conference finale is another plenary session with the topic of "Energy scenarios out to 2030 and their impact on networks". This will provide a fascinating insight into the future problems confronting the next generation of engineers who will solve the problems with the usual mix of technology, good management and (possibly) good luck.

Once again the conference is very strongly supported by industry and utilities alike and so there is a special thanks to our sponsors, with our corporate members EnergyAustralia, Integral Energy, Country Energy and TransGrid taking up Gold Sponsorship, Wilson Transformers Silver sponsorship, ActewAGL Bronze sponsorship and Siemens General Sponsorship. The welcome reception will be sponsored by Schneider Electric and ABB is the host to the very popular conference dinner.

EESA AGM and Breakfast (please register your attendance with The Meetings Manager)

When: Friday 3 September, 7:30 am

Where: Australian Technology Park, Bay 4, Meeting Room 5C

Future meetings of interest

Save the Date – EESA National Conference 2011

Dates: 6 - 8 April 2011 (please note the earlier date)

Venue: Wrest Point Convention Centre, Hobart, Tasmania

Call for Papers and other details will be available soon after the September 2010 EESA National Conference.

News and Issues from around the Industry

Awards For Safety Sensor

Aurora Energy Media Centre July 23, 2010

Tasmania's electrical safety invention WireAlert - marketed in Tasmania as CablePI - has been declared the winner of two national business awards. The safety sensor, which detects potentially dangerous electrical faults, won the 2010 Australian Business Awards for Best Business Product and Product Innovation.

Greg Mannion, CEO of Ezikey, the Aurora Energy subsidiary company that makes and markets the device, said the award was recognition of the device's potential to improve household electrical safety around Australia and beyond.

Aurora Energy distributed the device free of charge to more than 200,000 households last year. "Up to the end of last month in Tasmania, these devices have already detected 101 potential electric shock conditions, 620 potential fires and 1168 other electrical safety issues in homes." "This puts Tasmania's low voltage electrical distribution system well on track to becoming the safest in the country." Aurora said WireAlert won a Best Business Product award from a field of 93 entries and the Product Innovation category had a field of 86 entries.

<http://www.auroraenergy.com.au/news/default.asp?file=23-july-2010.txt>

AER Chairman appointed

Australian Energy Regulator Release # NR 006/10 July 26, 2010

Mr Andrew Reeves has been appointed Chair of the Australian Energy Regulator for three years from 19 July 2010. Mr Reeves has been the part-time state/territory member of the AER since 17 July 2008.

The AER regulates the wholesale electricity market and is responsible for the economic regulation of the electricity transmission and distribution networks in the national electricity market (NEM). The AER is also responsible for the economic regulation of gas transmission and distribution networks and enforcing the national gas law and national gas rules in all jurisdictions except Western Australia. The AER is an independent legal entity and part of the Australian Competition and Consumer Commission. Mr Reeves succeeds the inaugural chair Mr Steve Edwell.

<http://www.aer.gov.au/content/index.phtml/itemId/738477>

New Air Conditioner Conquers All Climates, Saves Up To 90% Energy

Free Republic June 22, 2010

The U.S. Department of Energy's National Renewable Energy Laboratory (NREL) has invented a new air conditioning process with the potential of using 50 percent to 90 percent less energy than conventional air conditioners. It uses membranes, evaporative cooling and liquid desiccants in a way that has never been done before in the centuries-old science of removing heat from the air.

NREL mechanical engineer Eric Kozubal, co-inventor of the Desiccant-Enhanced eVaporative air conditioner (DEVap), says that the idea is to revolutionize cooling, while removing millions of metric tons of carbon from the atmosphere.

Engineers have known for decades the value of desiccants to air conditioning. In fact, one of the pioneers of early air conditioning, Willis Haviland Carrier, knew of its potential, but opted to go the refrigeration route.

The desiccants NREL uses are syrupy liquids, highly concentrated aqueous salt solutions of lithium chloride or calcium chloride. They have a high affinity for water vapor, and can thus create very dry air.

Because of the complexity of desiccant cooling systems, they have traditionally only been used in industrial drying processes. The need to invent a device simple enough for easy installation and maintenance has impeded desiccant cooling from entering into commercial and residential cooling markets.

The membranes in the DEVap air conditioner are hydrophobic, which means water tends to bead up rather than soak through the membranes. Imagine rain falling on a freshly waxed car. That property allows the membranes to control the liquid flows within the cooling core. "It's that property that keeps the water and the desiccant separated from the air stream," Kozubal said. "We bring the water and liquid desiccant into DEVap's heat-mass exchanger core," Kozubal said. "The desiccant and evaporative cooling effect work together to create cold-dry air."

The air is cooled and dried from a hot-humid condition to a cold and dry condition all in one step. This all happens in a fraction of a second as air flows through the DEVap air conditioner. The result is an air conditioner that controls both thermal and humidity loads.

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News and Issues from around the Industry

Traditional air conditioners use a lot of electricity to run the refrigeration cycle, but DEVap replaces that refrigeration cycle with an absorption cycle that is thermally activated. It can be powered by natural gas or solar energy and uses very little electricity. This means that DEVap consumes 50 percent to 90 percent less energy than top-of-the-line refrigeration-based air conditioning. DEVap also avoids the use of hydrofluorocarbons which create green house gas emissions.

Eventually, NREL will license the technology to industry, "We're never going to be in the air conditioner manufacturing business", said Ron Judkoff, Principle Program Manager for Building Energy Research at NREL. "But we'd like to work with manufacturers to bring DEVap to market and create a more efficient and environmentally benign air conditioning product."

<http://www.freerepublic.com/focus/f-news/2542407/posts>

Radio Waves: Alternative Power Source

Technology Engineering Section of PhysOrg.com July 20, 2010

Researchers at Duke University are harvesting ambient radio waves to power small microprocessor devices that consume very little energy. Devices such as sensors that monitor critical environmental changes can be powered from radio waves.

Dr. Matt Reynolds, an assistant professor at Duke University, heads the electrical and computer department. Matt has demonstrated a low power device that is fitted into a hard-hat. Called a SmartHat, the device sounds a beeper that warns when dangerous equipment is nearby on a construction site.

The radio waves are harvested from wireless network transmitters installed on backhoes and bulldozers; they are used to keep track of their location. The low power sensor is used to monitor the direction and strength of the radio signal and warns the hard-hat wearer if they are too close.

Matt and his associates are inventing devices that consume so little power that batteries aren't required to run them. Ambient radio waves are sufficient to operate these devices equipped with low power microprocessors.

Powercast is a company that sells radio wave transmitters and receivers that use radio waves to operate low power devices. The company recently released a receiver for charging battery-free wireless sensors; the receiver powers modules that include microcontrollers from Microchip Technology.

Because radio waves spread and lose their energy rapidly, this technology hasn't been explored very much. With the recent advancements in silicon technology, tiny amounts of electricity can now be made to do useful work.

At Intel, Dr. Smith is exploring the use of electromagnetic radiation and creating an electronic "harvester" of ambient radio waves. The harvester collects enough energy from a TV station that's approximately 2.5 miles from the lab to run a temperature and humidity sensor. The device collects enough power to produce about 50 microwatts of power that's sufficient to operate many sensors. In comparison a solar powered calculator only consumes about 5 microwatts.

Dr. Reynolds of Duke University stated: "We are on the cusp of an explosion in small wireless devices than can run on alternatives to battery power. Devices like this can live on and on."

<http://www.physorg.com/news198855586.html>

Switching Off Your Lights Has a Bigger Impact Than You Might Think

ScienceDaily July 1, 2010

Switching off lights, turning the television off at the mains and using cooler washing cycles could have a much bigger impact on reducing carbon dioxide emissions from power stations than previously thought, according to a new study published this month in the journal Energy Policy. The study shows that the figure used by UK government advisors to estimate the amount of carbon dioxide saved by reducing people's electricity consumption is up to 60 percent too low.

The power stations that supply electricity vary in their carbon dioxide emission rates, depending on the fuel they use: those that burn fossil fuels (coal, gas and oil) have higher emissions than those driven by nuclear power and wind. In general only the fossil fuel power stations are able to respond instantly to changes in electricity demand.

Dr Adam Hawkes, the author of the new study from the Grantham Institute for Climate Change at Imperial College London, says the government should keep track of changing carbon emission rates from power stations to ensure that policy decisions for reducing emissions are based on robust scientific evidence. The new study suggests that excluding power stations with low carbon emission rates, such as wind and nuclear power stations, and focussing on those that deal with fluctuating demand would give a more accurate emission figure.

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News and Issues from around the Industry

Scientists advising government on for the best ways to reduce electricity demand currently use an estimated figure for emission rates. The new study shows that, at 0.43 kilograms of carbon dioxide per kilowatt hour of electricity consumed, this figure is 60 percent lower than the actual rates observed between 2002 and 2009 (0.69 kilograms of carbon dioxide per kilowatt hour), meaning that policy studies are underestimating the impact of people reducing their electricity use.

Dr Adam Hawkes, author of the paper, and a Visiting Fellow at the Grantham Institute for Climate Change at Imperial College London, said: "One way governments are trying to mitigate the effects of climate change is to encourage people to reduce their energy consumption and change the types of technologies they use in their homes. However, the UK government currently informs its policy decisions based on an estimate that, according to my research, is lower than it should be.

"This means any reduction we make in our electricity use -- for example, if everyone switched off lights that they weren't using, or turned off electric heating earlier in the year -- could have a bigger impact on the amount of carbon dioxide emitted by power stations than previously thought. However, this also acts in reverse: a small increase in the amount of electricity we use could mean a larger increase in emissions than we previously thought, so we need to make sure we do everything we can to reduce our electricity use," added Dr Hawkes.

Dr Hawkes drew upon 60 million data points showing the amount of electricity produced in each half-hour period by each power station in Great Britain from the start of 2002 to the end of 2009. He also calculated the emissions of each different type of generator by examining government data showing their average annual fuel use. Finally, he took these two sets of data to calculate the emissions rate that should be attributed to a small change in electricity demand.

The results show that, for 2002-09, the carbon dioxide emission rate for estimating the effect of a small change in electricity demand is 0.69 kilograms of carbon dioxide per kilowatt hour of electricity consumed. This is 30 percent higher than the average emissions rate across all power stations, which is 0.51 kilograms of carbon dioxide per kilowatt hour, and 60 percent higher than the figure currently used by government advisors, which is 0.43 kilograms of carbon dioxide per kilowatt hour.

Professor Sir Brian Hoskins, Director of Imperial's Grantham Institute for Climate Change, said: "This is a very important study that could help policy makers make more informed decisions to reduce our carbon emissions. The government needs a good understanding of the figures it uses to support policy analysis, because this has a big impact on which technologies we employ to reduce our energy use. With a more accurate picture of what is going on, we will be much better equipped to tackle our carbon dioxide emissions."

This research was funded by the Grantham Institute for Climate Change at Imperial College London.

<http://www.sciencedaily.com/releases/2010/06/100630101022.htm>

South Australia Set To Become Nation's Green Energy Power House

South Australian Government 16 July, 2010

Premier Mike Rann says a major independent report released by the State Government has provided a blueprint designed to establish South Australia as a significant green energy power house for Australia's eastern seaboard. Mr Rann says South Australia currently easily leads the nation in renewable energy investment, but now a feasibility study by a consortium lead by Macquarie Capital provides the key to unlocking billions of dollars more in green energy investment in SA and across the country.

"The report estimates that under their proposed plan, \$4.5 billion of green power investment for South Australia's Eyre Peninsula would be rolled out between 2015 to 2018. "It says \$1.8 billion would be spent in South Australia which would include building strategic transmission lines to tap into the Eyre Peninsula's outstanding wind resource. "At the moment, the Eyre Peninsula has an incredible capacity of four major wind zones with wind speeds above 8 metres per second - creating a potential of 10,000 MW of generation.

"The report shows that Stage One of the project could attract \$4.5 billion in a further 2000 MWs of wind power in our State - to add to the near 1000 MW of wind power already installed in South Australia (a \$2 billion investment). "The report also indicates that an additional 1000MW of wind generation could be accommodated right now within South Australia's existing grid. "This is one of the most exciting investment opportunities for South Australia that we expect the private sector to grab with both hands. I am pleased that four internationally experienced wind energy companies have already expressed great interest in the project. "The report establishes that the project is commercially viable and there is no need for direct State Government financial involvement.

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News and Issues from around the Industry

"The transmission connections required are a new \$613 million line from Elliston to Port Augusta along with a new \$840 million backbone for the existing network connection from Port Augusta to Heywood in Victoria." The report shows South Australia has the potential to contribute 30 per cent of the entire nation's renewable energy target. In other words – our State can be a major source of green power for the eastern States so they can reach their targets.

"The addition to South Australia's Gross State Product is estimated at \$158 million per year and the savings in greenhouse gases from this investment proceeding are forecast at 2.75 million tonnes of CO2 per annum across the National Electricity Market.

"It will require a change to the Federal regulations – but I expect the release of this report will accelerate the decision-making timetable for the changes required, given the national economic and environmental significance of this project." South Australia has now set a new target of 33 per cent of South Australia's power generation coming from renewable energy by 2020 – which is bold, even in international terms. "This project would see that target exceeded by 2015." Mr Rann said.

<http://www.ministers.sa.gov.au/images/stories/mediareleasesJUL10/green%20grid%20report2-1.pdf>

Job Opportunity

TransGrid seeks candidates for top executive positions

TransGrid is seeking candidates for two Executive General Management positions for its Capital Program Delivery and Network Planning and Performance Groups.

The NSW transmission network operator is undertaking its largest ever capital works program, investing over \$2.6 billion in the NSW transmission network over a five year period.

The two Executive General Management positions will direct the planning and development of TransGrid's important capital works program, to ensure the transmission grid continues to deliver a secure, reliable and safe electricity supply to more than three million customers in NSW and the ACT.

The Executive General Manager of Capital Program Delivery will lead TransGrid's engineering, design, research and project management capabilities. The position will involve leading a team of more than 170 people and delivering more than 88 major projects across the state over a five year period.

The Executive General Manager of Network Planning and Performance will oversee the development and optimisation of TransGrid's high voltage network. The role will direct TransGrid's planning and performance, asset management, demand side solutions, customer access and will require the management of more than 70 dedicated staff.

TransGrid is seeking applications from proven energy-sector executives with extensive understanding and experience in infrastructure asset management or infrastructure delivery.

Both Executive General Manager positions report directly to the Managing Director.

Potential candidates should contact Watermark Search International on (02) 92331200 OR e-mail: search@watermarksearch.com.au. Applications close on Friday 20 August 2010.



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