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INTELLIGENT GRID

NEWS
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Distributed Energy Roadmap

Welcome to the third edition of iGrid News. The Intelligent Grid Cluster (iGrid), is working in collaboration with CSIRO to develop the first Australian Distributed Energy Roadmap. The roadmap will assess the potential for "intelligent" distributed energy, including energy efficiency, load management, small-scale local power generation and smart meters, and identify the barriers to its implementation. Due to be released late next year, the roadmap will be a concise and practical plan to accelerate deployment of distributed energy across Australia.

The roadmap will be developed through a series of forums held around Australia. This process will commence at the Industry Forum "Distributed Energy: Reducing Greenhouse Gas Emissions Now" to be held on April 7 at Customs House, Brisbane. The forum provides an opportunity for Industry stakeholders as well as policy makers and regulators to contribute to the development of the Distributed Energy Roadmap.

The Intelligent Grid Research initiative aims to establish an advanced electricity distribution network in Australia to meet the twin challenges of reducing carbon emissions and reining in rising power costs. The key to early greenhouse abatement is through a mix of distributed generation, demand management and energy efficiency. Not only can this ensure a more robust and efficient electricity network it will also be cheaper and more sustainable.

The need for a more intelligent grid has been recognised in the United States as an "essential national asset" with $4.6B set aside in the stimulus bill for the development of Smart Grid according to Smart Grid News. Professor Stuart White, iGrid Leader and Director of the Institute for Sustainable Futures at the University of Technology, Sydney, said Australia should follow the lead of the US.

"Australian electricity networks are about to undertake their biggest ever investment in new infrastructure," Professor White said. "Consumers face bigger bills as a result, which will only get bigger when carbon pollution reduction measures are introduced. It is crucial that we act now to maximise use of smaller scale, local energy options that simultaneously reduce emissions and costs. The intelligent grid of tomorrow involves not just smarter metering, control and communication but also smarter pricing, smarter regulation and smarter decision making," Professor White said.

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Welcome to **iGrid News**

Our quarterly newsletter for clients, research partners and others who are interested in the iGrid cluster research.

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New iGrid Researchers

Welcome to Mr Tareq Aziz and Mr Sudarshan Dahal from the University of Queensland.
Mr Aziz will be involved in the research for Project 1 *Control Methodologies of Distributed Generation*. His component of the project will be to aid the development of the control methodologies for assessing the penetration of distributed generation systems in the existing electricity grid. Tareq has completed a Bachelor of Science majoring in Engineering and a Master of Science in Electrical & Electronic Engineering both from Bangladesh University of Engineering & Technology (BUET) in 2002 and 2005 respectively. He worked as a faculty member in Khulna University of Engineering & Technology and American International University-Bangladesh. Currently he is doing his PhD in the School of Information Technology & Electrical Engineering at the University of Queensland. His research interests include renewable energy extraction, power system stability and signal processing.

Sudarshan Dahal will also be working on Project 1 *Control Methodologies of Distributed Generation*. Sudarshan will be involved in researching the issue of power system volatility with wind power generation, his specific focus is on signal stability.
Sudarshan completed a Bachelor of Electrical Engineering from Tribhuvan University, Nepal and Masters of Engineering from Tokyo Institute of Technology, Japan in 2003 and 2008 respectively. He worked as an electrical engineer at Nepal Electricity Authority from 2004 to 2006. Currently he is completing his PhD at the School of Information Technology and Electrical Engineering, University of Queensland. His research interests are renewable energy, system modelling and stability assessment.

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The International Energy Agency estimates that by adopting new energy efficiency measures, constructing green energy infrastructure and taking steps to integrate cleaner energy into the power grids, greenhouse gas emissions can be reduced by almost 40 per cent relative to the projected baseline emissions for 2030.

The iGrid program is supported by the CSIRO Energy Transformed National Research Flagship and five participating universities: University of Technology Sydney, the University of Queensland, the University of South Australia, Queensland University of Technology and Curtin University.

The next forum **"The Business Case for Distributed Energy"** will be held in Melbourne on May 28.

This event will be the second in a series of six stakeholder consultative forums around the country over the next 18 months, focusing on the development of an Australian Distributed Energy Roadmap. This particular forum will focus on the costs and benefits of Distributed Energy.

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Turning sub-stations into power stations

While some electricity industry professionals and academic experts have come to understand and champion the benefits of distributed energy (DE) systems and associated intelligent grids, the majority appears to be mostly ignorant of these concepts. Others' perceptions are often based on information that is out of date with respect to the technological benefits and commercial opportunities. There is also some hostility to the concept as it challenges the prevailing paradigm of a centralised electricity system with a relatively small number of very large power stations.

Some of this is understandable given that the distribution system is very complex and non-uniform. It has tens of thousands of nodes (sub-stations) that are of different sizes and operating parameters. This has led to a difficulty in putting hard economic numbers in front of key stakeholders and regulators.

However, peak demand growth is out of control and is leading to enormous capital expenditures in the distribution and transmission sectors. The New South Wales network businesses alone are forecast to spend more $17 Billion over the next 5 years! Due to an extreme lack of regulatory alignment between different parts of the electricity system this expenditure is mostly wasted. It does nothing to address the system's current monumental challenge of reducing greenhouse gas emissions (GHG) not to mention meeting the additional generation capacity and reserve margin requirements forecast for the NEM and the WEM (Western Australian Electricity Market).

This project's goal is to rigorously model and quantify the benefits of distributed energy systems while, at the same time, taking into account the costs of deploying and integrating them into the Australian electricity system. In particular, the project will take into account recent and ongoing technological change and technological diffusion that is making key technologies, such as battery storage, solar PV and thermal cheaper. This project is led by Prof. John Foster, an expert in innovation, and based at the University of Queensland's School of Economics within the Energy Economics and Management Research Group (EEMRG).

The broad aim is to identify how the costs of generation and network expenditure, due to the imperative for climate change mitigation, aging infrastructure and peak demand growth, can be addressed by distributed energy systems.

Working together with iGrid Project 4: *Institutional Barriers, Stakeholder Engagement and Economic Modelling*. that deals with Institutional Barriers, researchers on this project are in the process of forming close collaborative relationships with key industry stakeholders, including electricity distributors, regulators, and generation infrastructure investors. The sharing of data about the layout and configuration of electricity networks and the augmentation projects between the iGrid and stakeholders will be essential for a complete quantification of the benefits of DES. Economic case studies of network regions, with various levels of forecast congestion problems, will be undertaken. In addition, generic methodologies will be developed to assess DES's economic benefits in arbitrary network layouts.

Stakeholders are invited to discuss collaboration opportunities by contacting Prof. John Foster (j.foster@uq.edu.au).

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