

# Renewable and Distributed Generation

24-25 November 2011 - University of Wollongong

With the support of the NSW Government Energy Efficiency Training Program, a professional development course in power engineering is presented by the Endeavour Energy Power Quality and Reliability Centre and the Sustainable Buildings Research Centre, at the School of Electrical, Computer and Telecommunications Engineering, University of Wollongong.

## Course Objectives

Renewable and distributed generation provide an effective means to improve network efficiency, decrease reliance on high carbon emission generation, and allow consumers to increase responsibility for their own electricity needs. However, the rapidly increasing installation of renewable and distributed generation such as solar and wind has increased the complexity and uncertainty in operation, control and protection of the networks. In addition, inclusion of these resources has potential to introduce system instability, unplanned outages, operational conflicts, safety hazards, and malfunction of control and protective devices. It has been already reported that distribution feeders at certain areas are approaching the limit for hosting these new additions. The Renewable and Distributed Generation course will give a practical understanding of; (i) the principles, practices and problems associated with these resources, (ii) the operation, control and protection of generation-rich electricity distribution networks, and (iii) network planning and reliability aspects for facilitating integration of these new generating units.

This course will cover mainly solar and wind power integration, and energy storage applications. Delegates will learn fundamental aspects, operation, control and protection techniques, and methods of integration to improve supply quality and reliability for utilities and customers. Course participants will also be presented with practical case studies of renewable energy integration problems and solutions from local industry experts and researchers.

## Course Benefits

Following the course you will have gained knowledge and skills to assist you in the following;

- an understanding of different renewable and distributed generation resources, their operation, and functional aspects,
- a systematic understanding of the impact of different renewable and distributed generation resources on electricity network operation, control and protection,
- knowledge of guidelines and standards for integration of these new energy resources into electricity grids,
- power electronic interfaces for different types of renewable energy resources and their particular applications for network benefits,
- knowledge of how utilities can accommodate these devices economically without violating network constraints,



- practical understanding of various power quality problems associated with renewable and distributed generation integration including exposure to specific case studies, and
- Empowerment to liaise with project managers, owners, vendors, consultants and utilities on related projects at concept, tendering and implementation stages.

## Who Should Attend?

Managers, utility specialists and senior technical staff who wish to advise customers on renewable energy integration, or who service large customers or who wish to understand aspects of network design, construction and maintenance techniques for maximising renewable energy penetration. Personnel working in all areas of power system design who wish to know how the system interacts with the end-user, and end users themselves, will also gain from this course.

## The Venue

The course will be held at the School of Electrical, Computer and Telecommunications Engineering, Building 35, University of Wollongong, Northfields Avenue, Wollongong.

## About the Speakers

**Associate Professor Sarath Perera** is Technical Director of the Endeavour Energy Power Quality and Reliability Centre and an Associate Professor in the School of Electrical, Computer and Telecommunications Engineering. His research interests include power quality, distribution system reliability, EMC and power system simulation techniques.

**Associate Professor Kashem Muttaqi** is an Associate Professor in the School of Electrical, Computer and Telecommunications Engineering. His areas of research cover distributed generation, renewable energy and distribution system automation.

**Professor Danny Sutanto** is Professor of Power Engineering in the School of Electrical, Computer and Telecommunications Engineering. His research interests include power electronic applications in industry and electrical transmission and distribution networks.

**Dr. Phil Ciufo** is a Senior Lecturer in the School of Electrical, Computer and Telecommunications Engineering. His areas of research include AC machine analysis and control, power system analysis, smart grids and distributed generation.

**Dr. Ashish Agalgaonkar** is a Lecturer in the School of Electrical, Computer and Telecommunications Engineering. His areas of research include impact



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of distributed generation on distribution systems, load modelling, system stability and micro-grids.

**Dr. Lasantha Meegahapola** is a Lecturer in the School of Electrical, Computer and Telecommunications Engineering. His areas of research include renewable power generation, system stability, active distribution networks and reactive power control, and intelligent power systems.

**Mr. Sean Elphick** is a Professional Officer with the School of Electrical, Computer and Telecommunications Engineering. He is active in the areas of solar PV, power quality monitoring and data analysis.

**Professor Leith Elder** is Senior Engineer Network Research with Essential Energy and has wide experience in electricity tariffs, electricity market and distributed generation installation dealing with problems of network design and operation.

**Dr. David Cornforth** is a Research Scientist at the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Newcastle, Australia. His background is in mini-grids, multi-agent simulation, and evolutionary optimisation.

**Mr. Neil Browne** is Power Quality, Protection and Operational Analysis Manager with Endeavour Energy with experience of planning distribution networks containing distributed generation.

**Mr. Rob Corke** is Manager - Plant Reliability with Ausgrid and has extensive experience with protection systems for distributed generation.

**Dr. Duane Robinson** is a Senior Lecturer with the Sustainable Buildings Research Centre. His area of research interests are energy efficiency, renewable energy and power quality.

## Course Outline

The course is conducted over two days commencing at 8:30 am on Thursday 24 November, 2011 and comprises lectures and demonstrations. Present course outline is provided below.

### Day 1

Time	&	Topic
8:30 am		Registration
		<ul style="list-style-type: none"> <li>Introduction to renewable and distributed generation</li> <li>Photovoltaic systems and solar energy</li> </ul> <p style="text-align: center;"><i>Morning Tea</i></p> <ul style="list-style-type: none"> <li>Wind energy systems</li> <li>Fuel cells and energy storage technologies</li> </ul> <p style="text-align: center;"><i>Lunch</i></p> <ul style="list-style-type: none"> <li>Power electronic applications in renewable energy integration</li> <li>Micro-grids</li> </ul> <p style="text-align: center;"><i>Afternoon Tea</i></p> <ul style="list-style-type: none"> <li>Network planning with distributed generation</li> <li>Voltage regulation with distributed generation</li> </ul>
5:30 pm		Conclusion Day 1

### Day 2

Time	&	Topic
8:30 am		Start Day 2
		<ul style="list-style-type: none"> <li>Impact of distributed generation on network reliability</li> <li>Distributed generation dynamics and stability</li> </ul> <p style="text-align: center;"><i>Morning Tea</i></p> <ul style="list-style-type: none"> <li>Impact of distributed generation on power quality</li> <li>Control of power electronics interfaces for network support</li> </ul> <p style="text-align: center;"><i>Lunch</i></p> <ul style="list-style-type: none"> <li>Distributed generation protection</li> <li>Simulation exercises and laboratory demonstration</li> </ul> <p style="text-align: center;"><i>Afternoon Tea</i></p> <ul style="list-style-type: none"> <li>Distributed generation economics</li> <li>Distributed generation standards and grid codes</li> </ul>
5:30 pm		Conclusion Day 2

## Training Investment

The course investment provides for an inclusive industry related training package with course notes, lunches and morning and afternoon tea. Course fee per person is AUD\$ 1,210 including GST.

## Extended Course Program

This professional development course is one of several offered as part of the energy efficiency training for engineers program (eete@UOW) at the University of Wollongong in 2011-2012. Other courses included in the program are;

Course Title	Date
• Energy efficiency enhancement through retrofitting of commercial buildings	TBA Nov 2012
• Energy auditing and de-carbonization of the built environment	1-2 Dec 2011
• Energy efficiency enhancement in domestic buildings	24-25 Nov 2011
• Energy efficiency in electrical energy utilisation	8-9 Dec 2011
• Electricity network energy efficiency enhancement	9-10 Feb 2012
• Smart metering and demand side management	TBA Nov 2012
• Energy auditing and efficiency enhancement in industry systems	TBA Nov 2012
• Improving energy efficiency in industrial processes	TBA Nov 2012

\* Dates marked TBA are proposed to be held in November 2012

Organisations or individuals registering as a group or in one or more of the above courses within the energy efficiency training for engineers program may be entitled to a group or multiple course discount.

## Accommodation

Arrangements for accommodation are the responsibility of participants and costs are not included in the course fee. A list of hotels and motels in the Wollongong area will be supplied to participants upon registration.

## Enquiries

*Registration enquiries:*

Please call **Ms Esperanza Gonzalez** at the School of Electrical, Computer and Telecommunications Engineering, University of Wollongong.

Phone: (02) 4221 3580

Fax: (02) 4221 3236

Email: [eriley@uow.edu.au](mailto:eriley@uow.edu.au)

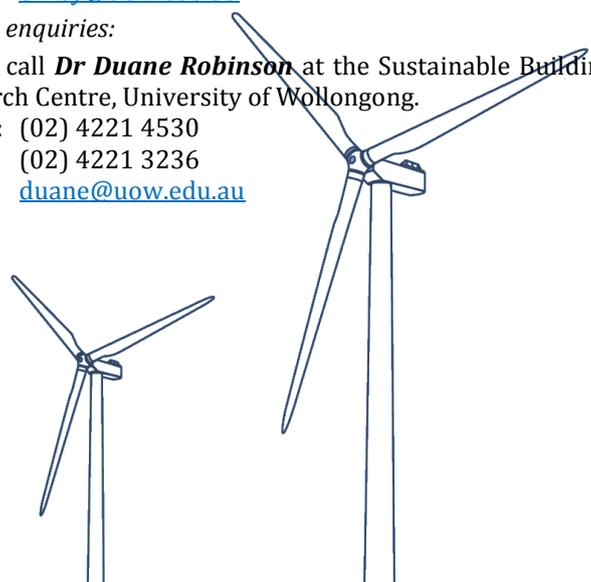
*Course enquiries:*

Please call **Dr Duane Robinson** at the Sustainable Buildings Research Centre, University of Wollongong.

Phone: (02) 4221 4530

Fax: (02) 4221 3236

Email: [duane@uow.edu.au](mailto:duane@uow.edu.au)





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## Registration Form



Please enrol me in the two-day course "Renewable and Distributed Generation" to be held in Wollongong, Australia from 24-25 November 2011.

Cost per person: AUD\$ 1,210 inclusive of GST

Please register before 11 November 2011 (please see Note below).

Surname:.....Given Name:.....

Organisation.....Job title/position.....

Postal Address.....

State.....Postcode.....Country.....

Telephone.....Fax.....

Mobile.....Email.....

Special dietary requirements.....

### Pre-Course Questionnaire

To assist in evaluating and maintaining high quality courses, please complete the brief pre-course questions below at time of registration (Please circle the appropriate weighting).

	Very limited		Very Extensive		
My knowledge in the field of renewable and distributed generation is:	1	2	3	4	5
My project experience in the field of renewable and distributed generation is:	1	2	3	4	5
My organisation's objectives in the field of renewable and distributed generation are:	1	2	3	4	5
My organisation's project experience in the field of renewable and distributed generation is:	1	2	3	4	5

### Methods of Payment

If you wish to pay by **credit card**, please fill out the details below and **fax to +61 2 4221 3236**.

Please debit (circle):      Bankcard    Visa      Mastercard

Card number:

Expires:   /   in the amount of

AUD\$.....

Name on card: .....

Signature: .....

Email for receipt: .....

**Cheque payable to "The University of Wollongong"**

**Mail to:**      Attention: Ms E. Gonzalez  
R & DG Course Registration  
School of Electrical, Computer and Telecommunications Engineering  
University of Wollongong NSW 2522  
Australia

**Note:** There is no guarantee that economic participation levels for this course can be achieved. Registrants will be notified on the 14 November 2011 if the course cannot proceed due to insufficient numbers. The program may be changed at any time due to unforeseen circumstances. If the course cannot proceed for any reason, UOW will not accept liability of whatsoever kind for expenses incurred by any person or corporation with the sole exception of the course investment, which will be refunded in full.