

# ANCILLARY SERVICES IN A COMPETITIVE ELECTRICITY INDUSTRY

## Live Online Training Course: The essential engineering systems that underpin Competitive Electricity Industry operation

This course is for experienced staff within the electricity industry, its equipment suppliers and governance bodies who wish to learn more about the essential engineering systems that underpin electricity industry operation.

**November**

Course Parts will commence at **13:00** and end at **17:00** (AEST). There will be short breaks during each course Part.

Part 1: **5<sup>th</sup> November**

Part 2: **6<sup>th</sup> November**

**2 Part Series**



### Our Expert Course Instructor



#### Dr Hugh Outhred

Hugh has delivered over 125 training courses on electricity industry design and renewable energy integration for governments, non-government organisations, the electricity supply industry and private industry in 14 countries.

### Key Learning Objectives - Improved Understanding Of:

- ▶ The complex engineering systems that underpin electricity industry operation
- ▶ How ancillary services fit into overall electricity industry design and operation
- ▶ Current practice in the provision of ancillary services including implementation of ancillary services in Europe, North America and the National Electricity Market (NEM)
- ▶ Strengths and weaknesses of current ancillary service arrangements in the context of increasing penetration of converter-interfaced devices, including wind and PV generation and many kinds of reversible storage and end-use equipment
- ▶ Future trends including potential enhancements to the provision of ancillary service in the NEM

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## ABOUT THE COURSE

This course provides experienced staff in the electricity industry, its equipment suppliers and governance bodies with an understanding of the concepts and challenges associated with ancillary service design and provision and how ancillary services fit into the overall task of electricity design, including future trends.

The course begins with a short review of electricity industry structure and operation, including a summary of implementation in the NEM, trends in electricity industry technology and a discussion of the implications of the increasing deployment of converter-interfaced devices.

The course then moves onto an overview of the theory behind design and operation of a competitive electricity industry (engineering, economics and governance) and the compromises involved in practical implementation, including how ancillary services fit into overall electricity industry design and operation.

This is followed by a summary of current international practice in the provision of ancillary services, placing implementation of ancillary services in the NEM in that context. This provides a basis for discussing strengths and weaknesses of current ancillary service arrangements in the light of increasing penetration of converter-interfaced devices, including wind and PV generation, reversible storage and flexible demand.

The final session of the course will discuss recent developments in ancillary service design and implementation as well as future trends, with a particular focus on the National Electricity Market.

## WHO WILL BENEFIT

The course is aimed at engineers and others who have had some exposure to engineering issues associated with the electricity industry. It will not assume high-level engineering knowledge but will provide an opportunity for high-level technical discussions if participants so wish.

## WHAT OUR CLIENTS SAY

*"Over the years I have attended many training courses provided by [Informa Corporate Learning]. I have always found the course content to be relevant and accurate and the course facilitators to be leaders in their field."*

Analyst, **ENI Australia Ltd.**

## EXPERT COURSE INSTRUCTOR



### Dr Hugh Outhred

Hugh Outhred is the Managing Director of Ipen Pty Ltd, a company established in 1998 to provide independent perspectives on energy, society and the environment. Hugh holds a PhD in Electrical Engineering from the University of Sydney and is a Fellow of the Australian Institute of Energy.

Hugh has provided advice and taught 125 short courses since 1988 on electricity industry design and renewable energy integration for governments, non government organisations, the electricity supply industry and private industry in 14 countries.

Hugh has contributed to the theory of electricity industry design since 1979 and to its practical implementation in Australia since the 1980's. In 1985 and 1986, he was seconded to the government of New South Wales as an advisor on electricity competition and sustainability. In 1995 and 1996, he led a project for the National Grid Management Council to undertake electricity trading experiments to trial the proposed National Electricity Market trading rules prior to their formal implementation. In 1997, he was appointed as an inaugural member of the NSW Licence Compliance Advisory Board, a position he held until the Board was replaced as part of revised industry governance arrangements in 2001 and in 1998 he was appointed as an inaugural member of the Australian National Electricity Tribunal - a position he held until the Tribunal was replaced as part of revised industry governance arrangements in 2006. In 2008, Hugh was a Lead Author for the IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation, which was published in 2011.

Hugh retired from the School of Electrical Engineering and Telecommunications at the University of New South Wales in September 2007 from the positions of inaugural Presiding Director of UNSW's Centre for Energy and Environmental Markets and Head, Energy Systems Research Group in the School of Electrical Engineering and Telecommunications.

Hugh was a Fulbright Senior Fellow at the University of California Berkeley in 1994 and has held visiting positions at Massachusetts Institute of Technology in the USA, the University of Liverpool in the UK, the Universidad Pontificia Comillas in Spain, Roskilde University Centre in Denmark and Murdoch University in Perth. He has been a Board member of the Australian Cooperative Research Centre for Renewable Energy, an Associate Director of UNSW's Centre for Photovoltaic Devices and Systems and a member of CSIRO's Energy Flagship Advisory Committee.

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## Course Outline

### The complex engineering systems that underpin the electricity industry

- Understanding and managing the dynamic behaviour of a conventional electricity industry supplied by large turbo-alternator generators
- Understanding and managing the dynamic behaviour of an electricity industry with a high penetration of distributed resources – small scale generation, reversible storage and flexible end-use
- Understanding and managing the dynamic behaviour of an electricity industry with a high penetration of converter-interfaced devices

### Design of competitive electricity industries, with particular attention to ancillary services

- Design of a competitive electricity industry using conventional technologies
- Design of a competitive electricity industry with a high penetration of distributed resources – small scale generation, reversible storage and flexible end-use
- Design of a competitive electricity industry with a high penetration of converter-interfaced devices

### Current practice in the provision of ancillary services

- Overview of the design and provision of ancillary services in Europe, North America and the Australian NEM
- Strengths and weakness in the design and provision of ancillary services

### Emerging issues and future directions in the design and provision of ancillary services

- Emerging issues and future trends in the provision of ancillary services in Europe, North America and the Australian NEM
- Implications for the Australian NEM

## Would You Like To Run This Course On-Site?

### Informa Corporate Learning: On-site & Customised Training

If you have **8+** interested people, an onsite course can be an ideal solution. Speak with **Anton Long** or **Holly Baldwin** on **+61 (02) 9080 4455** to discuss your customised learning solution, or email [training@informa.com.au](mailto:training@informa.com.au)

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## Easy Ways to Register

**1 Web**  
[www.informa.com.au/ancillaryservices](http://www.informa.com.au/ancillaryservices)

**2 Telephone**  
+61 (02) 9080 4395

**3 Email**  
[training@informa.com.au](mailto:training@informa.com.au)

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- **Invest** in yourself. Invest in your team.

**Register today** for our **Live Online Training** courses and find out how they can help you transform the way you work. Contact one of our training consultants on [training@informa.com.au](mailto:training@informa.com.au) to find out more.

## Ancillary Services in a Competitive Electricity Industry

Course Code	Location	Course Parts	Month	Standard Price	4+ Dels Discount
P20GT20SY02V	Live Online Training	All 2 Parts	November 20	\$1,295 + \$129.50 GST	<b>\$1,424.50</b> <b>Great Savings:</b> When you book <b>4 or more</b> participants! <b>Call us</b> today on <b>+61 (2) 9080 4395</b> or email <a href="mailto:training@informa.com.au">training@informa.com.au</a> to take advantage of the discount offer.

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### Informa Corporate Learning – On-site & Customised Training

Informa Corporate Learning has a long-standing track record of delivering very successful customised learning solutions achieving real and measurable value for our clients through our senior training consultants.

If you have 8+ interested people, an on-site course can be the ideal solution – giving you the opportunity to customise our course content to your specific training needs, as well as attracting significant savings compared to public course costs.

### Why Choose On-site With Informa Corporate Learning?

- 1. Custom design** – Together, we will identify the best blended learning solution for your culture, your people and your training objectives.
- 2. Quality Assured** – We design market-leading training programs, concepts and methodologies, with a 400+ course portfolio. Our rigorously selected 900+ instructor faculty are recognised experts in their field. Quality of their content and delivery methods is assured through continuous monitoring and evolution.
- 3. On-site training** is a cost effective way to train your people and achieve your defined outcomes.

### Our Long Standing Clients Include:

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