



Joint workshop, 31 January 2005: CEEM-UNSW & ERC-UCD



10.00: Introductions

10.15: CEEM Research program overview (Hugh Outhred)

10.45: UCD Energy research (Mark O'Malley)

11.15: Optimal Plant Mix Project (Ronan Doherty)

12.00: Open Discussion

12.30: Lunch

13.30: Testing market designs in the laboratory (Karel Nolles)

14.15: Open discussion

15.00: Close



Centre for Energy and
Environmental Markets

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SYDNEY • AUSTRALIA



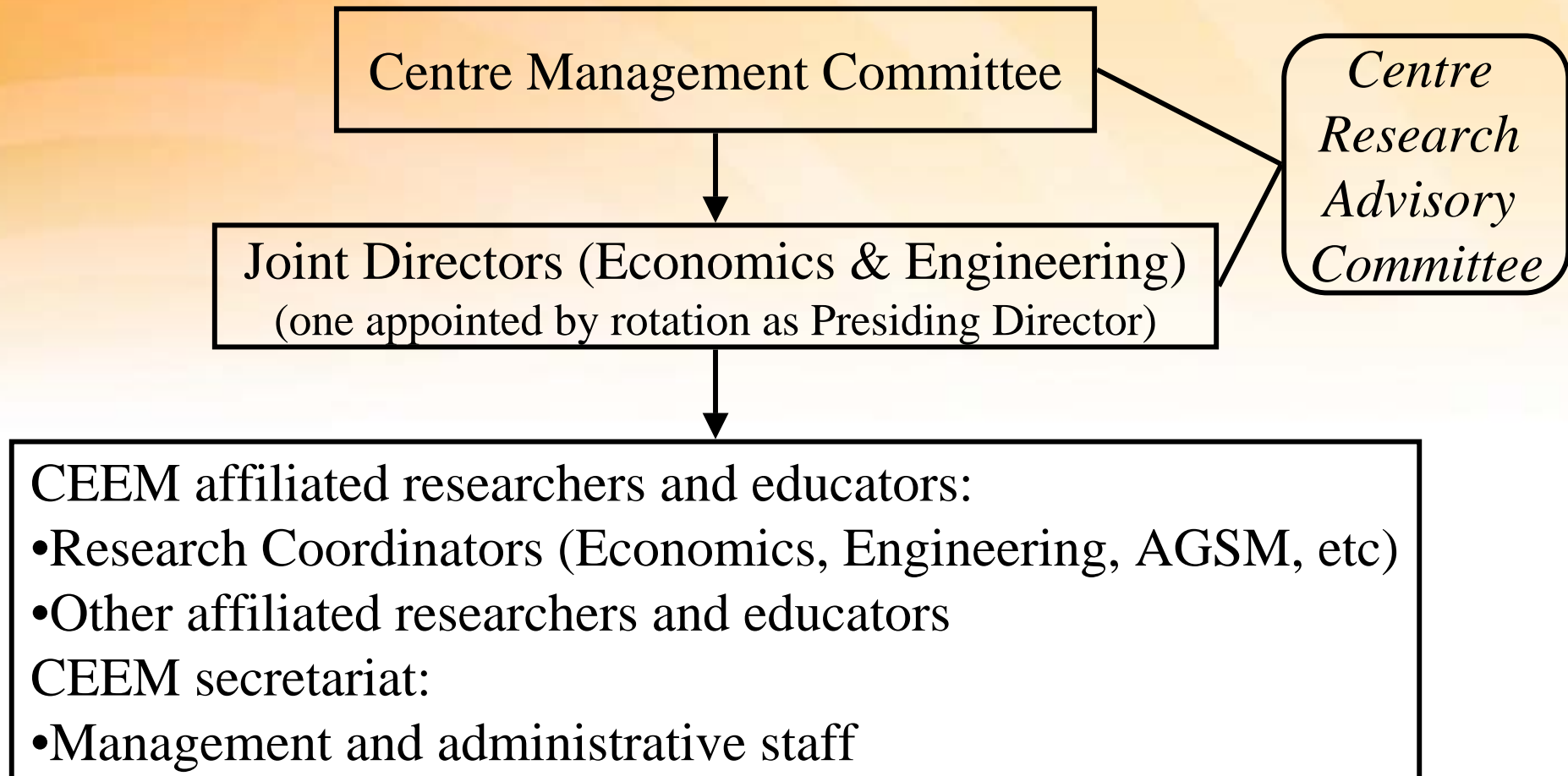
An introduction to CEEM

Presented by
Hugh Outhred

31 January 2005



Centre for Energy and Environmental Markets (CEEM) Organisation Chart





The purpose & scope of CEEM

- Interdisciplinary research in the:
 - Design, analysis and performance of energy and environmental markets and their associated policy frameworks
- A focus on infrastructure industries:
 - Initially electricity & gas, with a growing interest in water
- With participation from across UNSW:
 - Particularly Commerce & Economics; Engineering & the Australian Graduate School of Management
- CEEM approved by Vice Chancellor in July 2004



CEEM external partners

- Established relationships within Australia:
 - Securities Industry Research Centre of Australia-Pacific
 - CSIRO
- Signed MOU's with international partners:
 - Power System Engineering Research Center (USA)
 - The Interdisciplinary Center for Economic Science, George Mason University (USA)
- Developing international relationships:
 - Electricity Research Centre, University College Dublin
 - Instituto de Investigacion Tecnologica, Madrid
 - Fraunhofer Institute for Systems & Innovation Research



CEEM activities

- Research projects
- Research seminars, workshops and educational activities
- Consulting and advisory services

Build on an established track record at UNSW



CEEM & the National Research Priorities

- An environmentally sustainable Australia:
 - Sustainable energy; then water & waste management
- Promoting and maintaining good health:
 - Climate change mitigation, air & water quality
- Frontier technologies for building and transforming Australian industries:
 - Facilitating sustainable technologies
- Safeguarding Australia:
 - Energy security & environmental protection



CEEM research strands

- Design & performance evaluation of markets for:
 - Energy & ancillary services for electricity & gas; energy-related derivatives & environmental instruments
- Development of experimental market platforms to facilitate the development of efficient market design
- Applications of artificial intelligence to energy & environmental market analysis
- Design & performance evaluation of policy frameworks for the stationary energy sector
- Economic valuation methods & their application to energy & environmental markets

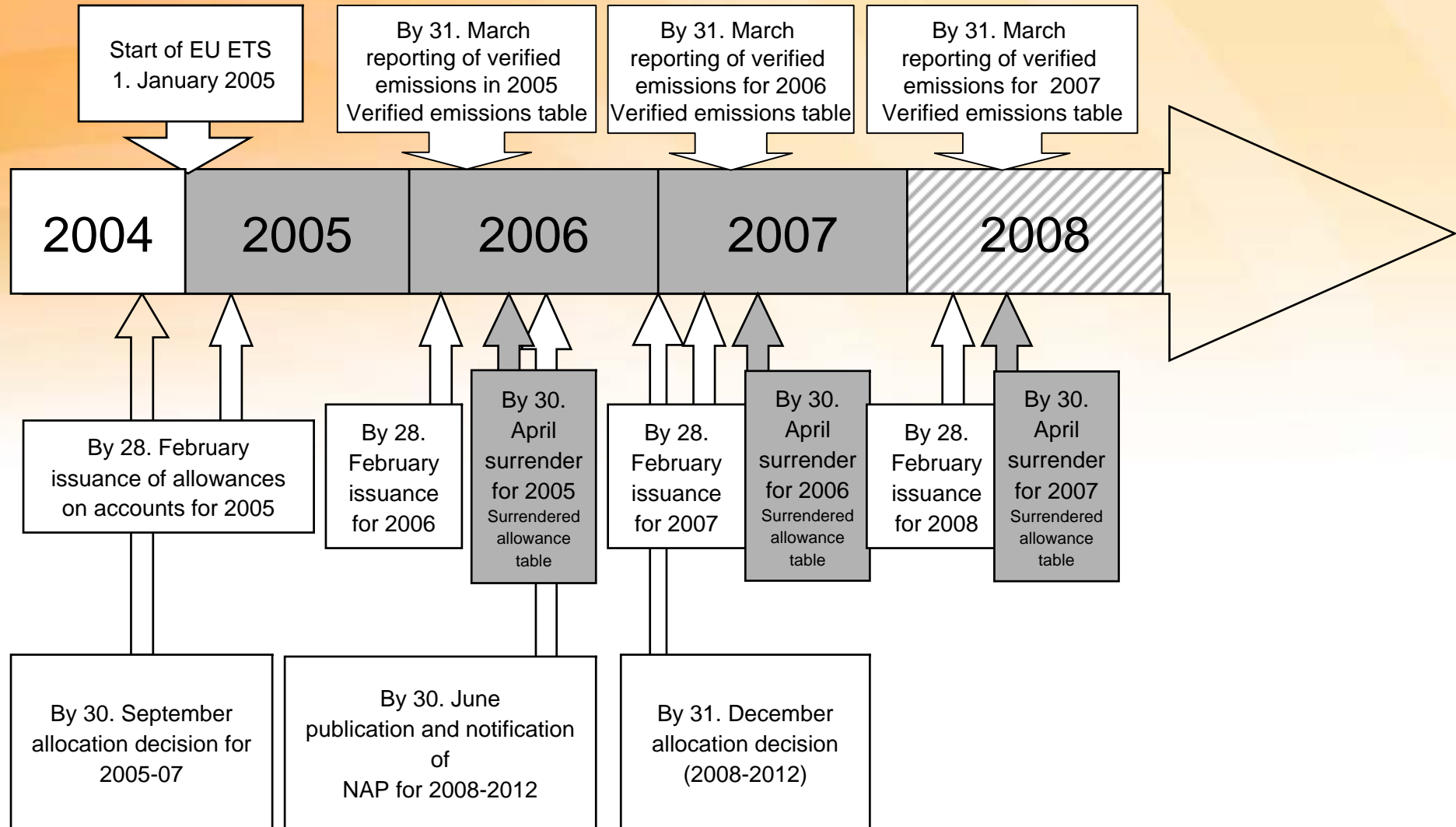


Examples of CEEM activities

- EU emission trading scheme workshop:
 - Presented by Dr Regina Betz, 26 November 2004
- Wind-power system integration (ongoing)
- Integrating voltage quality issues into electricity market design (ongoing)



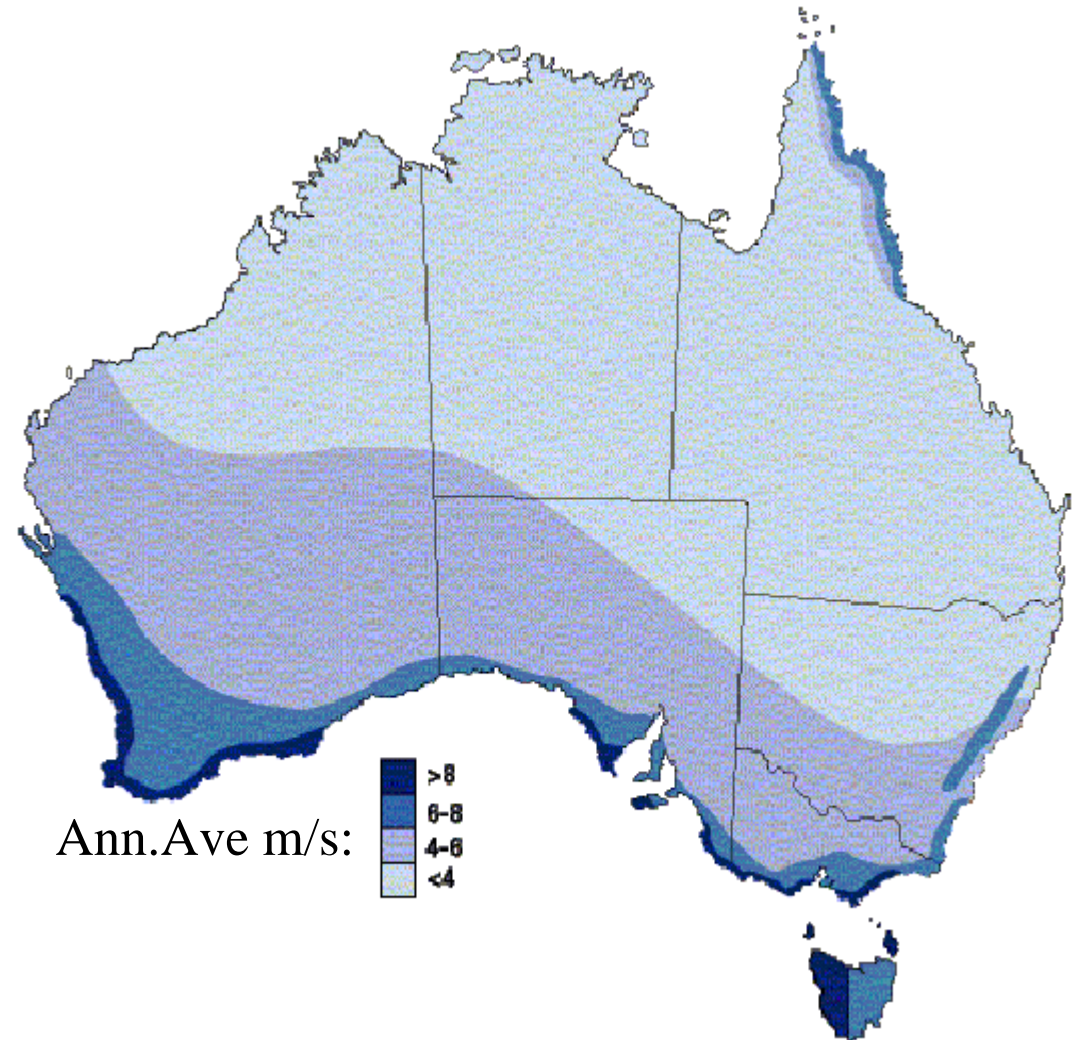
Timeline for EU emission trading scheme





The Australian wind resource

(Australian Greenhouse Office)





Comparing AusWEA forecast (www.auswea.com.au) & readily acceptable (RA) wind capacity for Australia (www.greenhouse.gov.au/renewable/tools.html#wind)

	Qld	NSW	Vic	SA	Tas	WA	Aus
Inst MW	13	17	92	35	11	28	196
Prop MW	40	115	437	1190	570	347	2699
Total MW	53	132	529	1225	581	375	2895
RA MW	2100	3100	2200	500	500	500	8900



Wind integration issues for NEM

- Power system operation & security assessment:
 - Appropriately aggregated wind farm behaviour:
 - Typical chronological data sets for Monte Carlo studies
 - Probability distributions for convolution-based assessments
 - 5-minute to 10-year timeframe, with emphasis on large, rapid changes
- Ancillary services & energy - spot & derivative markets:
 - Appropriately aggregated wind farm behaviour:
 - 5-minute forecast for spot price calculation (ANN?)
 - 24-hour chronological projection with error band for pre-dispatch
 - Probability distributions of volume & price for derivative markets
- Network investment:
 - Location-based forecasts of future wind farm output
 - Clarification of financing obligations



Integrating voltage quality issues into electricity market design

- Voltage is challenging to manage in a restructured electricity industry:
 - Accountabilities unclear & difficult to commercialise
 - Can contribute to blackouts (eg North America, 2003)
 - Potential to internalise voltage in electricity spot market

Source: Overbye & Wiegmann, 2005

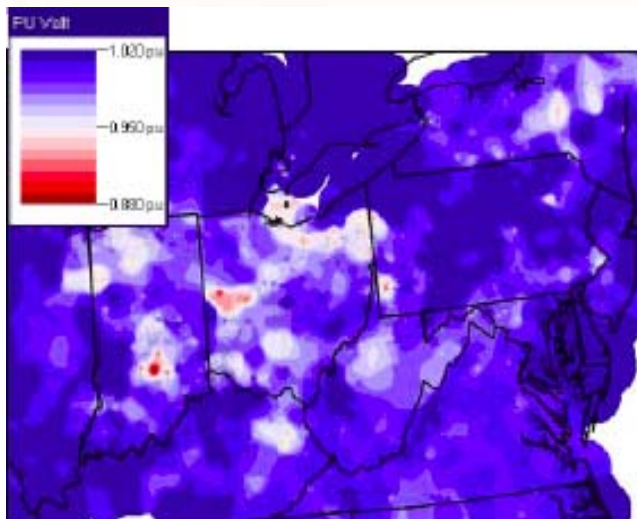


Figure 7: Pre-Blackout Ohio Region 115-230 kV
Voltage Contour

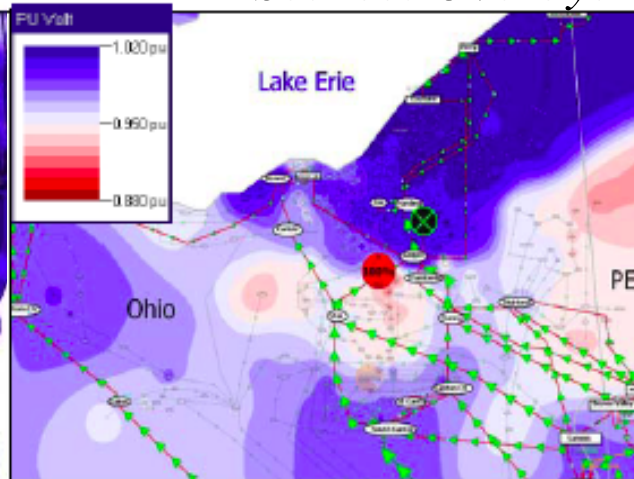


Figure 8: Northeast Ohio Voltage Contour at 15:05
EDT

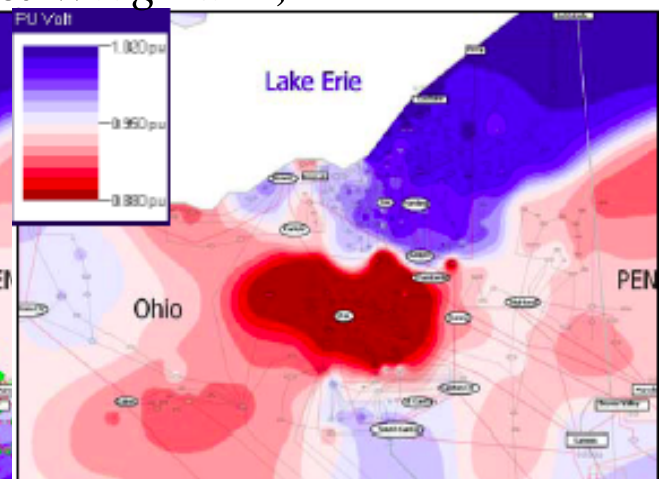


Figure 9: Northeast Ohio Voltage Contour at 15:51
EDT



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