AUPEC 2011

Australasian Universities Power Engineering Conference

Integrating Renewables into the Grid 25-28 Sept



Theme

A recent challenge to energy delivery has been the growth of renewable in the grid. Wind is creating issues with scheduling of conventional plant, photovoltaic installations are increasing at a great rate and many distribution utilities are having overvoltage problems. Addressing the security and reliability of the grid while decreasing the CO_2 impact will be a challenge over the next few years.

Hosted by the Power Engineering Group at QUT

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Message from the Chair

On behalf of the organizing committee, I would like to welcome you all to Brisbane. Brisbane is a subtropical city starting to experience the effects of distribution peak load growth problems and issues with PV systems in the grid.

It is a great pleasure to host AUPEC'11. This has become a respected annual conference in electrical power engineering in Australia, New Zealand and South-East Asia. It is technically sponsored by the Australasian Committee for Power Engineering (ACPE). This year we are celebrating the 21st meeting of AUPEC, which brings together both university and industry researchers and experts in power engineering while offering a platform for presentation of original research and educational development.

The theme of this year's conference is "***Integrating Renewables into the Grid*** ", which is dedicated to educate and inspire participants to make meaningful contributions to society by becoming more familiar with sustainable energy technologies and systems which is clearly one of the major driving forces in power engineering. In addition, I believe this conference also serves and directly addresses one of the challenging needs of industry, engineering workforce shortages.

All the presented papers will be made available in the IEEE Xplore Digital Library. In addition, all eligible papers will be evaluated for the best student papers based on the paper reviews and the student presentation. The conference will feature a internationally-recognized keynote speaker in the area of power engineering in Power Dynamics.

Finally, I would like to acknowledge the support provided by the staff of BEE Faculty and sponsorship by the Australian Power Institute (API). The conference was also co-sponsored by the IEEE Qld Chapter and by James Cook University.

My special thanks go to the committee members and the support team who provided tremendous help. I hope that you will have a chance to make memorable contacts during your time in Brisbane and will make time to see the South East Qld region, where you will find long/lovely beaches and an incredible range of foods and wine combined.

Gerard Ledwich
AUPEC2011 Organising Chair

Australasian Universities Power Engineering Conference (AUPEC) 2011

Organising Committee

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Technical Chair

Prof Arindam Ghosh, *Queensland University of Technology*

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2. Dr Amanullah Thang Oo, *Central Queensland University*
3. Dr Ahmad Zahedi, *James Cook University*

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41. S. Chakrabarti, *IIT Kanpur, India*

Australasian Universities Power Engineering Conference (AUPEC)
2011 Advance Program

	Monday 26 Sept, 2011	Tuesday 27 Sept, 2011	Wednesday 28 Sept, 2011
09:00-09:30	Conference Opening (S-410)	Technical Sessions	Technical Sessions
9:30-10:30	Keynote Speech (S-410); Prof. O. P. Malik, University of Calgary: Canada Smart Grid – Past, Present and Future	T-1 (S-408): Distribution Systems-2	W-1 (S-408): Distributed Generation
		T-2 (S-409): Electricity Markets	W-2 (S-409): Power Electronics
		T-3 (S-413): Power Systems Computation	
10:30-11:00	Morning Tea		
11:00-12:30	Technical Sessions	Technical Sessions	Technical Sessions
	M-1 (S-408) : Distribution System Planning	T-4 (S-408): Transmission Systems-2	W-3 (S-408): Transmission Systems-3
	M-2 (S-409): Wind/Hydro-1	T-5 (S-409): Microgrids	W-4 (S-409): Distribution Systems-3
	M-3 (S-413): Transmission Systems-1	T-6 (S-413): Wind/Hydro-2	
12:30-13:30	Lunch		
13:30-15:00	Technical Sessions	Industry Forum (Room S-410)	API Forum (Room S-410)
	M-4 (S-408): Plug-in Electric Vehicles		
	M-5 (S-409): High Voltage		
	M-6 (S-413): Power System Protection		
15:00-15:30	Afternoon Tea		Awards and Conference Closing (Room S-410)
15:30-17:00	Technical Sessions		
	M-7 (S-408): Distribution Systems-1		
	M-8 (S-409): Power Quality		
19:00-22:00		Conference Dinner – Kookaburra Queen, Brisbane River Cruise	

***Keynote Speaker**: Professor Om Prakash Malik is an Emeritus Professor at the University of Calgary, AB, Canada. He has done pioneering work in the development of adaptive and artificial intelligence based controllers for application in electric power systems over the past 40 years. He has supervised over 80 graduate (including 43 Ph.D.) students and has published over 700 papers in various journals and refereed conference proceedings. He is a Life Fellow of IEEE, and a Fellow of IET, the Engineering Institute of Canada, Canadian Academy of Engineering and World Innovation Foundation.*

Industry Forum Speakers:

1. *Mr. Simon Bartlett – Powerlink*
2. *Dr. Bevan Holcombe – Energex*
3. *Mr. Magnus Hindsberger – AEMO*

Technical Sessions

M1: Distribution Systems Planning-1

Session Chair: Dr. Ghavameddin Nourbakhsh, Queensland University of Technology

1. Loss reduction of power distribution network using optimum size of distributed generation, A. Anwar and H. R. Pota, *University of New South Wales at Australian Defence Force Academy*. #2
2. Static and dynamic var planning to support widespread penetration of distributed generation in distribution system, T. Aziz, T. K. Saha, and N. Mithulananthan, *University of Queensland*. #4
3. Optimal control of distributed generators and capacitors by hybrid DPSO, I. Ziari, G. Ledwich, A. Ghosh, *Queensland University of Technology* and G. Platt, *CSIRO*. #5
4. Novel mixed-integer method to optimize distributed generation mix in primary distribution systems, R. W. Chang, N. Mithulananthan, and T. K. Saha, *University of Queensland*. #6

M2: Wind/Hydro-1

Session Chair: Dr. Sumedha Rajakaruna, Curtin University

1. Identification of coherent generator groups in power system networks with windfarms, P. K. Naik, W. A. Qureshi and N. C. Nair, *University of Auckland*. #39
2. Frequency dynamics during high CCGT and wind penetrations, L. Meegahapola and D. Flynn, *University of Wollongong*. #41
3. Studies about the low voltage ride through capabilities of variable-speed motor-generators of pumped storage hydro power plants, E. Schmidt, J. Ertl, A. Preiss, R. Zensch, R. Schurhuber and J. Hell, *Vienna University of Technology, Vienna, Austria*. #70
4. Impacts of DFIG wind turbines on transient stability of power systems - a review, M. A. Chowdhury, N. Hosseinzadeh, W. Shen, H. R. Pota and T. A. Choudhury, *Swinburne University of Technology*. #42

M3: Transmission Systems-1

Session Chair: Dr. Yateendra Mishra, Queensland University of Technology

1. Application of TCSC to improve total transmission capacity in deregulated power systems, S. Hajforoosh, S. M. H. Nabavi, *Islamic Azad University, Tabriz, Iran* and M. A. S. Masoum, *Curtin University*. #27
2. Automatic under-frequency load shedding: systematic review and future potential for New Zealand power system, K. U. Mollah, M. Bahadornejad and N. C. Nair, *University of Auckland*. #38
3. Active and reactive power rescheduling for congestion management using particle swarm optimization, S. K. Joshi and K. S. Pandya, *MS University, Baroda, India*. #34
4. A hierarchical analysis of phasor measurement unit placement optimization in transmission network, J. Zhong and K. L. Wong, *RMIT University*. #50

M4: Plug-in Electric Vehicles

Session Chair: Prof. Satish K. Joshi, MS University, Baroda, India

1. A modified method for the sizing of the plug-in hybrid electric vehicle propulsion devices, S. Overington and S. Rajakaruna, *Curtin University*. #65
2. Impact of plug-in hybrid electric vehicles and their optimal deployment in smart grids, S. Pandyal, *University of Waterloo, Canada* and S. Dahal, *University of Queensland*. #67
3. V2G technology for designing active filter system to improve wind power quality, F. R. Islam, H. R. Pota and M. S. Ali, *University of New South Wales at Australian Defence Force Academy*. #85
4. Optimum demand side response of smart grid with renewable energy source and electrical vehicles, M. Marwan, *Queensland University of Technology*, and F. Kamel, *University of Southern Queensland*. #64

M5: High Voltage

Session Chair: Prof. Syed Islam, Curtin University

1. Machine learning techniques for power transformer insulation diagnosis, H. Ma, T. K. Saha and C. Ekanayake, *University of Queensland*. #15

2. A circuit-breaker restrike diagnostic algorithm using ATP and wavelet transforms, S. Kam, S. Nielsen and G. Ledwich, *Queensland University of Technology*. #16
3. Evaluating the accuracy of different DGA techniques for improving the transformer oil quality interpretation, A. D. Ashkezari, T. K.Saha, C. Ekanayake and H. Ma, *University of Queensland*. #17
4. Transformer diagnostics using dissolved gas analysis and polarisation and depolarisation current measurements - a case study, R. B. Jadav, T. K. Saha and C. Ekanayake, *University of Queensland*. #18

M6: Power System Protection

Session Chair: Prof. Erich Schmidt, Vienna University of Technology, Austria

1. A transient based protection scheme for distribution networks including distributed generators, S. M. Tayebi and A. Kazemi, *Iran University of Science and Technology*. #7
2. Impact of harmonics on the performance of over-current relays, H. Tin, A. Abu-Siada and M. S. Masoum, *Curtin University*. #30
3. Impact of propagation of fault signals on industrial diagnosis using current signature analysis, A. Gheitasi, A. Al-Anbuky and T. T. Lie, *Auckland University of Technology*. #31
4. Protection Coordination Issues With DFIG Wind Generation on Weak Networks: Preliminary Issues, R. Rossi, *Rossi and Associates* and M. A. S. Masoum, *Curtin University*. #95

M7: Distribution Systems-1

Session Chair: Prof. Michael Negnevitsky, University of Tasmania

1. Identification of critical parameters for distribution networks with DFIG and dynamic loads, M. S. Ali, H. R. Pota, M. A. Mahmud, *University of New South Wales at Australian Defence Force Academy* and M. J. Hossain, *University of Queensland*. #9
2. Voltage unbalance sensitivity analysis of plug-in electric vehicles in distribution networks, F. Shahnia, A. Ghosh, G. Ledwich and F. Zare, *Queensland University of Technology*. #60
3. Impacts of wind and solar integrations on the dynamic operation of distribution systems, M. J. Hossain, T. K. Saha and N. Mithulananthan, *University of Queensland*. #62
4. Impact of photovoltaic power fluctuations by moving clouds on network voltage: a case study of an urban network, R. Yan, S. Roediger and T. K. Saha, *University of Queensland*. #63

M8: Power Quality

Session Chair: Prof. Gerard Ledwich, Queensland University of Technology

1. New combined hybrid active filter for twelve pulse converter operating under asymmetrical operation, P. S. Modi and S.K. Joshi, *MS University, Baroda, India*. #24
2. Harmonic filter design to mitigate two resonant points in a distribution network, S. J. Bester and G. Atkinson-Hope, *Cape Peninsula University of Technology, Cape Town, South Africa*. #26
3. Distortions in three-phase transformer magnetizing currents with nonsinusoidal conditions considering magnetic hysteresis and leg-flux coupling effects, P. S. Moses and M. A. S. Masoum, *Curtin University*. #32
4. The use of voltage regulators in power systems with arc-suppression coils, R. Burgess and A. Ahfock, *University of Southern Queensland*. #37

T1: Distribution Systems-2

Session Chair: A/Prof. Ahmad Zahedi, James Cook University

1. An improved genetic algorithm and graph theory based method for optimal sectionalizer switch placement in distribution networks with DG, A. Vahidnia, G. Ledwich, A. Ghosh and E. Palmer, *Queensland University of Technology*. #8
2. A Fourier series based approach to the periodic optimisation of finely dispersed battery storage, P. Wolfs, N. Jayasekera and S. Subawickrama, *Curtin University*. #12
3. Community electricity storage and capacitor allocation in distribution systems, D. Q. Huang and N. Mithulananthan, *University of Queensland*. #90
4. Investigating the transient responses of fully rated converter-based wind turbines, H. T. Mokui, M. Mohseni, and M. A. S. Masoum, *Curtin University*. #46

T2: Electricity Markets

Session Chair: Prof. Gerard Ledwich, Queensland University of Technology

1. Modelling uncertainty in renewable generation entry to deregulated electricity market, K. N. Hasan, T. K. Saha and M. Eghbal, *University of Queensland*. #88
2. Financial withheld-based market power within congested power system, M. B. Nappu and T. K. Saha, *University of Queensland*. #20
3. Energy efficiency and market forces in the New Zealand electricity market, D. Nutt and T. T. Lie, *Auckland University of Technology*. #21
4. Customer recognition-based demand response implementation by an electricity retailer, N. Mahmoudi-Kohan, M. Eghbal, *University of Queensland* and M. P. Moghaddam, *Tarbiat Modares University, Tehran, Iran*. #66

T3: Power Systems Computation

Session Chair: Prof. O. P. Malik, University of Calgary, Canada

1. Complex network framework based dependency matrix of electric power grid, A. B. M. Nasiruzzaman, H. R. Pota and F. R. Islam, *University of New South Wales at Australian Defence Force Academy*. #86
2. A Comparative analysis of optimal power flow techniques based on equivalent current injection with conventional optimal power flow method, S. K. Joshi, *MS University, Baroda, India*, and G. H. Chitaliya, *Gujarat Plug-In Devices Pvt. Ltd; Vadodara, India*. #43
3. Probabilistic calculus in power system analysis and design, O. Krause, *University of Queensland*, J. Schwippe, *TU Dortmund University, Germany* and M. Eghbal, *University of Queensland*. #74
4. Preliminary Statistical Study of Low Voltage Distribution Feeders under a Representative HV Network in Western Australia, Y. Li, P. Wolfs, *Curtin University*. #75

T4: Transmission Systems-2

Session Chair: Dr. Mithulan Nadarajah, University of Queensland

1. Application of a STATCOM for damping subsynchronous oscillations and transient stability improvement, A. F. Abdou, *University of New South Wales at Australian Defence Force Academy*, A. Abu-Siada, *Curtin University* and H. R. Pota, *University of New South Wales at Australian Defence Force Academy*. #33
2. Assessing sampling for Prony analysis and Kalman filter in monitoring electromechanical oscillations, Q. Ao, J.C.-H. Peng, and N. C. Nair, *University of Auckland*. #40
3. Zero dynamic excitation controller design for power system with dynamic load, M. A. Mahmud, *University of New South Wales at Australian Defence Force Academy*, M. J. Hossain, *University of Queensland* and H. R. Pota, *University of New South Wales at Australian Defence Force Academy*. #48
4. Generalized Lyapunov function for stability analysis of interconnected power systems, M. A. Mahmud, *University of New South Wales at Australian Defence Force Academy*, M. J. Hossain, *University of Queensland*, H. R. Pota and M. S. Ali, *University of New South Wales at Australian Defence Force Academy*. #49

T5: Microgrids

Session Chair: Dr. Lasantha Perera, Queensland University of Technology

1. Protection of microgrids using differential relays, M. Dewadasa, A. Ghosh and G. Ledwich, *Queensland University of Technology*. #76
2. Distributed energy resources (DER) object modelling with IEC 61850-7-420, T. S. Ustun, C. Ozansoy and A. Zayegh, *Victoria University*. #3
3. Distributed renewables and battery storage for the support of the edge of the rural grid, P. Wolfs, *Curtin University*, C. Gunathilake, *Longmont Engineering*, P. Martino and I. Khanna, *Western Power*. #55
4. Renewable energy micro-grid power system for isolated communities, S. Tucker and M. Negnevitsky, *University of Tasmania*. #58

T6: Wind/Hydro-2

Session Chair: Prof. Tapan Saha, University of Queensland

1. A case-based reasoning approach for dynamic security assessment of power systems with large penetration of wind power, R. Tiako, D. Jayaweera and S. Islam, *Curtin University*. #56
2. LMP estimation considering the uncertainty of wind power, Y. Dai, J. Huang, K. Meng, Y. Xue, *Nanjing University of Science and Technology, China*, Z. Y. Dong, *Hong Kong Polytechnic University, Kowloon, Hong Kong* and G. Ledwich, *Queensland University of Technology*. #78
3. Developing a linear model for estimating the capacity factor of wind turbines, A. Zahedi, *James Cook University*. #80
4. Impact of high level of renewable energy penetration of inter-area oscillation, M. H. Nguyen, T. K. Saha and M. Eghbal, *University of Queensland*. #57

W1: Distributed Generation

Session Chair: Dr. Dilan Jayaweera, Curtin University

5. Effects of load modelling in power distribution system with distributed wind generation, N. K. Roy, *University of New South Wales at Australian Defence Force Academy*, M. J. Hossain, *University of Queensland* and H. R. Pota, *University of New South Wales at Australian Defence Force Academy*. #10
6. Load curtailment strategy in distribution network with dispersed generations, A. Arief, M. B. Nappu, *University of Queensland*, Z. Y. Dong, *University of Newcastle* and M. Arief, *University of Queensland*. #11
7. Impact of composite loads on dynamic loadability of emerging distribution systems, S. Dahal, N. Mithulananthan and T. K. Saha, *University of Queensland*. #72
8. Support vector machine model based model predictive control for PEMFC, J. Lu and A. Zahedi, *James Cook University*. #22

W2: Power Electronics

Session Chair: A/Prof. Firuz Zare, Queensland University of Technology

1. Improved predictive direct power control, M. Mesbah, M. A. S. Masoum and Syed Islam, *Curtin University*. #84
2. Carrier based PWM technique with over modulation strategies for a three-to-seven phase matrix converter, S. M. Ahmed, *Texas A&M University at Qatar, Doha*, Qatar, M. Saleh, *Victoria University*, A. Iqbal, H. Abu-Rub, *Texas A&M University at Qatar, Doha, Qatar* and A. Kalam, *Victoria University*. #89
3. Generator – battery hybrid power system using diagonal recurrent neural network, M. Ashari, D. K. Setiawan and Soedibyo, *Institut Teknologi Sepuluh Nopember (ITS), Surabaya, Indonesia*. #92
4. Framework for sensitivity analysis of industry algorithms for sensorless PMSM drives, B. Saunders, G. Heins and F. De Boer, *Charles Darwin University*. #77

W3: Transmission Systems-3

Session Chair: Prof. Arindam Ghosh, Queensland University of Technology

1. Wide-area signal selection for power system damping controller, N. Modi, *University of Queensland*, M. Lloyd, *Origin Energy* and T. K. Saha, *University of Queensland*. #36
2. Under voltage load shedding utilizing trajectory sensitivity to enhance voltage stability, A. Arief, M. B. Nappu, M. Gallagher, *University of Queensland* and Z. Y. Dong, *University of Newcastle*, #51
3. A comparison of ultracapacitor, BESS and shunt capacitor on oscillation damping of power system with large-scale PV plants, R. Shah and N. Mithulananthan, *University of Queensland*. #53
4. SSR risk alleviation in dual-rotor wind turbine by employing genetic solutions, E. M. Farahani, N. Hosseinzadeh and M. Ektesabi, *Swinburne University of Technology*. #44

W4: Distribution Systems-3

Session Chair: Prof. Peter Wolfs, Curtin University

1. Distributed DSTATCOMs for distribution line enhancement, L. Perera, G. Ledwich and A. Ghosh, *Queensland University of Technology*. #68

2. Voltage stability analysis with optimum size and location based synchronous machine DG, A. Anwar, N. K. Roy, and H. R. Pota, *University of New South Wales at Australian Defence Force Academy*. #45
3. Analysis and comparison of bus ranking indices for balanced and unbalanced three-phase distribution networks, P. Juanuwattanakul and M. A. S. Masoum, *Curtin University*. #47
4. Security of supply with dispersed integration of wind power in distribution networks, D. Jayaweera, R. C. Wee and S. Islam, *Curtin University*. #54