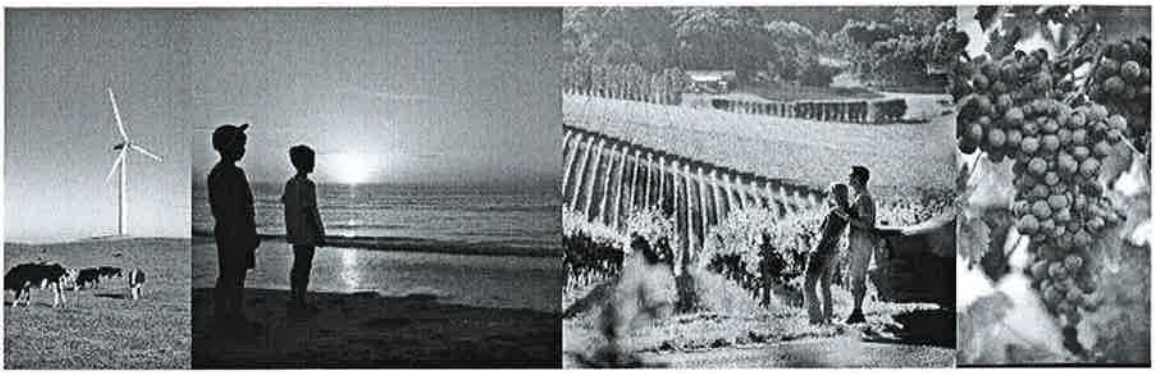

AUPEC'09

19th Australasian Universities Power Engineering Conference:

Sustainable Energy Technologies and Systems
27-30 September 2009

Hosted by Power Engineering Research Group
School of Electrical and Electronics Engineering
University of Adelaide
Adelaide, Australia

http://www.aupec09.eleceng.adelaide.edu.au/

ISBN: 978-0-86396-718-4

Co-sponsors: IEEE AP IET

Industry-sponsors: NATIONAL INSTRUMENTS iems EMONA

Message from the Chair

On behalf of the organizing committee, I would like to welcome you all to Adelaide. Adelaide is a city which combines pleasant weather and environment with a great education and research traditions.

It is a great pleasure to host AUPEC'09. This has become the premier 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 19th 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 "Sustainable Energy Technologies and Systems", 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.

Although more than five major international power and energy related conferences are running during the same time period in 2009, we have received 161 abstract/extended summaries this year. Among these, 148 contributors were invited to submit full papers, which were then each reviewed by two expert reviewers. A total of 99 full papers were accepted from 13 different countries will be orally presented in three parallel sessions. 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 internationally-recognized keynote speakers in the area of power engineering, and two tutorials will also be offered covering state-of-the-art developments in the areas of wind power systems and power electronics.

Finally, I would like to acknowledge the support provided by the Faculty of Engineering Computing and Mathematical Sciences, the University of Adelaide and Australian Power Institute (API). The conference was also co-sponsored by the IEEE SA Chapter and the IET Section. I also acknowledge the generous industry support of National Instruments, IEMS and EMONA. 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 Adelaide and will make time to see the Adelaide region, where you will find long/lovely beaches and an incredible range of foods and wine combined with a Mediterranean lifestyle.

Nesimi Ertugrul
AUPEC2009 Organising Chair

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Organising Committee

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Oral Presentation Requirements

All speakers are expected to be at their lecture theatre at least ten minutes prior to the start of their technical session to load their presentation file on to the lecture theatre computer. Every presenter is also required to give the Session Chair a short resume (< 100 words on a piece of paper) to introduce the presenters to the audience.

All the papers will be presented orally at 20 min intervals which nominally consists of a 15 minute presentation, 3 minutes for questions and 2 mins for changing speakers. There will be 3 parallel sessions. Please note that if a presenter is not available to present a paper, the session will be adjourned until the next scheduled technical paper.

For a better and clearer presentation, keep your slides as simple as possible. Do not use figures or charts with many lines, numbers or long, complex formulas or expressions. Avoids using normal-sized typewritten text or hand lettering that cannot be read at a distance. Presentation slides should be readable from the back of a room (at least 15 metres).

We recommend that presenters bring their presentation files in a format compatible with one of the applications below, with the files stored in a CD-ROM or a USB memory stick. PowerPoint slides or Acrobat PDF for presentation on a data projector are recommended. There will be an assistant in the room to help you

Note that all the presentation rooms will be equipped with the following items:

- A computer running WINDOWS XP Professional operating system, with MS-Office 2007 and Acrobat Reader.
- A data projector and screen(s).

AUPEC'09 Conference Program

Sunday 27th September 2009

9:30am – 12:30pm	Tutorial #1 : *Recent Advances in Power Electronics and Motor Drives* Presented by Prof. B.K. Bose, University of Tennessee, USA.	*Engineering North, N218*
1:30pm – 4:30pm	Tutorial #2 : *Wind Power Systems* (Short Course on Generating Electrical Energy from Wind Power Plants) Presented by Prof. Chem Nayar, Curtin University	*Engineering North, N218*

Monday 28th September 2009

8:15am	Conference registration opens	*Foyer outside Flentje*
9:00am – 9:30am	Welcome	*Flentje Lecture Theatre*
9:30am – 10:30am	Keynote Speech : "*Energy, Global Warming and Power Electronics*" Prof. B.K. Bose, University of Tennessee, USA	*Flentje Lecture Theatre*
10:30am – 11:00am	Morning Tea	*Foyer outside Flentje*
11:00am – 1:00pm	Conference Technical Sessions : three parallel sessions	
	A. Power Electronics : DC/DC Converters and PV Cells	*Rm 2060, Comp. Science*
	B. Distributed Generation, Micro-Grids and RAPS	*Polygon Lecture Theatre*
	C. Power System Dynamics, Operation, Planning, Optimisation	*Flentje Lecture Theatre*
1:00pm – 2:00pm	Lunch	*Foyer outside Flentje*
2:00pm – 3:20pm	Conference Technical Sessions : three parallel sessions	
	A. Electrical Machines : DC, PM, IM, SR, linear	*Rm 2060, Comp. Science*
	B. Diagnostics, Condition Monitoring, Instrumentation	*Polygon Lecture Theatre*
	C. Power System Transmission and Distribution	*Flentje Lecture Theatre*
3:20pm – 3:50pm	Afternoon Tea	*Foyer outside Flentje*
3:50pm – 5:10pm	Conference Technical Sessions : three parallel sessions	
	A. Modelling and Mathematical Techniques	*Rm 2060, Comp. Science*
	B. Power Quality, Harmonics, Active Filters	*Polygon Lecture Theatre*
	C. Power System Electricity Markets and Economics	*Flentje Lecture Theatre*
5:10pm – 7:00pm	Welcome Reception	*Foyer outside Flentje*

Tuesday 29th September 2009

8:30am	Conference registration opens	*Foyer outside Flentje*
9:00am – 10:00am	Keynote Speech : "*Energy Problems Facing the Third World*" Prof. D.P. Kothari, India	*Flentje Lecture Theatre*
10:00am – 10:30am	Morning Tea	*Foyer outside Flentje*
10:30am – 12:30pm	Conference Technical Sessions : three parallel sessions	
	A. Power Electronics : Motor Drives and Control	*Rm 2060, Comp. Science*
	B. Power System Transmission and Distribution and Diagnostics, Condition Monitoring, Instrumentation	*Polygon Lecture Theatre*
	C. Power System Protection, Control, Communications	*Flentje Lecture Theatre*
12:30pm – 1:30pm	Lunch	*Foyer outside Flentje*
	ACPE Committee meeting	*Engineering North, EM324*
1:30pm – 2:50pm	Conference Technical Sessions : three parallel sessions	
	A. Electrical Machines : DC, PM, IM, SR, linear	*Rm 2060, Comp. Science*
	B. Distributed Generation, Micro-Grids and RAPS	*Polygon Lecture Theatre*
	C. Power System Dynamics, Operation, Planning, Optimisation	*Flentje Lecture Theatre*
2:50pm – 3:20pm	Afternoon Tea	*Foyer outside Flentje*
3:20pm – 5:20pm	Australian Power Institute/Australian Strategic Technology Program Presentations	*Flentje Lecture Theatre*
7:00pm – 10:00pm	Conference Dinner	*National Wine Centre*

Wednesday 30th September 2009

8:30am	Conference registration opens	*Foyer outside Flentje*
9:00am – 10:00am	Keynote Speech : to be announced	*Flentje Lecture Theatre*
10:00am – 10:30am	Morning Tea	*Foyer outside Flentje*
10:30am – 12:30pm	Conference Technical Sessions : three parallel sessions	
	A. Power Electronics : Motor Drives and Control	*Rm 2060, Comp. Science*
	B. Power System Electricity Markets and Protection	*Polygon Lecture Theatre*
	C. Power System Dynamics, Operation, Planning, Optimisation	*Flentje Lecture Theatre*
12:30pm – 1:30pm	Lunch	*Foyer outside Flentje*
1:30pm – 2:30pm	Conference Technical Sessions : three parallel sessions	
	A. Electrical Machines and Distributed Generation	*Rm 2060, Comp. Science*
	B. Diagnostics, Condition Monitoring, Instrumentation	*Polygon Lecture Theatre*
	C. Power System Protection, Control, Communications	*Flentje Lecture Theatre*
2:30pm – 3:00pm	Afternoon Tea	*Foyer outside Flentje*
3:00pm – 4:00pm	Closing Ceremony and Awarding of Prizes	*Flentje Lecture Theatre*

Wednesday 30th September 2009 (Morning and Early Afternoon Sessions)

Time	Session A. Power Electronics : Motor Drives and Control	Session B. Power System Electricity Markets and Protection	Session C. Power System Dynamics, Operation, Planning, Optimisation
Location	**Room 2060, Computer Science**	**Polygon Lecture Theatre**	**Flentje Lecture Theatre**
Chairperson	**Dr. Herbert Iu, University of Western Australia**	**Prof. Tapan Saha, University of Queensland**	**Mr. David Vowles, University of Adelaide**
10:30am – 10:50am	**PP072** : An Improved Modeling and Control Approach for DFIG-Based Wind Generation Systems	**PP164** : Engineering Processes Using IEC 61850	**PP135** : Dynamic Modelling of Hydroelectric Turbine-Generator Unit connected to a HVDC System for Small Signal Stability Analysis
10:50am – 11:10am	**PP121** : Sensorless Direct Torque and Flux Control of IPM Synchronous Motor Drives using an Extended Rotor Flux Model	**PP159** : Demand Response in the Retail Market: Benefits and Challenges	**PP136** : On the Use of Indirect Inference in Equivalent Circuit Parameter Estimation
11:10am – 11:30am	**PP122** : Direct Torque and Flux Controlled IPM Synchronous Motor Drive using a Hybrid Signal Injection and Adaptive Sliding Mode Observer	**PP076** : Profit Based Unit Commitment Problem under Deregulated Environment	**PP101** : Real Power Loss Allocation Using Modified Nodal Equations for Deregulated Power System
11:30am – 11:50am	**PP148** : Comparative PLECS Modelling of Ideal and Non-ideal m-level IGBT Inverters at 11kV	**PP004** : Optimum Allocation of Reactive Power in Real-Time Operation under Deregulated Electricity Market	**PP079** : Design a LQG Power System Stabilizer for Bistun Power Plant
11:50am – 12:10pm	**PP031** : Investigation of Phase Advance Modulation with Surface Permanent Magnet Generators	**PP017** : Optimum Simultaneous Clearing of Energy and Spinning Reserve Markets With Stochastic Security	**PP080** : Optimal Choice of FACTS Devices for ATC Enhancement Using Bees Algorithm
12:10pm – 12:30pm	**PP154** : A Control Strategy for Grid-connected Photovoltaic Power Conditioning System	**PP018** : On the Stochastic Self-Scheduling of a Power Producer in Simultaneous/Aggregated Energy and Reserves Markets	**PP066** : Power System Static Security Enhancement by Optimal Allocation of TCSC using Real Coded GA and PSO Algorithm

Time	Session A. Electrical Machines and Distributed Generation	Session B. Diagnostics, Condition Monitoring, Instrumentation	Session C. Power System Protection, Control, Communications
Location	**Room 2060, Computer Science**	**Polygon Lecture Theatre**	**Flentje Lecture Theatre**
Chairperson	**Dr. Dylan Lu, University of Sydney**	**Dr. Alan Wong, RMIT**	**Dr. Rastko Zivanovic, University of Adelaide**
1:30pm – 1:50pm	**PP118** : Eigenfunction Expansion of the Stray Field of Large Power Transformers	**PP071** : Investigation of Partial Discharges In Single Void And Multi-Voids using Data Mining Technique	**PP054** : A Synchronized Event Logger for Substation Topology Processing
1:50pm – 2:10pm	**PP166** : Economics of Solar Energy for Diurnal Electrical Demand in South-East Queensland	**PP039** : Application of Wavelet Transform to Study Partial Discharge in XLPE Sample	**PP059** : Comparing Discrete Wavelet Transform (DWT) with Discrete Fourier Transform (DFT) implemented for Digital Relays
2:10pm – 2:30pm	**PP073** : Multi-Agent System Based 'Plug and Play' Theory Research in Micro-Grid	**PP081** : Early Fault Detection of Broken Rotor Bars Using Sliding Window Symbol Sequence Statistics	**PP062** : Methodology for Automated Testing of Transmission Line Fault Locator Algorithms

mix by incorporating uncertainty into key cost assumptions and therefore solving the probability distribution of the expected generation costs for different generation technology portfolios consisting of different generation technologies. The overall cost output is represented by a probability distribution in which the statistical features of mean and standard deviation are used to measure the cost and risk profile for each generation portfolio. The model is applied to a case study of electricity generation portfolios consisting of different mixes of the three most common generation technologies: coal, Combined Cycle Gas Turbine (CCGT) and Open Cycle Gas Turbine (OCGT), taking into account fuel and carbon prices uncertainty. The case study demonstrates the capability of this model in addressing the impact of uncertainty on the cost and risk across different possible electricity generation portfolios. Therefore, it provides a comprehensive basis to assist decision making in generation investment in order to identify appropriate generation technology and/or the generation technology portfolio mixes that most likely to achieve the objectives in terms of expected costs, risks and CO2 emissions.

PP159 Demand Response in the Retail Market: Benefits and Challenges

D.T. Nguyen, M. Negnevitsky, School of Engineering, University of Tasmania, Sandy Bay, Tasmania, Australia.
M. de Groot, C. Wang, Tasmania ICT Centre, CSIRO, Castray Esplanade, Tasmania, Australia.

Abstract—This paper discusses two types of Demand Response (DR), namely price-based DR and reliability-based DR, in the United States context. The advantages and limitations of each type of DR are reviewed through examining related studies. The paper claims that neither price-based DR nor reliabilitybased DR can maximize the DR benefit if applied alone. The paper then proposes two hybrid frameworks, in which both price-based and reliability-based programs are integrated into an information management system for both scheduling and dispatch. These frameworks encapsulate different degrees of change and decentralization of the electricity distribution grid.

PP160 Distribution Transformer Losses Evaluation under Non-Linear Load

M.S. Dalila, M. N. Khalid, M.Md Shah, Centre of Electrical Energy System, Faculty of Electrical Engineering, Universiti Teknologi Malaysia, 81310 Skudai Johor, Malaysia.

Abstract— Harmonic effect on power system component and load are one of the important considerations when evaluating the impact of harmonics. Transformers are one of the component and usually the interface between the supply and most nonlinear load. With the increasing use of nonlinear load the harmonic problem become worse. The increased losses in the transformer due to the harmonic
distortion can cause excessive winding loss and abnormal temperature rise. This paper presents the analysis and evaluation of distribution transformer losses under nonlinear load. In this study the harmonic data logging was conducted in the commercial building and the losses caused by harmonic in distribution transformer were calculated. The life of the transformer also can be estimated from the simulation results. The results show that an increase in the current harmonic distortion will increase the transformer losses and hence decreased it life expectancy.

PP161 Assessment of PV Cell Performance Under Actual Malaysia Operating Condition

A.R. Hasimah, M.N. Khalid, Mohammad Yusri H., Centre of Electrical Energy System, Faculty of Electrical Engineering, Universiti Teknologi Malaysia, 81310 UTM, Skudai, Johor, Malaysia

Abstract - The optimal utilization of solar modules technologies in different climates is of major economical important. In many locations, the solar modules are often utilized non-economically because of lack of solar radiation and climatologically data. This paper presents a simulation result on the PV system using two prediction tools; RETScreen and PVSYST for the grid-connected system by assessing four different PV technologies; monocrystalline, polycrystalline, amorphous silicon and cadmium telluride. The average monthly solar radiation and the mean ambient temperature data from Malaysia Meteorological Services Department are adopted. The finding indicates that higher module efficiency used less collector area of the PV modules (arrays) and hence less support structure to build for the system. Mono-crystalline and polycrystalline give higher returns of annual energy yields with high investment cost whereas amorphous silicon and cadmium telluride give less annual yield with lower investment cost. Comparatively the energy production cost per kWh indicates that amorphous Silicon and cadmium telluride give the lowest rate.

PP164 Engineering Processes Using IEC 61850

R. Hughes, UTInnovation Australia Pty. Ltd., Adelaide, Australia.
M. Jansen, UTInnovation LLC, Duiven, The Netherlands.

Abstract—Substation secondary system engineering has remained generally unchanged for over a hundred years based on physical construction being largely based on wire connections between plant and equipment. IEC 61850 allows replacement of wire based systems with communication based operation of the substation automation system generally operating over a Local Area Network. As such new engineering processes, specifications and tools are required combined with new skills across the collective substation engineering community.

PP166 Economics of Solar Energy for Diurnal Electrical Demand in South-East Queensland

F. Kamel, Faculty of Engineering & Surveying, Electrical, Electronic & Computer Engineering, University of Southern Queensland, Toowoomba, Queensland, Australia

Abstract - The study presents a life-time cost analysis for a combined solar system comprising a 1kW-peak grid-connected photovoltaic unit and an evacuated-tube solar water heater, 1.37m^2 collector area and a 120 Liter storage tank operated at Toowoomba Queensland. The work represents technical and economic assessment of the technology at local conditions. Present solar kWh price indicate the ability of the system to provide competitive prices to cover demand peaks in Queensland. Additionally, the solar system – being located on site – offers the advantage of avoiding transmission and distribution losses throughout the electrical network.

REVIEWER 1

Originality : 3. Satisfactory

Contribution : 4. Good

References : 3. Satisfactory

Presentation Style : 3. Satisfactory

Language Quality : 4. Good

Recommendation :

Possible Accept with Mandatory Revisions Comments to Authors :

This is a useful analysis of a the cost benefit approach and lifetime analsysis of solar energy applications.

The results are a useful addition to the state of art.

The revision requirement is to change the paper format into the standard version for AUPEC.

Author: Paper changed in the standard version for AUPEC (IEEE format).

REVIEWER 2

Originality : 3. Satisfactory

Contribution : 3. Satisfactory

References : 3. Satisfactory

Presentation Style : 3. Satisfactory

Language Quality : 2. Unsatisfactory

Recommendation :

Possible Accept with Mandatory Revisions Comments to Authors :

(1) The paper needs to be thoroughly edited in terms of spelling and grammar before this reviewer can accept.
Author: Paper has been thoroughly edited.

(2) The paper format should be changed to comply with the AUPEC prescribed format.
Author: Paper format changed in the standard version for AUPEC (IEEE format).

(3) The paper contains value judgements (e.g. "This can only be considered as an act of madness" ...) which are not acceptable in a scientific / engineering paper.
Author: Such judgements have been removed.

(4) The paper appears to exceed the 6 page limit by 4 pages -- possibly less if the correct format is used. It should be shortened.
Author: Paper changed to fit the standard of less than 6 pages.

(5) This reviewer is not an expert in engineering economics. Therefore, the following comments on technical content are of a general nature.
Author: The paper is using standard Net Present Value calculations, well known techniques in economics. References are given in the paper to support the used NPV techniques.

(6) The paper provides background "social-policy" information on domestic energy consumption. This is of interest but not original. For the sake of brevity it may be appropriate to shorten these introductory comments.
Author: Social-policy information have been reduced to a minimum.

(7) The paper performs standard "payback period" economic analysis on three alternative domestic scale solar energy options.
Author: The title and abstract are indicating the scope of this work..

(8) The 1976 paper used as a basis for the life-cycle economic analysis predates deregulation. It is desirable for the author to either update this reference (e.g. relevant ISO standards) or justify why this 1976 paper is still appropriate today.
Author: The reference has been removed since not essential. More recent reference has been left to indicate the used technique.

(9) There is some level of originality in that the author uses local data (i.e. Towoomba / Qld);
Author: This has been kept to validate originality of the work.

(10) The author refers to the high cost of peak power but does not appear to adequately explain how storing energy in hot water will reduce the cost of this peak power given that typically electricity for water heating is typically consumed during low demand periods when electricity tarrifs are low.
Author: This has been improved and covered on page 2.

(11) Following on from the previous comment, the author does not appear to explain how the most cost effective option (i.e. water heating) will reduce peak demand.
Author: This has been improved and covered on page 2.

(12) If there is an implicit assumption that solar hot water will be used for household heating &/or cooling then this should be stated explicitly and the additional infrastructure costs for appropriate heat-exhangers in the home should be fac tored into the analysis.

Author: This has been improved and covered on page 2.

FINAL RESULT :

Possible Accept with Mandatory Revisions Additional Comments :

Please format the document to meet the IEEE standard and also address the reviewer's comments.

Author: Thanks for the valuable review.