

# **2009 IEEE Power & Energy Society General Meeting**

**(PESGM 2009)**

**Calgary, Alberta, Canada  
26-30 July 2009**

**Pages 1-658**



**IEEE Catalog Number: CFP09POW-PRT  
ISBN: 978-1-4244-4240-9**

# TABLE OF CONTENTS

## ADVANCES IN DISTRIBUTION SYSTEM MODELING AND ANALYSIS

<b>Developing Benchmark Models for Low-Voltage Distribution Feeders</b> .....	1
<i>Kai Strunz; Robert Fletcher; Ryan Campbell; Feng Gao</i>	
<b>Behavioral Models of DR Technologies for Feeder-Level Analysis</b> .....	4
<i>Thomas E. McDermott</i>	
<b>A Taxonomy of North American Radial Distribution Feeders</b> .....	8
<i>Kevin Schneider; Yousu Chen; D. Engle; David Chassin</i>	
<b>Harmonic Analyses of Power Distribution Neutral-To-Earth Voltage (NEV) Test Case Using the Four-Wire Three-Phase Harmonic Current Injection Method</b> .....	14
<i>Abilio Variz; Jose Luiz R. Pereira; Sandoval Carneiro Jr.; Pedro G. Barbosa</i>	

## AUCTION THEORY FOR POWER INDUSTRY APPLICATIONS

<b>Auction Basics for Wholesale Power Markets: Objectives and Pricing Rules</b> .....	21
<i>Leigh Tesfatsion</i>	
<b>Alternative Auction Objectives and Pricing Schemes for Short-Term</b> .....	29
<i>Eugene Litvinov; Feng Zhao; Tongxin Zheng</i>	
<b>Nonconvex Electricity Market Design</b> .....	40
<i>Richard O'Neill</i>	
<b>Analyzing the Temporal Effects of Ex Ante Mechanism Designs in Power Markets</b> .....	47
<i>Derek Bunn; Maria Martocchia</i>	
<b>Auctioning Adequacy in South America Through Long-Term Contracts and Options: From Classic Pay-As-Bid to Multi-Item Dynamic Auctions</b> .....	51
<i>Rodrigo Moreno; Bernardo Bezerra; Luiz Augusto Barroso; Sebastian Mocarquer; Hugh Rudnick</i>	
<b>Optimal Strategies for Selling Wind Power in Mid-Term Energy Auctions</b> .....	59
<i>Javier García-González; Tomás Gómez San Román; Juan Rivier; Plácido Ostos</i>	

## CHANNELING SPONSORED RESEARCH INTO CLASSROOM EDUCATION

<b>Channeling University-Based Sponsored Research Into Classroom Education</b> .....	66
<i>Badrul Chowdhury</i>	
<b>Channeling Research Into Education: Synergy Between Research and Education</b> .....	69
<i>Ned Mohan; Krushna Mohapatra</i>	
<b>Integrating Distribution Automation and Control Techniques Into Power System Curriculum</b> .....	71
<i>Karen Miu; Anthony Deese; Xiaoguang Yang; Valentina Cecchi; Michael Kleinberg; Christian Schegan</i>	
<b>NSF's Activities in Electric Power and Energy Research and Education</b> .....	74
<i>Dagmar Niebur</i>	
<b>Channeling Sponsored Research Into Classroom Education - Sharing the Experience of the University of Alberta</b> .....	75
<i>Wilsun Xu</i>	
<b>Integrating Today's Research to Prepare Tomorrow's Power Engineers</b> .....	80
<i>Noel Schulz</i>	
<b>Teaching Research Nexus - An Australian Experience</b> .....	84
<i>Syed Islam</i>	
<b>Using Research Results for Power System Classroom Education: A Power Flow and Transient Stability Case Study</b> .....	89
<i>Thomas Overbye</i>	

## CHARACTERISTICS AND CONTROL STRATEGIES OF MAGNETIC BEARING MACHINES AND BRUSHLESS MACHINES

<b>Control of Rotor Torque and Rotor Electric Power in a Reluctance Wound Rotor Brushless Doubly Fed Machine</b> .....	92
<i>Ayman Abdel-Khalik; Mahmoud Masoud; Adel Mohamadein; Barry Williams; M. M. Ahmed;</i>	
<b>A Magnetic Suspension Control Strategy by 3-Phase Inverters in Bearingless Brushless DC Motors</b> .....	97
<i>Masahide Ooshima</i>	
<b>Rotational Characteristics of Bearingless Motor with Passive Magnetic Bearings Tetsuro Asami;</b> .....	102
<i>Tetsuro Asami; Yukiko Nakano; Junichi Asama; Akira Chiba; Tadashi Fukao; Atsushi Nakajima</i>	
<b>A Novel Design of a Thrust Magnetic Bearing with a Cylindrical-Shaped Rotor</b> .....	106
<i>Junichi Asama; Naoya Miyamoto; Takehiro Enomoto; Miya Amada; Akira Chiba; Tadashi Fukao</i>	

## **DISTRIBUTED GENERATION: OPERATION AND CONTROL PROBLEMS - ASIAN AND AUSTRALIAN EXPERIENCE**

<b>Operation and Control Problems of Power Systems with Distributed Generation .....</b>	<b>110</b>
<i>Nicolai Voropai; Dmitry Efimov</i>	
<b>Development of Distributed Generation in China .....</b>	<b>115</b>
<i>Minnan Wang; Jin Zhong</i>	
<b>Distributed Generation in Japan .....</b>	<b>122</b>
<i>Takao Shinji; Akihiko Yokoyama; Yasuhiro Hayashi</i>	
<b>The Design Experience of a CCP MicroGrid in China .....</b>	<b>127</b>
<i>Chengshan Wang; Li Guo; Shouxiang Wang; Bing Wang; Xiaochen Wu; Yufeng Hu</i>	
<b>Research and Development of Grid Integration of Distributed Generation in Japan .....</b>	<b>134</b>
<i>Hiromu Kobayashi; Ikuo Kurihara</i>	
<b>Study on a New Power Control of Distributed Generation in an Isolated Microgrid .....</b>	<b>142</b>
<i>Junichi Arai; Shuichiro Yamazaki; Motohisa Ishikawa; Toshiyuki Ito</i>	
<b>Research and Development of Distributed Generation in China .....</b>	<b>148</b>
<i>Ming Ding; YuSheng Xue; Meiqin Mao; Liuchen Chang</i>	
<b>Experience and Prospect of Wind Power Generation in Korea: .....</b>	<b>153</b>
<i>Jeju Island Case Seung-II Moon; Jinwoo Park; Gi-chan Pyo</i>	
<b>Distributed Generation - Basic Policy, Perspective Planning, and Achievement So Far in India .....</b>	<b>159</b>
<i>Subrata Mukhopadhyay; Bhim Singh</i>	

## **DISTRIBUTION AUTOMATION WORKING GROUP**

<b>Modeling Distribution Automation System Components Using IEC 61850 .....</b>	<b>166</b>
<i>Salman Mohagheghi; Mirrasoul Mousavi; James Stoupis; Zhenyuan Wang</i>	

## **DISTRIBUTION STRAY VOLTAGE WG**

<b>Determining Voltage Levels of Concern for Human and Animal Response to AC Current .....</b>	<b>172</b>
<i>Doug Dorr</i>	
<b>Investigation of Residential Customer Safety- Line, Neutral and Earth Integrity .....</b>	<b>178</b>
<i>Raj Jadav; Tapan Saha</i>	

## **DISTRIBUTION SYSTEM RELIABILITY AND AUTOMATION**

<b>Distribution System Reliability Improvement Using Predictive Models .....</b>	<b>185</b>
<i>Julio Romero Agüero; John Spare; Edmund Phillips; Craig O'Meally; Jia Wang; Richard Brown</i>	
<b>Reliability Improvement of Distribution Feeders Through Real-Time, Intelligent Monitoring .....</b>	<b>192</b>
<i>B. Don Russell; Carl L. Benner; Robert Cheney; Charles F. Wallis; Thomas L. Anthony; William E. Muston</i>	
<b>A Technique for Network Modeling and Reliability Evaluation of Complex Radial Distribution Systems .....</b>	<b>200</b>
<i>Weixing Li; Wei Zhao; Xiaoming Mou</i>	
<b>Application of Cutout Type Reclosers on Distribution Lateral Circuits – A Field Study .....</b>	<b>205</b>
<i>Nicholas Carlson; Haukur Aegirsson; Raluca Lascu; James Benaglio; Michael Ennis</i>	
<b>Hybrid Intelligent Architecture for Fault Identification in Power Distribution Systems .....</b>	<b>209</b>
<i>Rogério Andrade Flauzino; V. Ziolkowski; Ivan Silva; D. M. B. S. de Souza</i>	
<b>On Field Experience Results Related to High-Impedance Faults in Power Distribution System .....</b>	<b>215</b>
<i>V. Ziolkowski; Ivan Silva; D. M. B. S. de Souza; Rogério Andrade Flauzino</i>	
<b>Integrated Vision the Basis for Electric Network Automation .....</b>	<b>220</b>
<i>Rodolfo Garcia Sierra; Felipe Rueda Posada; Juan C. Peralta Martínez; Robinson Díaz Méndez; Oscar E. Arias Salamanca; Alejandro Díaz Santibáñez; Zindy Johana Martínez Garzón; Maribel Vega Muñoz; Orlando Crespo León</i>	
<b>Importance of Distribution Automation System for Indian Power Utility .....</b>	<b>225</b>
<i>Rabindranath Lahiri; Arup Sinha; S. Chowdhury; Shyama Pada Chowdhury; C. Trevor Gaunt</i>	
<b>Efficient Allocation of Fault Indicators in Distribution Circuits Using Fuzzy Logic .....</b>	<b>232</b>
<i>D. M. B. S. de Souza; Ivan Silva; V. Ziolkowski; Rogério Andrade Flauzino</i>	

## **ELECTRIC MACHINE MODELING AND PRACTICAL TECHNIQUES**

<b>Visualization of Propagation Signals Accompanied by Contact Using Cross-Correlation Method Based on In-Place Fast Haar Wavelet Transform .....</b>	<b>238</b>
<i>Masatake Kawada; Koji Yamada; Yasutomo Kaneko; Katsuo Isaka</i>	
<b>Regenerative Braking Strategy for Electric Vehicles .....</b>	<b>N/A</b>
<i>Jingang Guo; Jumping Wang; Binggang Cao</i>	

<b>Improved Design of Existing 210Mw Hydrogen and Water Cooled Generators</b> .....	244
<i>Vishal Gogna; Rintu Khanna</i>	
<b>Fast Convergence to the Steady-State Operating Point of a VFT Park Using the Limit Cycle Method and a Reduced Order Model</b> .....	248
<i>Luis Contreras-Aguilar; Norberto Garcia</i>	
<b>Next-Generation Synchronous Condenser Installation at the VELCO Granite Substation</b> .....	253
<i>John Skliutas; Dean LaForest; Robert D'Aquila; Dale Derr; Erik Kronbeck</i>	

## **ENERGY AND ANCILLARY SERVICE MARKETS**

<b>Midwest Iso Co-Optimization Based Real-Time Dispatch and Pricing of Energy and Ancillary Services</b> .....	261
<i>Xingwang Ma; Yonghong Chen; Jie Wan</i>	
<b>Real Time Ramp Model in MIDWEST ISO Co-Optimized Energy and Ancillary Service Market Design</b> .....	267
<i>Yonghong Chen; Paul Gribik; Li Zhang; Robert Merring; Joe Gardner; Kimberly Sperry; Xingwang Ma</i>	
<b>The Security-Constrained Commitment and Dispatch for Midwest Iso Day-Ahead Co-Optimized Energy Market with Bilateral Contracts and Ancillary Service Market</b> .....	275
<i>Xingwang Ma; Haili Song; Mingguo Hong; Jie Wan; Yonghong Chen; Eugene Zak</i>	
<b>Spatial Market Integration Upon Expanding PJM Electricity Market</b> .....	283
<i>Licheng Jin; David H. Hennessy</i>	
<b>Evaluation of Electricity Market Operating Performance in China</b> .....	290
<i>Qin Wang; Aimin Yang; Fushuan Wen; Iain MacGill</i>	
<b>Market Outcomes in a Congested Electricity System with Fuel Supply Network</b> .....	296
<i>Sarah Ryan</i>	
<b>A Comprehensive Tool for Congestion-Based Nodal Price Modeling</b> .....	304
<i>Muhammad Nappu; Tapan Saha</i>	
<b>Variation Index to Measure Transmission Congestion Impact in LMP-Based Electricity Market</b> .....	312
<i>Dan Yang</i>	
<b>Congestion and Price Prediction Under Load Variation</b> .....	318
<i>Fangxing Li; Rui Bo</i>	
<b>Congestion Management in Hybrid Electricity Markets with a Coordinated Constraint</b> .....	319
<i>Jian Xiao; Fushuan Wen; Iain MacGill</i>	
<b>Locational Marginal Pricing Basics for Restructured Wholesale Power Markets</b> .....	325
<i>Haifeng Liu; Leigh Tesfatsion; A. A. Chowdhury</i>	
<b>Optimal Bidding Strategies for Thermal and Combined Cycle Units in the Day-Ahead Electricity</b> .....	333
<i>F. Javier Heredia; Marcos J. Rider; Cristina Corchero</i>	
<b>Bidding Strategy Under Uncertainty for Risk-Averse Generator Companies in a Long-Term Forward Contract Auction</b> .....	339
<i>Alexandre Street; Luiz Augusto Barroso; Sergio Granville; Mario Veiga Pereira</i>	
<b>Bilateral Negotiation of Energy Contracts from the Buyer Perspective</b> .....	347
<i>Juan Carlos Mateus; Pablo Cuervo</i>	
<b>Comparison of Power Scheduling Outcomes in Electricity Markets</b> .....	354
<i>Somboon Nuchprayoon; Miroslav Begovic</i>	
<b>A Subgradient-Based Cutting Plane Method to Calculate Convex Hull Market Prices</b> .....	360
<i>Congcong Wang; Peter B. Luh; Paul Gribik; Li Zhang; Tengshun Peng</i>	
<b>Optimal Capacity Allocation in Different Markets for Generation Companies Employing the Mean-Lower Partial Moments Model</b> .....	367
<i>Yong Yan; Fushuan Wen; Jiansheng Huang</i>	

## **ENERGY DEVELOPMENT AND POWER GENERATION**

<b>A Small Hydro Power (SHP) System in Taiwan Using Outlet-Water Energy of a Reservoir: System Introduction and Measured Results</b> .....	375
<i>Li Wang; Dong-Jing Lee; Jian-Hong Liu; Zan-Zia Chen; Zone-Yuan Kuo; Wei-Jen Lee; Jin-Shi Hsu; Cheng-Mei Chen; Shen-Syi Chiu; Ming-Hua Tsai; Wei-Taw Lin; Yuan-Chung Li</i>	
<b>Energy Saving of a Prototype Fishing Boat Using a Small Wind Turbine Generator: Practical Installation and Measured Results</b> .....	382
<i>Li Wang; Shiang-Shong Chen; Chen-Yuan Wei; Kuo-Hua Wang; Jun-De Lee; Cheng-Ching Huang; Wei-Jen Lee</i>	
<b>Trade-Off Analysis of Autonomous Microgrid Sizing with PV, Diesel, and Battery Storage</b> .....	388
<i>Naoki Saito; Tak Niimura; Kaoru Koyanagi; Ryuichi Yokoyama</i>	
<b>A Maximum Power Point Tracking Algorithm Based on Gradient Descent Method</b> .....	394
<i>Jianpo Zhang; Tao Wang; Huijuan Ran</i>	
<b>A Comparative Metric to Quantify the Variability of Wind Power</b> .....	399
<i>Patrick Doody; Surya Santoso</i>	
<b>Behavior and Protection of Doubly-Fed Induction Generators During Network Faults</b> .....	405
<i>Sarah Foster; Lie Xu; Brendan Fox</i>	
<b>Comparison of Pitch Angle Control Models of Wind Farm for Power System Analysis</b> .....	413
<i>Li Lin; Jing Zhang; Yihan Yang</i>	

<b>Development and Analysis of an ESS-Based Application for Regulating Wind Farm Power Output Variation .....</b>	<b>420</b>
<i>Ha Thu Le; Surya Santoso; W. Mack Grady</i>	
<b>Validation and Analysis of Wind Power Plant Models Using Short-Circuit Field Measurement Data .....</b>	<b>428</b>
<i>Mohit Singh; Keith Faria; Surya Santoso; Eduard Muljadi</i>	

## **ENERGY DEVELOPMENTS IN SOUTH EAST EUROPE**

<b>Existing SEE Transmission System and Development.....</b>	<b>434</b>
<i>Davor Bajcs; Goran Majstrovic</i>	
<b>Modeling and Simulation of the Interconnected SEE and Italy Electricity Markets .....</b>	<b>441</b>
<i>S. Bruno; Massimo La Scala; George Gross</i>	
<b>Development of the SEE Electricity Market - Current Obstacles and Way Forward .....</b>	<b>447</b>
<i>Manuel Tinoco</i>	
<b>Development of Coordinated Cross-Border Congestion Management in the SEE Region.....</b>	<b>455</b>
<i>Manfred Pils</i>	
<b>Trading Opportunities in the SEE.....</b>	<b>458</b>
<i>Niko A. Iliadis; Pantelis Biskas</i>	
<b>Status and Development of the Russian Electricity Market .....</b>	<b>461</b>
<i>Sergey Palamarchuk; N. I. Voropai</i>	

## **ETCC POSTER SESSION**

<b>Application of Multi-Agents for Fault Detection and Reconfiguration of Power Distribution Systems .....</b>	<b>466</b>
<i>Koushaly Nareshkumar; Muhammad A. Choudhry; Hong-Jian Lai; Ali Feliachi</i>	
<b>Sequence-Based Control for Large-Scale Power Electronics Networks .....</b>	<b>474</b>
<i>Sudip Mazumder; K. Acharya</i>	
<b>State of Art of Fault Current Limiters and Their Impact on Overcurrent Protection .....</b>	<b>483</b>
<i>Sujay Orpe; Nirmal-Kumar C. Nair</i>	
<b>Reactive Power Compensation Using Z-Source Based Photovoltaic System.....</b>	<b>488</b>
<i>Reza Gharakhany; Mustafa Mohamadian; Ali Yazdian Varjani</i>	
<b>Optimization of Vehicle-To-Grid Scheduling in Constrained Parking Lots .....</b>	<b>495</b>
<i>Ahmed Saber; Ganesh Kumar Venayagamoorthy</i>	

## **EXCITATION SYSTEMS PERFORMANCE AND MODELING**

<b>Coordination of Digital Excitation System Settings for Reliable Operation .....</b>	<b>503</b>
<i>Richard Schaefer; Don Jansen; Shawn McMullen; Pranesh Rao</i>	
<b>Coordination of Under Excitation Limiters and Loss of Excitation Relays with Generator Capability.....</b>	<b>510</b>
<i>Roger Berube; Les Hajagos</i>	

## **EXPERIENCE WITH OPERATING GENCO ASSETS IN RTO MARKETS**

<b>Lessons Learned from Operating Genco Assets in RTO Markets.....</b>	<b>518</b>
<i>Khai Le</i>	
<b>SPP's Experience with Operating the Energy Imbalance Market .....</b>	<b>520</b>
<i>Richard Dillon</i>	
<b>PJM's Experience with Operating Energy and Ancillary-Service Markets.....</b>	<b>521</b>
<i>Bhavana Keshavamurthy</i>	
<b>Operating Independent Power Plants in Japanese Market: From Contract Management to Real-Time Operations.....</b>	<b>522</b>
<i>Marta Marmiroli; Yukioki Tsukamoto</i>	
<b>Benefits of Fast-Response Devices for System Regulation in ISO Markets.....</b>	<b>523</b>
<i>Khoi Vu; Ralph Masiello; Richard Fioravanti</i>	

## **GENERAL SYSTEMS PAPER SESSION**

<b>Fast Realization of the Modal Vector Fitting Method for Rational Modeling with Accurate Representation of Small Eigenvalues .....</b>	<b>531</b>
<i>Bjorn Gustavsen; Christoph Heitz</i>	
<b>Loss Reduction Opportunities in EHV Transmission Systems .....</b>	<b>532</b>
<i>J. H. Gurney; Rodolfo J. Koessler; Jai S. Mumick; F. S. Prabhakara; Gang Shen</i>	
<b>Integrated Fault Current Limiter and Power Flow Controller for Grid Tie-Lines.....</b>	<b>539</b>
<i>Debrup Das; Deepak Divan; Frank Lambert</i>	

<b>Applications of Real-Time Simulation Techniques for Shunt Active Power Filter Design</b> .....	546
<i>Yu-Jen Liu; Gary Chang; Rong-Chin Hong; Chi-Yun Chao</i>	
<b>Use of a Pre-Insertion Resistor to Minimize Zero-Missing Phenomenon and Switching Overvoltages</b> .....	551
<i>Filipe Faria da Silva; Claus Bak; Ummur Gudmundsdottir; Wojciech Wiechowski; Martin Knardrupgård</i>	
<b>Quadratized Model of Nonlinear Saturable-Core Inductor for Time-Domain Simulation</b> .....	558
<i>George Stefanopoulos; George Cokkinides; Sakis Meliopoulos</i>	
<b>Transient Interaction Between Coupling Capacitors Voltage Transformers and Transmission Lines</b> .....	566
<i>Ademar Carvalho Jr.; Antonio Freire; Helio Oliveira</i>	
<b>Supplemental Control of Voltage Sourced Converter-Based Back-To-Back for Damping Subsynchronous Resonance</b> .....	574
<i>Sherif Faried; Guosheng Tang; Abdel-Aty Edris</i>	
<b>Application and Analysis of Optimum PMU Placement Methods with Application to State Estimation Accuracy</b> .....	580
<i>Kun Zhu; Lars Nordström; Lennart Ekstam</i>	

## **GOING "GREEN"**

<b>Development of Renewable Energy Sources for Indian Power Sector Moving Towards Competitive Electricity Market</b> .....	587
<i>Randhir Singh; Yog Raj Sood; Narayana Prasad Padhy</i>	
<b>A Generic Outline for Dynamic Modeling of Ocean Wave and Tidal Current Energy Conversion Systems</b> .....	593
<i>Jahangir Khan; Ali Moshref; Gouri Bhuyan</i>	
<b>REX10 Interconnection and Environmental Greenhouse Gas Reduction in South Korea</b> .....	599
<i>Sang-Seung Lee; Jong-Keun Park; Goon-Cherl Park; Seung-Il Moon; Geun-Pyo Park; Yong Tae Yoon</i>	
<b>PEM Fuel Cell System as an Autonomous Power Supplier</b> .....	605
<i>Maik Heuer; Mathias Käbisch; Günter Heideck; Zbigniew A. Styczynski</i>	
<b>Single Stage Single Phase Series-Grid Connected PV System for Voltage Compensation and Power Supply</b> .....	610
<i>Seyed Hossein Hosseini; Saeed Danyali; Ali Yazdanpanah Goharizi</i>	
<b>Test Operations of Stand Alone Photovoltaic Power Generation Systems and Calculation of Their Scale Merit</b> .....	617
<i>Kazuaki Terao; Tomonaga Ostuka; Toshihiko Nakano; Teruhisa Kumano</i>	
<b>Uninterruptible Photovoltaic Power Supply: A Case Study of System Failure</b> .....	623
<i>Kame Khouzam</i>	
<b>Environmental Benefits of Plug-In Hybrid Electric Vehicles: The Case of Alberta</b> .....	631
<i>Mahdi Hajian; Hamidreza Zareipour; William Rosehart</i>	
<b>Design, Modeling and Simulation of a Green Building Energy System</b> .....	637
<i>Zhenhua Jiang; Habiballah Rahimi-Eichi</i>	
<b>Linking Energy Policy, Electricity Generation and Transmission Using Strong Sustainability and Co-Optimization</b> .....	644
<i>Justin Bishop; Gehan Amaratunga; Cuauhtemoc Rodriguez</i>	

## **IMPACT OF HIGH PENETRATION OF WIND POWER ON POWER SYSTEM OPERATIONS**

<b>Realistic Operational Simulation of Wind Projects</b> .....	651
<i>Zuyi Li; Mohammad Shahidehpour; Frank Bristol</i>	
<b>Managing Wind Uncertainty and Variability in the Irish Power System</b> .....	652
<i>Aidan Tuohy; Niamh Troy;;rej F. Gubina; Mark O'Malley</i>	
<b>Impact of High Penetration of Wind on Power System Operations</b> .....	657
<i>John Adams</i>	
<b>The Evolution of Wind Power Integration Studies: Past, Present, and Future</b> .....	659
<i>Erik Ela; Michael Milligan; Brian Parsons; Debra Lew; David Corbus</i>	
<b>Reserve Determination for System with Large Wind Generation</b> .....	667
<i>J. Charles Smith; Mark Ahlstrom; Robert Zavadil; Ali Sadjadpour</i>	
<b>Reliability-Based Long Term Hydro/Thermal Reserve Allocation of Power Systems with High Wind Power Penetration</b> .....	672
<i>Peng Wang; Lalit Goel; Yi Ding; Loh Poh Chang; M.;rew</i>	
<b>Security-Constrained Unit Commitment with Volatile Wind Power Generation</b> .....	679
<i>Jianhui Wang; Mohammad Shahidehpour; Zuyi Li</i>	

## **IMPACTS OF DISTRIBUTED RESOURCES ON DISTRIBUTION SYSTEMS**

<b>A Checklist Approach to DR Interconnection and Impact Studies</b> .....	680
<i>Thomas E. McDermott; J. F. Manwell; J. G. McGowan</i>	
<b>A Multifaceted View of Distributed Generation Systems and Their Impacts</b> .....	684
<i>Marcelo Algrain</i>	
<b>Islanding Issues for Large-Scale Wind Generators Interconnected to Local-Delivery Distribution Systems</b> .....	689
<i>R. Walling</i>	

## **INTERACTION BETWEEN ELECTRICITY AND GAS MARKETS**

<b>The Integrated Operation and Expansion Planning of Natural Gas and Electricity Systems: Technical and Economical Aspects</b> .....	693
<i>Clodomiro Unsihuay-Vila; Jose Wanderley Marangon-Lima; Antonio Carlos Zambroni de Souza</i>	
<b>Electricity and Gas Interaction: A UK Perspective and Risk Assessment</b> .....	701
<i>James Whiteford; Gareth Harrison; Janusz Bialek</i>	
<b>Linear Models for Optimization of Interconnected Gas and Electricity Networks</b> .....	707
<i>Bjorn H. Bakken; Sigrun Kavli Mindeberg</i>	
<b>Interdependence of NG and Electricity Infrastructures in Turkey</b> .....	709
<i>Cem Sahin; Mohammad Shahidehpour</i>	
<b>Power and Gas Integration: The Spanish Experience</b> .....	715
<i>Ernesto Parrilla</i>	
<b>The Need for Resource Diversity in New England</b> .....	720
<i>Michael Henderson; Wayne Coste; Peter Wong; James Platts</i>	

## **POWER ENGINEERING EDUCATION COMMITTEE POSTER SESSION**

<b>From Wind-Solar Energy Educational Demo System (WISE) to Sustainable Energy Research Facility (SERF)</b> .....	725
<i>Oguz Soysal; Hilkat Soysal</i>	
<b>Design and Performance of a Scaled Electromechanical Wind Turbine Power Train Model</b> .....	731
<i>Jules D. Campbell; Surya Santoso</i>	
<b>Improving the Evaluation of Electric Power Systems Class Students Through BLS-Based Assessments</b> .....	737
<i>Walid Morsi; Mohamed El-Hawary</i>	
<b>International Sabbaticals: Experiences and Opportunities</b> .....	741
<i>Noel Schulz; A. Manu Haddad</i>	

## **POWER SYSTEM CONTROL AND STABILITY**

<b>Accurate Prediction of Damping in Large Interconnected Power Systems with the Aid of Regression Analysis</b> .....	747
<i>Brian Archer; Udaya Annakkage; Bathiya Jayasekara; Punya Wijetunge</i>	
<b>Sequential Computation of Transfer Function Dominant Poles of S-Domain System Models</b> .....	748
<i>Sergio Gomes Jr.; Nelson Martins; Carlos Portela</i>	
<b>The Modal Series Method and Multi-Dimensional Laplace Transforms for the Analysis of Nonlinear Effects in Power Systems Dynamics</b> .....	749
<i>Oswaldo Rodriguez; Aurelio Medina; Arturo Roman Messina; Claudio Ruben Fuerte-Esquivel</i>	
<b>Excitation Control for Large Disturbances in Power Systems with Dynamic Loads</b> .....	757
<i>Jahangir Hossain; Hemanshu Roy Pota; Valeri Ugrinovskii; Rodrigo A. Ramos</i>	
<b>Damping Inter-Area Oscillations by Multiple Modal Selectivity Method</b> .....	765
<i>Hamed Golestani Far; Hadi Banakar; Pei Li; Changling Luo; Boon-Teck Ooi</i>	
<b>A Wavelet-Based Method to Extract Frequency Feature for Power System Fault/Event Analysis</b> .....	774
<i>Jiaxin Ning; Wenzhong Gao</i>	
<b>Nonlinear Damping Computation and Envelope Detection Using Hilbert Transform and Its Application to Power Systems Wide Area Monitoring</b> .....	779
<i>Dina Shona Laila; Mats Larsson; Bikash Chandra Pal; Petr Korba</i>	
<b>An Improved Power System Stability Criterion with Multiple Time Delays</b> .....	786
<i>Sun Qiang; An Haiyun; Jia Hongjie; Yu Xiaodan; Wang Chengshan; Wei Wei; Ma Zhiyu; Zeng Yuan; Zhao Jinli; Li Peng</i>	
<b>A Channel Matching Approach for Estimating Electromechanical Mode Shape and Coherence</b> .....	793
<i>Luke Dosiek; John Pierre; Daniel Trudnowski; Ning Zhou</i>	
<b>Theoretical Foundation of CUEP Method for Two-Time Scale Power System Models</b> .....	801
<i>Luís Fernando Costa Alberto; Hsiao-Dong Chiang</i>	

## **POWER SYSTEM DYNAMIC PERFORMANCE COMMITTEE POSTER SESSION**

<b>A Supplementary Damping Controller of TCSC for Mitigating SSR</b> .....	810
<i>Xiang Zheng; Zheng Xu; Jing Zhang</i>	
<b>TS-Fuzzy Controlled DFIG Based Wind Energy Conversion Systems</b> .....	815
<i>S. Mishra; Yateendra Mishra; Fangxing Li; Z. Y. Dong</i>	
<b>Sub-Synchronous Resonance Damping in Series Compensated Transmission Lines Using a STATCOM in the Common Bus</b> .....	822
<i>Hamed Khalilinia; Jafar Ghaisari</i>	
<b>Comparison of the Grid Support Capability of DFIG-Based Wind Farms and Conventional Power Plants with Synchronous Generators</b> .....	829
<i>Christian Feltes; Stephan Engelhardt; Joerg Kretschmann; Jens Fortmann; Friedrich Koch; Istvan Erlich</i>	

<b>Bi-Directional Power Electronic Transformer Based Compact Dynamic Voltage Restorer .....</b>	<b>836</b>
<i>Seyed Hossein Hosseini; Mohammad Bagher Bana Sharifian; Mehran Sabahi; Ali Yazdanpanah Goharri; Gevorg B. Gharehpetian</i>	
<b>Determining Modes of Low Frequency Oscillations Based on Power Oscillation Flows in the Tie Lines .....</b>	<b>841</b>
<i>Cheng Wu; Jing Zhang</i>	
<b>An Efficient Method of Calculation for Transient Stability ATC in Longitudinal Power Systems .....</b>	<b>846</b>
<i>Ryosuke Takahashi; Yujiro Hiraki; Shinichi Iwamoto; Hironobu Morita; Kunio Sakamoto</i>	
<b>Coordinated Design of Multiple FACTS Controllers Based on Fuzzy Immune Co-Evolutionary Algorithm .....</b>	<b>852</b>
<i>Qing Liu; Wang Zengzeng</i>	
<b>Design of Power System Controllers by Nonsmooth, Nonconvex Optimization .....</b>	<b>858</b>
<i>Daniel Dotta; Aginaldo Silva; Ildemar Decker</i>	

## **POWER SYSTEM OPERATIONS COMMITTEE POSTER SESSION**

<b>Wind Power Forecasting and Error Analysis Using the Autoregressive Moving Average Modeling .....</b>	<b>865</b>
<i>Sidharth Rajagopalan; Surya Santoso</i>	
<b>Generation Adequacy Assessment of Power Systems with Wind Generation: A System Operations Perspective .....</b>	<b>871</b>
<i>Claudine D'Annunzio; Shun-Hsien Huang; Surya Santoso</i>	
<b>Effects of Security Constraints on Unit Commitment with Wind Generators .....</b>	<b>878</b>
<i>Dechen Choling; Peng Yu; Bala Venkatesh</i>	
<b>Fuzzy MILP Unit Commitment Incorporating Wind Generators .....</b>	<b>884</b>
<i>Bala Venkatesh; Peng Yu; Dechen Choling; H. B. Gooi</i>	
<b>Estimating the System Costs of Wind Power Forecast Uncertainty .....</b>	<b>885</b>
<i>C.Anderson; Judith Cardell</i>	
<b>Study on Microturbine as a Back-Up Power Supply for Power Grid Black-Start .....</b>	<b>889</b>
<i>Tao Yu; Jia-peng Tong; K. W. Chan</i>	
<b>A New Method to Determine the Droop of Inverter-Based DGs .....</b>	<b>895</b>
<i>Hyun-Koo Kang; Seon-Ju Ahn; Seung-Il Moon</i>	
<b>Development of the Emergency Voltage Control Scheme Using VMPI .....</b>	<b>901</b>
<i>Hirohide Tanaka; Keita Tokumitsu; Shinichi Iwamoto; Ryoji Kobayashi; Daigo Hirano; Akira Takeuchi</i>	
<b>Transient Stability Enhancement of Power System Using MPC Based TCSC Controller .....</b>	<b>907</b>
<i>Sudhir Bhil; Atul Kamath; Navdeep Singh; Sushama Wagh</i>	
<b>Dynamic Strategy Based Parallel GA Coordinated with FACTS Devices to Enhance the Power System Security .....</b>	<b>914</b>
<i>Belkacem Mahdad; K. Srairi; T. Bouktir</i>	
<b>OPF with Environmental Constraints with FACTS Controller Using Decomposed Parallel GA: Application to the Algerian Network .....</b>	<b>922</b>
<i>Belkacem Mahdad; T. Bouktir; K. Srairi</i>	
<b>A Load Frequency Control Design Using the Sliding Mode Control Theory with a VSS Observer .....</b>	<b>930</b>
<i>Hidekazu Kondo; Yuya Suzuki; Shinichi Iwamoto</i>	
<b>Wide-Area Mode Visualization Strategy Based on FNET Measurements .....</b>	<b>935</b>
<i>Robert Gardner; Brandon Jordan; Yilu Liu</i>	
<b>Power Quality Enhancement Using a New Hybrid Active Power Filter Under Non-Ideal Source and Load Conditions .....</b>	<b>941</b>
<i>Seyed Hossein Hosseini; Tohid Nouri; Mehran Sabahi</i>	
<b>Economic Evaluation for Generation Investment in South Korea Electricity Market .....</b>	<b>947</b>
<i>Sun-Kyo Kim; Jun-Hyung Park; Ho-Chul Lee; Geun-Pyo Park; Sang-Seung Lee; Wook Kim; Yong Tae Yoon</i>	
<b>Small Signal Model for Analysis and Design of FACTS Controllers .....</b>	<b>952</b>
<i>Rajendra Kumar Pandey; N. K. Singh</i>	
<b>A New Technology for HVDC Start-Up and Operation Using VSC-HVDC System .....</b>	<b>960</b>
<i>Chunyi Guo; Chengyong Zhao</i>	
<b>Complete-Independent Control Strategy of Active and Reactive Power for VSC Based HVDC System .....</b>	<b>965</b>
<i>Chengyong Zhao; Chunyi Guo</i>	
<b>Minimization of Steady-State Losses in Meshed Networks Using VSC HVDC .....</b>	<b>971</b>
<i>Gilles Daelemans; Kailash Srivastava; Muhamad Reza; Stijn Cole; Ronnie Belmans</i>	
<b>Scheduling of Head-Sensitive Cascaded Hydro Systems: A Nonlinear Approach .....</b>	<b>976</b>
<i>J.P.S. Catalão; S. J. P. S. Mariano; V. M. F. Mendes; L. A. F. M. Ferreira</i>	
<b>Reliability Benefits of Distributed Generation as a Backup Source .....</b>	<b>977</b>
<i>Irfan Waseem; Manisa Pipattanasomporn; Saifur Rahman</i>	

## **POWER SYSTEM PLANNING AND IMPLEMENTATION (PSPI) POSTER SESSION**

<b>Reliability Evaluation of UHVDC Systems Using Monte Carlo Simulation .....</b>	<b>985</b>
<i>Longjun Wang; Gang Wang; Bo Li</i>	
<b>Determination of the Optimum Routine Maintenance Intervals for Protective Systems .....</b>	<b>991</b>
<i>Longjun Wang; Gang Wang; Zhibin Sun</i>	
<b>Modified Augmented Hopfield Neural Network for Optimal Thermal Unit Commitment .....</b>	<b>996</b>
<i>Mohamed Kamh; Almoataz Abdelaziz; Saeed Mekhamer; Mohamed Abdel-Latif Badr</i>	

<b>A Performance Comparison of Probabilistic Techniques for Electricity Market Simulation</b> .....	1004
<i>P. A. J. Fonseca; Zhaoyang Dong; Tapan Saha</i>	
<b>Distribution Network Planning Using a Constructive Heuristic Algorithm</b> .....	1010
<i>Marina Lavorato; Marcos J. Rider; Ariovaldo V. Garcia; Rubén Romero</i>	
<b>Some Common Misconceptions About the Modeling of Repairable Components</b> .....	1016
<i>Carlos J. Zapata; Alvaro Torres; Daniel S. Kirschen; Mario A. Rios</i>	
<b>Optimum Planning of Large Distributed Resources in a Mesh Connected System Based on Artificial Neural Networks</b> .....	1024
<i>Mohab Elnashar; Ramadan El Shatshat; Magdy Salama</i>	
<b>Human-Machine Co-Construct Intelligence on Horizon Year Load in Long Term Spatial Load Forecasting</b> .....	1030
<i>Tao Hong; Simon Hsiang; Le Xu</i>	
<b>Cost and Loadability Based Design Technique for LV Distribution Networks</b> .....	1036
<i>Hossein Shateri; Ali Asghar Anjadi; Milad Ghorbani; Amir Hossein Mohammad-Khani</i>	
<b>An Analytical Method for DG Placements Considering Reliability Improvements</b> .....	1042
<i>Lei Han; Renjun Zhou; Xuehua Deng</i>	
<b>Assessing the Performance of Electric Utilities of Developing Countries: An Intercountry Comparison Using DEA</b> .....	1047
<i>Vinod Yadav; Narayana Prasad Padhy; Hari Om Gupta</i>	
<b>Probabilistic Load Models for Simulating the Impact of Load Management</b> .....	1054
<i>Peiyuan Chen; Birgitte Bak-Jensen; Zhe Chen</i>	

## **POWER SYSTEM RELAYING POSTER SESSION**

<b>Approximate Entropy and Its Application to Fault Detection and Identification in Power Swing</b> .....	1062
<i>Ling Fu; Zhengyou He; Ruikun Mai; ZhiQian Bo</i>	
<b>An Adaptive Mimic Filter – Based Algorithm for the Detections of CT Saturations</b> .....	1070
<i>Chi-Shan Yu; Zong-Sian Wu; Joe-Air Jiang</i>	
<b>An Adaptive Inverse Time-Delay Characteristic of the Zero-Sequence Overvoltage Protection for Identification of the Single-Phase Earth Fault in the Neutral Non-Effectively Grounded Power Systems</b> .....	1076
<i>Xiangning Lin; Zhimin Zhao; ZhiQian Bo</i>	
<b>An Agent Brokering-Based Scheme for Anti-Islanding Protection of Distributed Generation</b> .....	1081
<i>Chen Ma; Zhen Lu; Wenhui Tang; Henry Wu; John Fitch</i>	
<b>Investigations of Impacts of Distributed Generations on Feeder Protections</b> .....	1089
<i>Helen Cheung; Alexander Hamlyn; Lin Wang; Cungang Yang; Richard Cheung</i>	
<b>Impact of SSSC on the Digital Distance Relaying</b> .....	1096
<i>Mojtaba Khederzadeh; Amir Ghorbani; Ahmad Salemnia</i>	
<b>Development of Wide Area Monitoring and Control Applications in Malaysia</b> .....	1104
<i>Maszatul Akmar Mustafa; Nik Sofizan Yusuf; Vladimir Terzija</i>	
<b>Study on the Dynamic Performance Characteristics of HVDC Control and Protections for the HVDC Line Fault</b> .....	1112
<i>Aimin Li; Zexiang Cai; Qizhen Sun; Xiaohua Li; Dayong Ren; Zeming Yang</i>	
<b>Influence of Auxiliary DC System Capacitance on Relay Protection Operation</b> .....	1117
<i>Vitaly Faybisovich; Terry Chapman</i>	
<b>A Protection Scheme for Phase-To-Phase Faults Based on Spectrum Characteristic of Fault-Generated High-Frequency Transient Signals</b> .....	1125
<i>Shao Feng Huang; Xing Guo Wang</i>	
<b>A Fault Location Scheme Based on Spectrum Characteristic of Fault-Generated High-Frequency Transient Signals</b> .....	1130
<i>Shao Feng Huang; Xing Guo Wang</i>	
<b>The Comparative Investigation on Current Differential Criteria Between the One Using Phase Current and the One Using Phase-Phase Current Difference for the Transformer Using Y-Delta Connection</b> .....	1135
<i>Xiangning Lin; Hanli Weng; Bin Wang; ZhiQian Bo</i>	
<b>Modeling of UHV Power Transformer and Analysis of Electromagnetic Transient</b> .....	1141
<i>Linjun Zeng; Xiangning Lin; Jingguang Huang; ZhiQian Bo</i>	
<b>A Fault-Component Based Adaptive Distance Protection Scheme</b> .....	1146
<i>Xiangning Lin; Hanli Weng; Bin Wang; ZhiQian Bo</i>	
<b>Applying 100% Stator Ground Fault Protection by Low Frequency Injection for Generators</b> .....	1152
<i>Steve Turner</i>	
<b>Fault Location for Double-Circuit Lines Utilizing Sparse Voltage Measurements</b> .....	1158
<i>Ning Kang; Yuan Liao</i>	
<b>A New Algorithm for Fault Location on Transmission Lines</b> .....	1165
<i>Mojtaba Shiroei; Sabah Daniar; Mehdi Akhbari</i>	
<b>A Centralized Protection Scheme Based on Combined Positional Protection Techniques</b> .....	1170
<i>ZhiQian Bo; Min Han;rew Klimek; Baohui Zhang; Jinghan He; Xinzhou Dong</i>	
<b>Generator Fault Detection Technique Using Detailed Coefficients Ratio by Daubechies Wavelet Transform</b> .....	1176
<i>Chul-Won Park; Kwang-Chul Shin; Sang-Seung Lee; Jong-Keun Park; Myong-Chul Shin</i>	
<b>Study on Non-Unit Transient Protection Principle for EHV Transmission Lines Based on Wavelet Singular Entropy</b> .....	1183
<i>Liu Qing; Wang Zengzeng</i>	
<b>Modified Distance Protection in Presence of SSSC on a Transmission Line</b> .....	1189
<i>Sadegh Jamali; Ahad Kazemi; Hossein Shateri</i>	

<b>Faulted Feeder Selection in Neutral Non-Effectively Grounded Distribution System Using Single-Phase Current Traveling Wave</b> .....	1197
<i>Shenxing Shi; Xinzhou Dong</i>	
<b>An Adaptive Distance Relaying Algorithm with a Morphological Fault Detector Embedded</b> .....	1204
<i>Zhen Lu; Tianyao Ji; Henry Wu; J. Fitch</i>	
<b>Development of Test Facility for Compatibility and Performance Testing of All-Digital Protection Systems Connected to IEC 61850-9-2 Standard</b> .....	1212
<i>Sadik Kucuksari; George Karady</i>	
<b>Measured Impedance by Distance Relay for Inter Phase Faults in Presence of Inductive Fault Current Limiter</b> .....	1220
<i>Hossein Shateri; Sadegh Jamali</i>	
<b>WAMS Assisted Frequency and Voltage Stability Based Adaptive Load Shedding Scheme</b> .....	1227
<i>K. Seethalekshmi; S. N. Singh; S. C. Srivastava</i>	
<b>Comparing Impacts of SSSC and STATCOM on Measured Impedance at Relaying Point</b> .....	1235
<i>Ahad Kazemi; Sadegh Jamali; Hossein Shateri</i>	
<b>Feeder Automation System Based on Non-Communication Protection and Control Unit</b> .....	1242
<i>Xinzhou Dong; Shenxing Shi; Bin Wang; Wei Kong; ZhiQian Bo</i>	
<b>HVDC Converter Modeling and Harmonic Calculation Under Asymmetric Faults in the AC System</b> .....	1249
<i>Wang Gang; Li Zhikeng; Li Haifeng; Li Xiaolin; Fu Chuang</i>	
<b>Ajax-Based Information Publishing System for Traveling Wave Fault Location</b> .....	1255
<i>Ling Li; Zeng Xiangjun; Zhang Yongxi; Deng Feng; Chu Xianghui</i>	
<b>Novel PCB Sensor Based on Rogowski Coil for Transmission Lines Fault Detection</b> .....	1260
<i>Chu Xianghui; Zeng Xiangjun; Deng Feng; Li Ling</i>	
<b>HHT Based Non-Unit Transmission Line Protection Using Traveling Wave</b> .....	1264
<i>Xiangjun Zeng; Xiao'an Qin; Yijie Zhang; Zhihua Wu</i>	
<b>New Simple Formulations and Validations for Digital Implementation of Pilot Protective Relaying Schemes</b> .....	1269
<i>Helen Cheung; Alexander Hamlyn; Lin Wang; Cungang Yang; Richard Cheung</i>	

## **PREASSESSMENT OF FLICKER DUE TO LOADS SERVED FROM THE UTILITY GRID**

<b>How Can Flicker Level Be Determined Before a Customer Is Connected to the Electric Grid</b> .....	1275
<i>Xavier Yang; Jacques Gauthier</i>	
<b>How Does IEEE 1453 Compare to the GE Curve in Evaluating Flicker Compliance</b> .....	1281
<i>Reuben Burch</i>	
<b>Voltage Flicker Analysis of a Proposed Car Shredder</b> .....	1285
<i>David Zech; Kevin Little; Kenneth Sedziol</i>	
<b>Assessment of Flicker Impact of Fluctuating Loads Prior to Connection</b> .....	1290
<i>Mark Halpin</i>	

## **PRESENTATIONS SURGE PROTECTIVE DEVICES**

<b>Simulation and Analysis of the Effect of Single-Pole Auto-Reclosing on HV Transmission Lines Switching Overvoltages</b> .....	1292
<i>Ehsan Abbasi; Heresh Seyedi; Kai Strunz</i>	
<b>Investigating Protection of Approach Lighting Systems (ALS) Against Electrical Surges</b> .....	1301
<i>James A. Momoh; Arunsi Chuku; Abdoulaye Sy; Thomas Geuting; Lateef Baruwa</i>	

## **PSCC POSTER SESSION**

<b>Managing Remote On-line Partial Discharge Data</b> .....	1307
<i>Victoria Catterson; Stephen McArthur; Martin Judd; Ammar Zaher</i>	

## **PSIM POSTER**

<b>Energy Distribution Analysis in the Closing Process of Contactor</b> .....	1308
<i>Shih-An Yin; Chieh-Tsung Chi</i>	
<b>The Electronic Capacitive Voltage Transformers Error Characteristics Research and Parameter Optimization Design</b> .....	1315
<i>Hongxing Wang; Guoqing Zhang; Xingguo Cai; Zhizhong Guo</i>	
<b>Research on Control Strategy of VSC Based HVDC System Supplying Passive Network</b> .....	1322
<i>Hairong Chen</i>	
<b>A Two-Stage Combined Method for Harmonic/Interharmonic Analysis</b> .....	1326
<i>Jun-Zhe Yang</i>	
<b>Analysis on Measuring Performance of Three Flicker Detecting Methods</b> .....	1332
<i>Qing Chen; Xiufang Jia; Chengyong Zhao</i>	

<b>Novel Method of Live Line Measuring the Zero Sequence Parameters of Transmission Lines with Mutual Inductance</b> .....	1339
<i>Zhijian Hu; Zhongzhu Xu; Jiacheng Fan; Mi Chen</i>	
<b>The Design of the Sensor in Electronic Voltage Transformer</b> .....	1343
<i>Zhimin Zhao; Xiangning Lin; ZhiQian Bo</i>	
<b>Phasor Measurement Unit Placement Algorithm</b> .....	1347
<i>Saurabh Kulkarni; Alicia Allen; Surya Santoso; W. Mack Grady</i>	
<b>New Method of Live Line Measuring the Parameters of T-Connection Transmission Lines with Mutual Inductance</b> .....	1353
<i>Zhijian Hu; Jiacheng Fan; Mi Chen; Zhongzhu Xu</i>	
<b>Sliding Window Recursive DFT with Dyadic Downsampling – A New Strategy for Time-Varying Power Harmonic Decomposition</b> .....	1358
<i>Paulo Silveira; Carlos Duque; Thomas Baldwin; Paulo Ribeiro</i>	
<b>Fault-Tolerant Decentralized PCT Estimators Applied to Non-Linear Electrical Power System State Estimation</b> .....	1364
<i>Huimin Li; Antonello Monti; Ferdinanda Ponci; Gabriele D'Antona</i>	
<b>Detection and Correction of Current Transformer Saturation Effects in Secondary Current Signals</b> .....	1369
<i>Philipp Stachel; Peter Schegner</i>	

## **SOLVING MAJOR CHALLENGES IN TRANSMISSION ASSET INVESTMENT IN COMPETITIVE ENVIRONMENT**

<b>Solving the Major Challenges in Transmission Asset Investment in the Competitive Environment: The Brazilian Case</b> .....	1375
<i>Luiz Augusto Barroso; Fernando Porrua; Mario Veiga Pereira; Bernardo Bezerra</i>	
<b>Formulation of Incentives for Decentralized Transmission Asset Investments</b> .....	1383
<i>Javier Contreras; George Gross</i>	
<b>The Transmission Investment Debacle</b> .....	1386
<i>George Gross</i>	
<b>Grid Development in France and in Europe: The New Paradigm</b> .....	1388
<i>Pierre Bornard; Thomas Veyrenc</i>	
<b>Application of California ISO Transmission Economic Assessment Methodology (TEAM) for the Sunrise Powerlink Project</b> .....	1391
<i>Ali Chowdhury; David Le</i>	

## **SUBSTATIONS**

<b>Assessment of Component Criticality in High Voltage Transmission Stations</b> .....	1396
<i>Gomaa Hamoud</i>	
<b>A Fully Integrated Substation LAN Network for Protection, Control and Data Acquisition</b> .....	1403
<i>Mike Shen; Frank Chan; Reg Laprise; Leo Lu</i>	

## **SYNCHRONIZED MEASUREMENTS IN POWER SYSTEM OPERATION: INTERNATIONAL PRACTICES AND RESEARCH ISSUES**

<b>Synchronized Measurements in Power System Operation: International Practices and Research Issues</b> .....	1409
<i>Elias Kyriakides; Gerald Heydt</i>	
<b>Dynamic State Estimator with Phasor Measurements for Power System Electromechanical Transient Process</b> .....	1412
<i>Tianshu Bi; Xiaohui Qin; Qixun Yang</i>	
<b>Enhanced State Estimation with Real-Time Updated Network Parameters Using SMT</b> .....	1417
<i>Gustavo Valverde; Deyu Cai; John Fitch; Vladimir Terzija</i>	
<b>The North American SynchroPhasor Initiative (NASPI)</b> .....	1424
<i>Jeff Dagle</i>	
<b>Practical Synchronized Phasor Solutions</b> .....	1426
<i>Edmund O. Schweitzer, III; David Whitehead; Greg Zweigle</i>	
<b>Awareness System Based on Synchronized Phasor Measurements</b> .....	1434
<i>Walter Sattinger</i>	
<b>Network-Security Measurements for Highly Loaded Power Systems</b> .....	1438
<i>Rainer Krebs; Markus Wache</i>	

## **TOWERS, POLES & CONDUCTORS WG2/6 OVHD CONDUCTORS CONNECTORS**

<b>Design of an Adaptive On-Load De-Icing Scheme for Overhead Power Transmission Line</b> .....	1444
<i>Qi Huang; Yong Chen; Changhua Zhang</i>	

## **TRANSFORMERS POSTER SESSION**

<b>Intelligent Framework and Techniques for Power Transformer Insulation Diagnosis</b> .....	1449
<i>Hui Ma; Tapan Saha;;rew Thomas; Chandima Ekanayake</i>	
<b>Understanding Frequency and Time Domain Polarization Methods for the Insulation Condition Assessment of Power Transformers</b> .....	1456
<i>Tapan Saha; Rick Middleton;Andrew Thomas</i>	
<b>Frequency Effect on Calculation for Voltage Distribution of Winding</b> .....	1464
<i>Chun Zhao; Jiang-jun Ruan; Ling Ruan; Zhiye Du; Liang Chen; Shifeng Yu</i>	

## **TRANSMISSION AND DISTRIBUTION COMMITTEE POSTER SESSION**

<b>Induction Motor Loads and Voltage Stability Assessment Using PV Curves</b> .....	1469
<i>Leon Vargas; Juri Jatskevich; Jose Marti</i>	
<b>Efficient Implementation of DVR's Control</b> .....	1476
<i>Pedro Garcia-Vite; Juan Ramirez; Julio Rosas-Caro</i>	
<b>A Robust Voltage Unbalance Allocation Methodology Based on the IEC/TR 61000-3-13 Guidelines</b> .....	1483
<i>Prabodha Paranavithana; Sarath Perera</i>	
<b>Sharing Frequency Response Between Asynchronous Electrical Systems</b> .....	1489
<i>Stefan Sterpu; Minh Nguyen-Tuan</i>	
<b>Web-Based Power Flow Simulator for Independent Power Distribution Systems</b> .....	1495
<i>Sang-Seung Lee; Ho-Chul Lee; Nack-Hyun Choi; Dong-Hyeon Kim; Geun-Pyo Park; Song-Keun Lee; Jong-Keun Park; Seung-Il Moon; Yong Tae Yoon</i>	
<b>Grid Interaction of MV-Connected CHP-Plants During Disturbances</b> .....	1501
<i>Edward Coster; Johanna Myrzik; Wil Kling</i>	
<b>Graph Theory-Based Feeder Automation Logic for Low-End Controller Application</b> .....	1509
<i>Fang Yang; Zhao Li; Vaibhav Donde; Zhenyuan Wang; James Stoupis</i>	
<b>An Average Model of Solid State Transformer for Dynamic System Simulation</b> .....	1516
<i>Tiefu Zhao; Jie Zeng; Subhashish Bhattacharya; Mesut E. Baran; Alex Q. Huang</i>	
<b>Assessing the Efficiency of Iranian Electric Distribution Companies Using Nonparametric Approach</b> .....	1524
<i>Mohsen Simab; Mahmood-Reza Haghijam</i>	
<b>Comparative Analysis of Voltage Control Strategies in Distribution Networks with Distributed</b> .....	1529
<i>Chun-Lien Su</i>	
<b>Bibliography of HVDC Transmission 2007-2008 Part I: IEEE Working Group Report</b> .....	1536
<i>Rajiv Varma; Jon Berge; Wayne Litzenberger</i>	
<b>Bibliography of HVDC Transmission 2007-2008 Part II: IEEE Working Group Report</b> .....	1543
<i>Jon Berge; Rajiv Varma; Wayne Litzenberger</i>	
<b>Event Detection and Location in Electric Power Systems Using Constrained Optimization</b> .....	1550
<i>Michael Smith; Kevin Wedeward</i>	
<b>Rotor Angle Stability Prediction Using Post-Disturbance Voltage Trajectory Patterns</b> .....	1556
<i>Athula Rajapakse; Francisco Gomez; Kasun Nanayakkara; Peter A. Crossley; Vladimir Terzija</i>	
<b>Method to Include Lumped Devices in Multi-Conductor Transmission Line System Models</b> .....	1562
<i>Ziya Mazloom; Nelson Theethayi; Rajeev Thottappillil</i>	
<b>Monitoring Sag and Tension of a Tilted Transmission Line Using Geometric Transformation</b> .....	1568
<i>Sunita Malhara; Vijay Vittal</i>	

## **TRANSMISSION CAPACITY ENHANCEMENT IN THE 21ST CENTURY**

<b>A Study on Transmission Planning Prioritization Using Multi-Objective Evaluation</b> .....	1575
<i>Eiji Sakakibara; Kiyotaka Matsushita; Shinichi Iwamoto</i>	
<b>Derivation of a Mathematical Structure for Market-Based Transmission Augmentation in Oligopoly Electricity Markets Using Multilevel Programming</b> .....	1581
<i>Mohammad Hesamzadeh; Darryl Biggar; Nasser Hosseinzadeh; Peter Wolfs</i>	
<b>Determination of a Deterministic Reliability Criterion for Composite Power System Expansion Planning</b> .....	1588
<i>Junmin Cha; Jeongje Park; Jaeseok Choi; Youngbum Jung; Yongbum Yun</i>	
<b>Comprehensive SC Renewal Planning Scheme Considering Optimal Allocation and Reallocation</b> .....	1594
<i>Katsuyuki Kimura; Yuta Tanaka; Shinichi Iwamoto</i>	
<b>A Method of Enhancement of Transmission Capability Limit Using System Damping Resistor and Series - Shunt Capacitors</b> .....	1601
<i>Yuichiro Mikuni; Goro Shirai; Ryuichi Yokoyama; Goro Fujita</i>	
<b>Effects on Power Grid Due to Large Incremental Generation In-Feed Under Open Power Market Environment</b> .....	1609
<i>Wang Weichao; Zhang Ming; Zhao Baojun; Hu Kun; H. W. Ngan</i>	
<b>Locating Series FACTS Devices Using Line Outage Sensitivity Factors and Particle Swarm Optimization for Congestion Management</b> .....	1616
<i>Hossein Hashemzadeh; Seyed Hamid Hosseini</i>	

<b>About the Impact of Burdening and Relieving Partial Power Flows Caused by Loop Flows in Interconnected Networks on ITC Amount .....</b>	<b>1622</b>
<i>Martin Wolter</i>	
<b>Transmission Charging Practices in ER of Indian Power Utility .....</b>	<b>1630</b>
<i>Niranjana Kumar; Devadutta Das; Narayana Prasad Padhy</i>	

## **TRANSMISSION PLANNING WITH WIND GENERATORS**

<b>Impact of DFIG Based Wind Turbine Generators on Transient and Small Signal Stability of Power Systems .....</b>	<b>1638</b>
<i>Durga Gautam; Vijay Vittal</i>	
<b>Assessing Transfer Capability Requirement for Wind Power Generation Using a Combined Deterministic and Probabilistic Approach .....</b>	<b>1644</b>
<i>Wijarn Wangdee; Wenyuan Li; Wah Shum; Paul Choudhury</i>	
<b>Reliability Assessment of Wind Integration in Operating and Planning of Generation Systems .....</b>	<b>1652</b>
<i>Yi Zhang; Ali Chowdhury</i>	
<b>Transmission Evaluation of Large New Renewable Generation Interconnections at the California ISO .....</b>	<b>1659</b>
<i>Ali Chowdhury; Yi Zhang; Haifeng Liu; Songzhe Zhu; David Le</i>	
<b>A Conceptual Study on Reliability Constrained Transmission System Planning Including Wind Power .....</b>	<b>1666</b>
<i>Lingfeng Wang; Chanan Singh</i>	
<b>A Novel Voltage Stability Assessment Tool to Incorporate Wind Variability .....</b>	<b>1673</b>
<i>Pradip Vijayan; Subhadarshi Sarkar; Venkataramana Ajjarapu</i>	

## **ADVANCED METERING INFRASTRUCTURE AND SMART GRID**

<b>A Synergistic Approach to Implement Demand Response, Asset Management and Service Reliability Using Smart Metering, AMI and MDM Systems .....</b>	<b>1681</b>
<i>Sioe Mak</i>	
<b>Sweden – Reaching 100 % ‘Smart Meters’ July 1, 2009 .....</b>	<b>1684</b>
<i>Anders Mannikoff; Hakan Nilsson</i>	
<b>Current Measurement Methods for the Smart Grid .....</b>	<b>1687</b>
<i>Harold Kirkham</i>	
<b>Hydro One Smart Meter Initiative Paves Way for Defining the Smart Grid of the Future .....</b>	<b>1694</b>
<i>Ron Davies</i>	

## **ANALYSIS AND CONTROL OF DISTRIBUTED GENERATION SYSTEMS**

<b>Voltage Support by Distributed Generation Units and Shunt Capacitors in Distribution Systems .....</b>	<b>1696</b>
<i>Kai Zou; Ashish Agalgaonkar; Kashem Muttaqi; Sarath Perera</i>	
<b>Intelligent Modified Predictive Optimal Control of Reheater Steam Temperature in a Large-Scale Boiler Unit .....</b>	<b>1704</b>
<i>Kwang Y. Lee; Liangyu Ma; Chang-Jin Boo; Won-Hee Jung; Sung-Ho Kim</i>	
<b>A Scalable Power-Line-Signaling-Based Scheme for Islanding Detection of Distributed Generators .....</b>	<b>1711</b>
<i>Wencong Wang; Jacek Kliber; Wilsun Xu</i>	
<b>A Greenfield Approach to the Future Supply of Multiple Energy Carriers .....</b>	<b>1712</b>
<i>Florian Kienzle; Göran,ersson</i>	
<b>Strategic Deployment of CHP-Based Distributed Energy Resources in Microgrids .....</b>	<b>1720</b>
<i>A. K. Basu; Sunetra Chowdhury; Shyama Pada Chowdhury</i>	
<b>Maintenance-Oriented Information Digitalization of Hydro Turbine Generator Sets .....</b>	<b>1726</b>
<i>Zhao-Hui Li; Xing-Bin Yang; Shao-Qing Niu; Om P. Malik</i>	
<b>A Tri-Directional Power Electronic Transformer for Photo Voltaic Based Distributed Generation Application .....</b>	<b>1733</b>
<i>Seyed Hossein Hosseini; Mohammad Bagher Bana Sharifian; Mehran Sabahi; Zoheir Hooshi; Gevorg B. Gharehpetian</i>	
<b>Active Power - Voltage Control Scheme for Islanding Operation of Inverter-Interfaced Microgrids .....</b>	<b>1738</b>
<i>Zhenhua Jiang and Xunwei Yu</i>	

## **BIDDING & RISK STRATEGIES**

<b>Risk Analysis of Volume Cheat Strategy in a Competitive Capacity Market .....</b>	<b>1745</b>
<i>Donghan Feng; Zhao Xu</i>	
<b>Fuzzy Game Theory Approach in Calculating the Optimal Bidding Strategy of Generating Companies with Consideration of Load Forecast Uncertainty .....</b>	<b>1752</b>
<i>Mehdi Kabiri; Shahabeddin Akbari; Nima Amjadi</i>	
<b>Dynamic Sizing of Energy Storage for Hedging Wind Power Forecast Uncertainty .....</b>	<b>1760</b>
<i>Pierre Pinson; George Papaefthymiou; Bernd Klockl; Jody Verboomen</i>	

## **DISTRIBUTION AUTOMATION AS PART OF THE SMARTGRID ROADMAP**

<b>Modeling Distribution Automation Schemes with a Control Systems Overlay .....</b>	<b>1768</b>
<i>Thomas E. McDermott; Roger Dugan; Lee King; Mark McGranaghan</i>	
<b>Distribution Automation: The Cornerstone for Smart Grid Development Strategy .....</b>	<b>1771</b>
<i>Xavier Mamo; Sylvie Mallet; Thierry Coste; Sebastien Grenard</i>	
<b>A Deterministic Analysis Method for Back-Feed Power Restoration of Distribution Networks .....</b>	<b>1777</b>
<i>Zhenyuan Wang; Vaibhav Dondé; Fang Yang; James Stoupis</i>	
<b>Distribution Automation: Applications to Move from Today's Distribution System to Tomorrow's Smartgrid .....</b>	<b>1783</b>
<i>Georges Simard; Denis Chartrand; Patrick Christophe</i>	

## **DISTRIBUTION SWITCHING & OVERCURRENT PROTECTION WG**

<b>Application of Customer Exposure Ratio to Distribution Circuits.....</b>	<b>1788</b>
<i>Ryan Melbard</i>	

## **ENABLING TECHNOLOGIES FOR THE CUSTOMER-DRIVEN MICROGRID**

<b>Enabling Technologies for the Customer-Driven Microgrid.....</b>	<b>1793</b>
<i>Siddharth Suryanarayanan; Joydeep Mitra</i>	
<b>Distribution System Design Enabling Renewable Energy Resource Deployment .....</b>	<b>1796</b>
<i>Gerald Heydt; Bharadwaj Sathyanarayana; Vijay Vittal</i>	
<b>Control and Protection of Power Electronics Interfaced Distributed Generation Systems in a Customer-Driven Microgrid.....</b>	<b>1801</b>
<i>Fang Z. Peng; Yun Wei Li; Leon Tolbert</i>	
<b>Control Agents for Enabling Customer-Driven Microgrids.....</b>	<b>1809</b>
<i>Aris Dimeas; S. I. Hatzivaasiliadis; Nikos Hatziaargyiou</i>	
<b>An Integration Facility to Accelerate Deployment of Distributed Energy Resources in Microgrids .....</b>	<b>1816</b>
<i>Benjamin Kroposki</i>	
<b>Accelerating the Customer-Driven Microgrid Through Real-Time Digital Simulation .....</b>	<b>1820</b>
<i>Isaac Leonard; Thomas Baldwin; Michael Sloderbeck</i>	

## **EQUILIBRIUM OF ELECTRICITY MARKET EFFICIENCY AND POWER SYSTEM OPERATION RISK: STATE-OF-THE-ART AND TOMORROW**

<b>Electricity Market Equilibrium, Efficiency and Operation Risk: Observations .....</b>	<b>1823</b>
<i>Fernando Alvarado</i>	
<b>Long-Term Security-Constrained Unit Commitment for Reliability Analyses .....</b>	<b>1825</b>
<i>Mohammad Shahidehpour and Zuyi Li</i>	
<b>Economic Valuation of Reserves in Power Systems with High Penetration of Wind Power .....</b>	<b>1826</b>
<i>Juan Morales; Antonio Conejo; Juan Perez-Ruiz</i>	
<b>How Capacity Markets Address Resource Adequacy.....</b>	<b>1827</b>
<i>Henry Chao; David Lawrence</i>	
<b>Reflecting Real Time Operation Business Practices in Market Design.....</b>	<b>1831</b>
<i>Eugene Litvinov; Feng Zhao; Tongxin Zheng</i>	
<b>Balance Economic Efficiency and Operation Risk .....</b>	<b>1832</b>
<i>Hong Chen</i>	

## **ETCC COMBO SESSION**

<b>Real-Time Particle Swarm Optimization Based Current Harmonic Cancellation.....</b>	<b>1833</b>
<i>Wenxin Liu; Il-Yop Chung; Siyu Leng; David Cartes</i>	
<b>A General Modular Design Methodology for Flexible Smart Grid Inverters .....</b>	<b>1840</b>
<i>Egon Ortjohann; Max Lingemann; Worpong Sinsukthavorn; Alaa Mohd; A. Schmelter; N. Hamsic; D. Morton</i>	
<b>Thermo-Electric Co-Simulation on Geographically Distributed Real-Time Simulators .....</b>	<b>1848</b>
<i>Omar Faruque; Michael Sloderbeck; Michael Steurer; Venkata Dinavahi</i>	
<b>A New Control Strategy for Stand-Alone Fuel Cell-Battery Hybrid Power Supply System .....</b>	<b>1855</b>
<i>Vadim Zheglov; Wenzhong Gao; Eduard Muljadi; Ge Wang</i>	
<b>Emitter Turn-Off (ETO) Thyristor, ETO Light Converter and Their Grid Applications .....</b>	<b>1861</b>
<i>Alex Huang; Yu Liu; Qian Chen; Jun Li; Wenchao Song</i>	
<b>Testing of a Controller for an ETO Based STATCOM Through Controller Hardware in the Loop Simulation .....</b>	<b>1869</b>
<i>James Langston; Li Qi; O. Bolado; Michael Sloderbeck; Yu Liu; Zhengping Xi; Sameer Mundkur; Zhigang Liang; Alex Huang; Subhashish Bhattacharya; Wayne Litzenberger; Loren;erson; Poul Ejnar Sørensen; Ashok Sundaram</i>	

## **EUROPE: INTEGRATING DISTRIBUTED GENERATION: EUROPEAN DEMONSTRATION PROJECTS AND EXPERIENCES WITH VIRTUAL POWER PLANTS**

<b>On the Concept and the Interest of Virtual Power Plant: Some Results from the European Project FENIX</b> .....	1877
<i>Christophe Kieny; Boris Berseneff; Nouredine Hadjsaid; Yvon Besanger; Joseph Maire</i>	
<b>European Test Field: VPP Denmark</b> .....	1883
<i>Antje Orths; Peter Børre Eriksen</i>	
<b>Renewable Model Region Harz: Climate Protection and Energy Efficiency by Modern ICT and Innovative Operation Strategies</b> .....	1888
<i>Kurt Rohrig; Florian Schlögl; Jörg Heuer</i>	
<b>Towards a Future SCADA</b> .....	1894
<i>Zita Vale; Hugo Morais; Marco Silva; Carlos Ramos</i>	
<b>Optimal Operation of a Virtual Power Plant</b> .....	1901
<i>Pio Lombardi; Michal Powalko; Krzysztof Rudion</i>	
<b>Control Aspects and the Design of a Small-Scale Test Virtual Power Plant</b> .....	1907
<i>Anton Ishchenko; Wil Kling; Johanna Myrzik</i>	
<b>A Novel Approach for Distribution System Operation Utilization State of the Art Communication Technology</b> .....	1915
<i>Dirk Westermann; Peter Bretschneider; Hannes Rüttinger</i>	
<b>Individual Customers' Influence on the Operation of Virtual Power Plants</b> .....	1921
<i>Britta Buchholz; David Nestle;;reas Kiessling</i>	

## **FUNDAMENTALS AND CASE STUDIES OF POWER SYSTEM PLANNING**

<b>Resource Adequacy Assessment Considering Transmission and Generation Via Market Simulations</b> .....	1927
<i>Henry Chao; Ghassan Simaan</i>	
<b>Midwest ISO Transmission Planning Processes</b> .....	1940
<i>Dale Osborn; J. Lawhorn</i>	
<b>Power System Planning Process and Issues</b> .....	1945
<i>Michael Henderson; Peter Wong; James Platts</i>	
<b>Importance of Dynamic Stability Phenomena in Power System Planning</b> .....	1951
<i>Eric Allen; Albert Keri; Arthur DeGroff; Dmitry Kosterev; Philip Tatro</i>	
<b>Demand or Request: Will Load Behave?</b> .....	1957
<i>Steve Widergren</i>	
<b>Demand Response Issues and Experience in New England</b> .....	1962
<i>Michael Henderson; Robert Burke; Peter Wong</i>	

## **GENERAL SYSTEMS PROGRESS IN ELECTROMAGNETIC TRANSIENT ANALYSIS**

<b>Numerical Integration by the 2-Stage Diagonally Implicit Runge-Kutta Method for Electromagnetic Transient Simulations</b> .....	1967
<i>Taku Noda; Kiyoshi Takenaka; Toshio Inoue</i>	
<b>FPGA-Based Real-Time EMTP</b> .....	1968
<i>Yuan Chen; Venkata Dinavahi</i>	
<b>Nested Fast and Simultaneous Solution for Time Domain Simulation of Integrative Power Electric and Electronic Systems</b> .....	1969
<i>Kai Strunz; Eric Carlson</i>	

## **GENERATION AND TRANSMISSION PLANNING TOOLS IN THE DEREGULATED PARADIGM**

<b>Integrated Generation and Transmission Planning and System Expansion</b> .....	1970
<i>Ali Chowdhury; David Le</i>	
<b>Integrated Generation and Transmission Planning Tools Under Competitive Energy Markets: An Academic Perspective</b> .....	1975
<i>Fangxing Li; Hui Yuan; Kevin Tomsovic</i>	
<b>Integrated Generation and Transmission Planning Tools – PTO Perspective</b> .....	1980
<i>Ravi Aggarwal; William Mittelstadt</i>	
<b>Concorda – An Integrated Power Systems Analysis Suite</b> .....	1983
<i>Sundar Venkataraman; Gary Jordan; Devin Van Zandt</i>	

## **GENERATOR TESTING AND MODEL VALIDATION FOR GRID CODE COMPLIANCE**

<b>Testing and Model Validation for South African Grid Code Compliance</b> .....	1989
<i>Fhedzisani Modau</i>	

<b>Update on Development of NERC Requirements for Verification of Generator Dynamic Models</b> .....	1997
<i>Lee Taylor</i>	
<b>Generating Unit Model Validation: WECC Lessons and Moving Forward</b> .....	2004
<i>John Undrill; Les Pereira; Dmitry Kosterev; Shawn Patterson; Donald Davies; Steve Yang; Baj Agrawal</i>	
<b>Dynamic Model Validation for Compliance with NERC Standards</b> .....	2009
<i>Leonardo Lima</i>	
<b>Elements of a Successful Validation Test: A Practical Approach to NERC Generator Compliance</b> .....	2016
<i>Mike Fogarty; Les Hajagos; Roger Berube</i>	
<b>Automated Parameter Derivation for Power Plant Models from System Disturbance Data</b> .....	2023
<i>Pouyan Pourbeik</i>	

## **INTEGRATING DISTRIBUTED GENERATION**

<b>Multilevel Inverter with Dual Reference Modulation Technique for Grid-Connected PV System</b> .....	2033
<i>Nasrudin Abd Rahim; Jeyraj Selvaraj</i>	
<b>Control of PMSG Based Variable Speed Wind-Battery Hybrid System in an Isolated Network</b> .....	2041
<i>Mukhtiar Singh; Ambrish Chandra</i>	
<b>Simulation of Micro-Sources in a Small Scale Microgrid</b> .....	2047
<i>Hesam Hosseinzadeh; Xinhong Huang; Jin Jiang</i>	
<b>Model Augmentation for Hybrid Fuel-Cell / Gas Turbine Power Plant</b> .....	2055
<i>Wenli Yang; Kwang Y. Lee; S. Tobias Junker; Hossein Ghezal-Ayagh</i>	
<b>A Study on Electricity Export Capability of the <math>\mu</math>CHP System with Spot Price</b> .....	2063
<i>Shi You; Chresten Træholt; Bjarne Poulsen</i>	

## **INTEGRATING PLUG-IN HYBRID VEHICLES TO THE GRID**

<b>Electric Vehicles: Holy Grail or Fool's Gold</b> .....	2069
<i>Pedram Mohseni; Richard Stevie</i>	
<b>Vehicle Fleet as a Distributed Energy Storage System for the Power Grid</b> .....	2074
<i>Mehdi Ferdowsi</i>	
<b>Evaluation of the Impact of Plug-In Electric Vehicle Loading on Distribution System Operations</b> .....	2076
<i>Jason Taylor; Arindam Maitra; M. Alexander; Daniel Brooks; Mark Duvall</i>	
<b>On the Suitability of Plug-In Hybrid Electric Vehicle (PHEV) Charging Infrastructures Based on Wind and Solar Energy</b> .....	2082
<i>Xin Li; Luiz Lopes; Sheldon Williamson</i>	

## **INTERACTIONS BETWEEN EMISSIONS MARKET AND ELECTRICITY MARKET**

<b>Implications of Global Climate Change for the U.S. National Power Grid</b> .....	2090
<i>Jerry Pell</i>	
<b>Influence of Emissions Trading Scheme on Market Clearing and Prices</b> .....	2093
<i>Ivana Kockar; Antonio Conejo; James R. McDonald</i>	
<b>Electric Rate Design and Greenhouse-Gas Emissions Reduction</b> .....	2098
<i>Seth Blumsack</i>	
<b>An Agent-Based Approach to Modeling Interactions Between Emission Market and Electricity Market</b> .....	2102
<i>Jianhui Wang; Vladimir Koritarov; Jin-Ho Kim</i>	
<b>Environmental Regulation in Transmission-Constrained Electricity Markets</b> .....	2110
<i>Anthony Papavasiliou; Yihsu Chen; Shmuel Oren</i>	
<b>Cogeneration and Potential for Emission Reductions in Oil Sands Operations</b> .....	2118
<i>Ganesh Doluweera; Sarah Jordaan; Joule Bergerson; Michal Moore</i>	
<b>Allocation of Emission Allowances to Effectively Reduce Emissions in Electricity Generation</b> .....	2123
<i>Bless Kuri; Furong Li</i>	

## **INTERNATIONAL PRACTICES IN DEVELOPMENTS AND TECHNIQUES IN SMART GRIDS**

<b>Exploratory Analysis of Massive Data for Distribution Fault Diagnosis in Smart Grids</b> .....	2131
<i>Yixin Cai; Mo-Yuen Chow</i>	
<b>Smart Metering in Micro-Grid Applications</b> .....	2137
<i>Ping Kwong Lee; Loi Lei Lai</i>	
<b>Potentials and Promises of Computational Intelligence for Smart Grids</b> .....	2142
<i>Ganesh Kumar Venayagamoorthy</i>	
<b>An Introduction to Multiobjective Optimization Methods for Decentralized Power Planning</b> .....	2148
<i>Adam Berry; David Cornforth; Glenn Platt</i>	

<b>Intelligent Energy Management System Simulator for PHEVs at Municipal Parking Deck in a Smart Grid Environment</b> .....	2157
<i>Preetika Kulshrestha; Lei Wang; Mo-Yuen Chow; Srdjan Lukic</i>	
<b>A New Approach to the Design of Multiple Inverter Systems Using Evolutionary Optimization</b> .....	2163
<i>Steven Kong; David Cornforth; Adam Berry</i>	
<b>Towards a Danish Power System with 50% Wind - Smart Grids Activities in Denmark</b> .....	2171
<i>Zhao Xu; Mark Gordon; Morten Lind; Jacob Østergaard</i>	
<b>Applications of Data Mining to Time Series of Electrical Disturbance Data</b> .....	2179
<i>David Cornforth</i>	
<b>Intelligent Reconfiguration of Smart Distribution Network Using Multi-Agent Technology</b> .....	2187
<i>Sridhar Chouhan; Hui Wan; Hongjian Lai; Ali Feliachi; Muhammad A. Choudhry</i>	
<b>A Vision of Smart Transmission Grids</b> .....	2193
<i>Zhenhua Jiang; Fangxing Li; Wei Qiao; Hongbin Sun; Hui Wan; Jianhui Wang; Yan Xia; Zhao Xu; Pei Zhang</i>	

## **LIGHTNING PERFORMANCE OF OVERHEAD LINES**

<b>Experimental Study on Lightning Surge Response of 500kV Transmission Tower with Overhead Lines</b> .....	2203
<i>Hideki Motoyama; Yasuhide Kinoshita; Katsumasa Nonaka</i>	
<b>Experimental and Analytical Studies on Lightning Surge Response of 500kV Transmission Tower</b> .....	2204
<i>Hideki Motoyama; Yasuhide Kinoshita; Katsumasa Nonaka; Yoshihiro Baba</i>	
<b>Experimental Study on Lightning Shielding Performance of b500 KV HVDC Transmission Lines</b> .....	2205
<i>He Junjia; He Hengxin</i>	
<b>On the Analysis and Evaluation of a Transmission Line Upgrading Assisted by Line Arresters</b> .....	2206
<i>José Antonio Jardini; Durval Missali; Mauricio George Jardini; Ricardo Leon Vasquez-Arnez; Mário Masuda</i>	
<b>Flashover Rate of Distribution Line Due to Indirect Negative Lightning Return Strokes</b> .....	2213
<i>Koji Michishita; Masaru Ishii; Yasuji Hongo</i>	
<b>New Approach to Improve High Voltage Transmission Line Reliability</b> .....	2214
<i>Paulo Silveira; Jose Adami; Manuel Martinez</i>	
<b>Optimized Selection Approach of Transformer Protection Devices Against Atmospheric Discharges Using Expert System</b> .....	2215
<i>Nerivaldo dos Reis Santos; Ivan Nunes da Silva; Rogerio Andrade Flauzino; Danilo Hernane Spatti</i>	

## **LOAD FORECASTING TOPICS**

<b>Forecasting Electric Daily Peak Load Based on Local Prediction</b> .....	2221
<i>E. E. El-Attar; J. Y. Goulermas; Henry Wu</i>	
<b>Short-Term Load Forecasting: Multi-Level Wavelet Neural Networks with Holiday Corrections</b> .....	2227
<i>Yige Zhao; Peter B. Luh; Carl Bomgardner; Gustav H. Beerel</i>	

## **MISCELLANEOUS ASPECTS OF ELECTROMAGNETIC TRANSIENTS SIMULATIONS**

<b>Parameter Estimation from Frequency Response Measurements</b> .....	2234
<i>Juan Martinez; Bjorn Gustavsen</i>	
<b>Computation of Power System Transients: Modeling Portability</b> .....	2241
<i>Jean Mahseredjian; Omar Saad; Sébastien Denetière</i>	
<b>Dynamic System Equivalents: A Survey of Available Techniques</b> .....	2247
<i>Udaya Annakkage; Nirmal-Kumar C. Nair; A. M. Gole; Venkata Dinavahi; Taku Noda; G. Hassan; Antonello Monti</i>	
<b>Interfacing Techniques for Simulation Tools</b> .....	2252
<i>Venkata Dinavahi; Michael Steurer; Kai Strunz; Juan Martinez</i>	
<b>Trends in the Frequency Domain Analysis of Electromagnetic Transients</b> .....	2258
<i>Lu Naredo; Leonardo Guardado; Alberto Gutierrez-Robles; Pablo Moreno; Felipe Uribe; Victor Hugo Ortiz; Laurence Snider</i>	
<b>Interfacing Methods for Design-Oriented Electromagnetic Transient Simulation</b> .....	2263
<i>Shaahin Filizadeh; Maziar Heidari</i>	
<b>Dynamic Average Modeling of Line-Commutated Converters for Power Systems Applications</b> .....	2268
<i>Sina Chiniforoosh; Juri Jatskevich; Venkata Dinavahi; Reza Iravani; Juan Martinez; Abner Ramirez</i>	

## **NEW APPLICATIONS OF INTELLIGENT DATA MINING IN POWER SYSTEMS**

<b>Power Systems Reliability Calculation Based on Fuzzy Data Mining</b> .....	2276
<i>Sérgio Ramos; H. M. Khodr; Filipe Azevedo; Zita Vale</i>	
<b>Fraud Detection System for High and Low Voltage Electricity Consumers Based on Data Mining</b> .....	2283
<i>Jose E. Cabral; João O. P. Pinto; Alexandra M. A. C. Pinto</i>	
<b>An Overview of Forecasting Problems and Techniques in Power Systems</b> .....	2288
<i>Michael Negnevitsky; Paras Mandal; Anurag Srivastava</i>	

<b>Innovative Applications of Diagnosis, Forecasting, Pattern Recognition and Knowledge Discovery in Power Systems</b> .....	2292
<i>Manuel Mejia-Lavalle; Gustavo Arroyo-Figueroa; Eduardo F. Morales</i>	

## **NSF-SPONSORED US-AFRICAN COLLABORATIVE RESEARCH AND EDUCATION**

<b>System Frequency Monitoring in the Nigerian Power System</b> .....	2301
<i>Luigi Vanfretti; Usman Aliyu; Joe H. Chow; James A. Momoh</i>	
<b>Use of System Dynamics for Studying a Restructured West African Power Pool</b> .....	2307
<i>Mengstab Gebremicael; Hui Yuan; Kevin Tomsovic</i>	
<b>Potentials and Promises of Computational Intelligence for Smart Grids</b> .....	2311
<i>Ganesh Kumar Venayagamoorthy</i>	
<b>Engineering Research and Education in Power System Voltage Stability Enhancement</b> .....	2317
<i>James A. Momoh; C. Trevor Gaunt; Sunny Onohaebi</i>	

## **POWER SYSTEM ECONOMICS AND OPTIMIZATION**

<b>Long-Run Incremental Cost Pricing for the Use of Network Reactive Power Compensation Devices for Systems with Different R/X Ratios</b> .....	2328
<i>Edwin Matlotse; Furong Li</i>	
<b>Cost and Usage Based Cross-Border TSO Tariffication with Power Flow Decomposition Models</b> .....	2336
<i>Bernd Klockl</i>	
<b>Operational Analysis of Security Constrained Optimal Reactive Power Flow Solutions</b> .....	2342
<i>Peter Macfie; Gareth Taylor; Malcolm Irving; Paul Hurlock; Martin Bradley; Rachel Morfill; Hai-Bin Wan</i>	
<b>Security and Economic Dispatch of Power System with Environmental Consideration</b> .....	2351
<i>Aiguo Zhang; Jianhua Zhang; Jingfu Shang; Jialin Qin</i>	
<b>An Extended Optimal Power Flow Measure for Unsolvable Cases Based on Interior Point Method</b> .....	2357
<i>Liu Lin; Wang Xifan; Xiaoying Ding; Furong Li; Min Fu</i>	
<b>Step Size Optimization Based Interior Point Algorithm: Applications and Treatment of Ill-Conditioning in Optimal Power Flow Solutions</b> .....	2366
<i>Manfred Bedriñana; Carlos Castro</i>	
<b>Evaluation of Network Equivalents for Voltage Optimization in Multi-Area Power Systems</b> .....	2374
<i>Yannick Phulpin; Miroslav Begovic; Marc Petit; Jean-Baptiste Heyberger; Damien Ernst</i>	
<b>Global Transient Stability-Constrained Optimal Power Flow Using the SIME Method</b> .....	2375
<i>Alejandro Pizano-Martinez; Claudio Ruben Fuerte-Esquivel; Daniel Ruiz-Vega</i>	
<b>Security-Constrained Generation Scheduling with Feasible Energy Delivery</b> .....	2383
<i>Hongyu Wu; Xiaohong Guan; Qiaozhu Zhai; Feng Gao; Yuanchao Yang</i>	
<b>Impact of Generator Reactive Reserve on Structure-Induced Bifurcation</b> .....	2389
<i>Shao-Hua Li; Hsiao-Dong Chiang</i>	
<b>Novel Approach on ATC Determination for AC/DC Transmission Systems</b> .....	2394
<i>Ning Ji; Yajing Gao; Ming Zhou; Gengyin Li</i>	
<b>A Proposal for Investment Recovery of TCSC Based on Electrical Dissecting Method</b> .....	2402
<i>Tang Yi; Wu Ying-jun; Li Yang</i>	

## **POWER SYSTEM PLANNING AND IMPLEMENTATION COMMITTEE - PAPER SESSION**

<b>Dynamic Load Tree for Day-Ahead Studies and Real Time Operations</b> .....	2408
<i>Slava Maslennikov; Ramya Nagarajan</i>	
<b>Power System Risk Assessment Using a Hybrid Method of Fuzzy Set and Monte Carlo Simulation</b> .....	2415
<i>Wenyuan Li; Jiaqi Zhou</i>	
<b>Value Based Transmission Planning Process for Joint Coordinated System Plan</b> .....	2416
<i>Liangying Hecker; Zheng Zhou; Dale Osborn; John Lawhorn</i>	
<b>Adequacy Criteria and Methods for Wind Power Transmission Planning</b> .....	2422
<i>Rajesh Karki; Po Hu; Roy Billinton</i>	
<b>Planning Reconfigurable Reactive Control for Voltage Stability Limited Power Systems</b> .....	2429
<i>Haijeng Liu; Licheng Jin; James McCalley; Ratnesh Kumar; Venkataramana Ajjarapu; Nicola Elia</i>	
<b>Locational Capacity Credit Evaluation</b> .....	2430
<i>Girish Pudaruth; Furong Li</i>	

## **POWER SYSTEM STABILITY CONTROLS SUBCOMMITTEE MEETING AND FACTS AND WIND POWER PAPER SESSION**

<b>Damping Subsynchronous Resonance Using a STATCOM Operating in a Phase Imbalanced Mode</b> .....	2431
<i>Dipendra Rai; Gokaraju Ramakrishna; Sherif Faried; Abdel-Aty Edris</i>	

<b>Investigation of Positive Feedback Anti-Islanding Control for Multiple Inverter-Based Distributed Generators</b> .....	2439
<i>Xiaoyu Wang</i>	
<b>Gramian-Based Reduction Method Applied to Large Sparse Power System Descriptor Models</b> .....	2440
<i>Francisco Freitas; Joost Rommes; Nelson Martins</i>	
<b>Missing-Sensor-Fault-Tolerant Control for SSSC FACTS Device with Real-Time Implementation</b> .....	2441
<i>Wei Qiao; Ganesh Kumar Venayagamoorthy; Ronald G. Harley</i>	
<b>Coordinated Reactive Power Control of a Large Wind Farm and a STATCOM Using Heuristic Dynamic Programming</b> .....	2442
<i>Wei Qiao; Ronald G. Harley; Ganesh Kumar Venayagamoorthy</i>	
<b>Resilient Operation of Voltage-Source BTB HVDC Systems Under Power System Disturbances</b> .....	2443
<i>Babak Parkhideh; Subhashish Bhattacharya</i>	
<b>Power System Stabilizers in Variable Speed Wind Farms</b> .....	2450
<i>Carlos Martinez; Geza Joos; Boon-Teck Ooi</i>	
<b>Small Signal Stability Analysis of a DFIG Based Wind Power System with Tuned Damping Controller Under Super/Sub-Synchronous Mode of Operation</b> .....	2457
<i>Yateendra Mishra; S. Mishra; Fangxing Li; Z. Y. Dong</i>	
<b>Effect of Wind Turbine Output Current During Faults on Grid Voltage and the Transient Stability of Wind Parks</b> .....	2465
<i>I. Erlich; F. Shewarega; Stephan Engelhardt; Joerg Kretschmann; J. Fortmann; Friedrich Koch</i>	

## **PROGRESS REPORT ON NATURAL ESTER FLUIDS FOR DISTRIBUTION AND POWER TRANSFORMERS**

<b>Progress Report on Natural Esters for Distribution and Power Transformers</b> .....	2473
<i>Philip Hopkinson</i>	
<b>Natural Ester Dielectric Fluid Development Update</b> .....	2476
<i>Charles Patrick McShane; Jerry Corkran; Kevin Rapp; John Luksich</i>	
<b>Tapchangers for De-Energized Operation in Natural Ester Fluid, Mineral Oil and Silicone</b> .....	2482
<i>Larry Dix; Philip Hopkinson</i>	
<b>Some Considerations for New and Retrofill Applications of Natural Ester Dielectric Fluids in Medium and Large Power Transformers Revisited</b> .....	2488
<i>Steven Moore</i>	
<b>Dielectric Properties of Natural Esters and Their Influence on Transformer Insulation System Design and Performance - An Update</b> .....	2495
<i>Thomas Prevost</i>	
<b>Design and Test Experience with Natural Ester Fluid for Power Transformers Update</b> .....	2502
<i>S. D. Smith; Barry Beaster</i>	
<b>Distribution Utility Experience with Natural Ester Dielectric Coolants</b> .....	2505
<i>Jerry Murphy; James Graham</i>	

## **PSCC PAPER SESSION**

<b>A Sag Monitoring Device Based on a Cluster of Code Based GPS Receivers</b> .....	2508
<i>Shalini Sushmitha Komaragiri; Satish Mahajan</i>	
<b>Modeling and Simulation of Wide Area Monitoring and Control Systems in IP-Based Networks</b> .....	2514
<i>Moustafa Chenine; Elias Karam; Lars Nordström</i>	

## **REGULATOR AND PUBLIC CHALLENGES TO UTILITY ENHANCEMENTS**

<b>Challenges of PHEV Penetration to the Residential Distribution Network</b> .....	2522
<i>Shengnan Shao; Manisa Pipattanasomporn; Saifur Rahman</i>	
<b>Managing California's Electric Markets in an Interconnected Regional Transmission Network</b> .....	2530
<i>James Price; Mark Rothleder</i>	
<b>Demand Response and Market Performance in Power Economics</b> .....	2537
<i>Dan Yang; Yanni Chen</i>	
<b>A Framework of Cost-Benefit Analysis for Overhead-To-Underground Conversions in Florida</b> .....	2543
<i>Le Xu; Richard Brown</i>	
<b>Economic Benefit Evaluation in Economic Transmission Planning</b> .....	2550
<i>Ming Ni; John Lawhorn</i>	
<b>A Reliability Initiative That Actually Justifies Funding and Makes Measurable Improvements</b> .....	2556
<i>Joshua Jones</i>	
<b>The Operation of a Distribution Company Under Uncertainty: An Overview</b> .....	2563
<i>Yousef El-Mabruk Saad; M. M. A. Salama; R. A. Elshatshat; K. Ponnambalam</i>	
<b>Integration of Asset and Outage Management Tasks for Distribution Systems</b> .....	2570
<i>Yimai Dong; Visvakumar Aravinthan; Mladen Kezunovic; Ward Jewell</i>	

## **REQUIREMENTS FOR AUTOMATED FAULT REPORTING**

<b>Automated Fault Data Collection, Analysis, and Reporting</b> .....	2578
<i>Deepak Maragal; Bruce Fardanesh</i>	
<b>Substation Fault Analysis Requirements</b> .....	2582
<i>Mladen Kezunovic</i>	
<b>An Automated Fault Analysis System for SP Energy Networks: Requirements, Design and Implementation</b> .....	2584
<i>Gary Napier; Euan Davidson; Stephen McArthur; James R. McDonald</i>	
<b>Overview of an Automatic Underground Distribution Fault Location System</b> .....	2591
<i>D. Daniel Sabin; Cristiana Dimitriu; David Santiago; George Baroudi</i>	
<b>Automated Fault Analysis: From Requirements to Implementation</b> .....	2596
<i>Tomo Popovic; Matthew Kuhn</i>	

## **SUPER SESSION WIND - PART 1**

<b>Integration of Wind Turbine, SOFC and Microturbine in Distributed Generation</b> .....	2602
<i>Akshay Kumar Saha; Sunetra Chowdhury; Shyama Pada Chowdhury; C. Trevor Gaunt</i>	
<b>Extending the Modeling Framework for Wind Generation Systems: RLS-Based Paradigm for Performance Under High Turbulence Inflow</b> .....	2610
<i>Billy Muhando; Tomonobu Senjyu; Hiroshi Kinjo; Toshihisa Funabashi</i>	
<b>Maximum Power Tracking Control for a Wind Turbine System Including a Matrix Converter</b> .....	2611
<i>Masoud Barakati; Mehrdad Kazerani; Dwight Aplevich</i>	
<b>Modeling and Control of an Integrated Wind Power Generation and Energy Storage System</b> .....	2612
<i>Zhenhua Jiang; Xunwei Yu</i>	
<b>Transient Stability of Power Systems with High Penetration of DFIG Based Wind Farms</b> .....	2620
<i>Libao Shi; Shiqiang Dai; Yixin Ni; Liangzhong Yao; Masoud Bazargan</i>	

## **SUPER SESSION WIND - PART 2**

<b>Coherency-Based Equivalencing Method for Large Wind Farms</b> .....	2626
<i>Sizhen Zhao; Nirmal-Kumar C. Nair; Nyuk-Min Vong</i>	
<b>Wind Generation Scheduling with Pump Storage Unit by Collocation Method</b> .....	2634
<i>Feng Gao; Arne Hallam; Chien-Ning Yu</i>	
<b>Impact of Pumped Storage on Power Systems with Increasing Wind Penetration</b> .....	2642
<i>Aidan Tuohy; Mark O'Malley</i>	
<b>Offshore Wind Farm Connection with Low Frequency AC Transmission Technology</b> .....	2650
<i>Nan Qin; Shi You; Zhao Xu; Vladislav Akhmatov</i>	

## **SUSTAINABLE ENERGY SYSTEMS FOR DEVELOPING COMMUNITIES**

<b>Electricity Supply Industry Arrangements and Policies on Rural Electrification</b> .....	2658
<i>Joseph Mutale; Chris Mensah-Bonsu</i>	
<b>Clean Energy and Extreme Poverty: The Cost Burden of Donated Solar Home Lighting Systems</b> .....	2663
<i>Hope J. Corsair</i>	
<b>Sustainable Development of the Indian Private Power Industry Meeting Corporate, Social and Climate Objectives</b> .....	2669
<i>Arunavo Mukerjee; S. A. Kharparde</i>	
<b>Renewable Energy as a Tool to Assure Continuity of a Low Emission Brazilian Electric Power Sector-Results of an Aggressive Renewable Energy Policy</b> .....	2673
<i>Oswaldo Soliano Pereira</i>	

## **T&D POWER QUALITY PAPER SESSION**

<b>Voltage Sags: Validating Short-Term Monitoring by Using Long-Term Stochastic Simulation</b> .....	2680
<i>Thiago Clé de Oliveira; José Maria de Carvalho Filho; Roberto Chouhy Leborgne; Math H. J. Bollen</i>	
<b>A New Fuzzy-Based Representative Quality Power Factor for Unbalanced Three-Phase Systems with Nonsinusoidal Situations</b> .....	2681
<i>Walid Morsi; Mohamed El-Hawary</i>	
<b>A New Fuzzy-Wavelet Based Representative Quality Power Factor for Stationary and Nonstationary Power Quality Disturbances</b> .....	2682
<i>Walid Morsi; Mohamed El-Hawary</i>	
<b>A New Perspective for the IEEE Standard 1459-2000 Via Stationary Wavelet Transform in the Presence of Nonstationary Power Quality Disturbance</b> .....	2689
<i>Walid Morsi; Mohamed El-Hawary</i>	

<b>Review and Comments on Applications of Harmonic Indices .....</b>	<b>2690</b>
<i>Cheng-I Chen; Gary Chang</i>	
<b>Voltage Sag Cost Assessment Based on Power Flow Reduction and Non Supplied Energy.....</b>	<b>2695</b>
<i>José Maria de Carvalho Filho; Roberto Chouhy Leborgne; Thiago Clé de Oliveira; Jeder Francisco de Oliveira; Gustavo Tomio Watanabe</i>	
<b>Conducted and Radiated Emission from Pantograph Arcing in AC Traction System .....</b>	<b>2700</b>
<i>Surajit Midya; Dierk Bormann; Ziya Mazloom; Thorsten Schütte; Rajeev Thottappillil</i>	
<b>An Efficient Time-Domain Approach Based on Prony's Method for Time-Varying Power System Harmonics Estimation.....</b>	<b>2708</b>
<i>Cheng-I Chen; Gary Chang</i>	
<b>Single-Phase Active Power Filter Using FFT with Harmonic Phase-Delay Compensation.....</b>	<b>2714</b>
<i>ByongMoon Han</i>	
<b>A Method of Tracking Voltage Flicker Envelope Real-Time .....</b>	<b>2720</b>
<i>Xiufang Jia; Qing Chen</i>	
<b>Open Loop Response Characterization of an Aluminum Smelting Plant for Short Time Interval Feeding .....</b>	<b>2726</b>
<i>Ashish Agalgaonkar; Kashem Muttaqi; Sarah Perera</i>	
<b>The Distribution Network in DongGuan City Harmonic Sampling Examination and Statistical Analysis.....</b>	<b>2733</b>
<i>Jiang Zeng; Wen-jun Yu; Tao Yu</i>	
<b>Sliding Mode Control with Variable Structure of Series Active Power Filter .....</b>	<b>2739</b>
<i>Gelan Zhu; Gang Wang; D. Hua</i>	
<b>Phase Based-Voltage Dip Classification Using a New Classification Algorithm.....</b>	<b>2744</b>
<i>Mogamad Jattiem; Komla Folly; P. Pillay</i>	
<b>Identification of Non-Linear Load Using the Time-Varying Harmonic Transition Principle .....</b>	<b>NA</b>
<i>Carlos Duque; Moises Ribeiro; Thomas Baldwin; Satish Ranade; Paulo Ribeiro</i>	
<b>Unified Power Quality Index Based on Value-Based Methodology.....</b>	<b>2750</b>
<i>Buhm Lee; Kyoung Min Kim</i>	

## **TRAINING THE FUTURE WORKFORCE FOR THE ELECTRIC POWER AND ENERGY INDUSTRY**

<b>Replenishing the Aging Work Force in the Power Industry .....</b>	<b>2758</b>
<i>Daniel Wong; Randy Kimura</i>	
<b>Training T &amp; D's Next Generation for Next Generation Networks: The CIGRE Experience.....</b>	<b>2766</b>
<i>Adam Middleton; Jonathan Halliday</i>	
<b>The Power Academy in the UK: A Successful Initiative to Attract Graduates to the Power Industry .....</b>	<b>2772</b>
<i>Keith Bell; Bill Fenton; Huw Griffiths; Jim McDonald; Bikash Chandra Pal</i>	
<b>A Course in Power System Analysis Based on Project Based Learning Methodology.....</b>	<b>2780</b>
<i>Nasser Hosseinzadeh; Mohammad Hesamzadeh</i>	
<b>Using Hardware and Software Studies to Teach Power-System Modeling and Analysis .....</b>	<b>2786</b>
<i>Arun Shrestha; Robert Cox; Zia Salami; Jason Anderson; Prayag Parikh</i>	
<b>Integrative Graduate Program in Sustainable Electric Energy Systems.....</b>	<b>2792</b>
<i>Efrain O'Neill-Carrillo; Agustin Irizarry-Rivera; Cristina Pomales-Garcia; Emilio Contreras</i>	

## **TRANSMISSION AND PRICING FOR FAST GROWING MARKETS**

<b>The New Transmission Arrangements in the UK.....</b>	<b>2797</b>
<i>Rodrigo Moreno; Christos Vasilakos Konstantinidis; Danny Pudjianto; Goran Strbac</i>	
<b>Transmission Planning- From a Market Approach to a Centralized One- The Chilean Experience.....</b>	<b>2804</b>
<i>Hugh Rudnick; Juan C. Araneda; Sebastian Mocarquer</i>	
<b>Incorporating Large-Scale Renewables to the Transmission Grid: Technical and Regulatory Issues .....</b>	<b>2811</b>
<i>Fernando Porrua; Raphael Chabar; Luiz Thomé; Luiz Augusto Barroso; Mario Veiga Pereira</i>	
<b>Transmission Expansion and Pricing in Colombia: An Appraisal of Current Practices.....</b>	<b>2818</b>
<i>Harold Salazar; Luis J. Zuluaga-López; Ramón A. León</i>	
<b>Transmission Tariffs and Planning in the Central American Regional Electricity Market.....</b>	<b>2825</b>
<i>Manuel Tinoco</i>	

## **WIND PLANT COLLECTOR SYSTEM DESIGN PANEL SESSION**

<b>Wind Power Plant Collector System Design Considerations.....</b>	<b>2832</b>
<i>Ernst Camm; M. R. Behnke; O. Bolado; M. Bollen; C. Brooks; W. Dilling; M. Edds; W. J. Hejduk; D. Houseman; S. Klein; F. Li; J. Li; P. Maibach; T. Nicolai; J. Patino; S. V. Pasupulati; N. Samaan; S. Saylor; T. Siebert; T. Smith; M. Starke; R. Walling</i>	
<b>Wind Power Plant Grounding, Overvoltage Protection, and Insulation Coordination .....</b>	<b>2839</b>
<i>Ernst Camm; M. R. Behnke; O. Bolado; M. Bollen; C. Brooks; W. Dilling; M. Edds; W. J. Hejduk; D. Houseman; S. Klein; F. Li; P. Maibach; T. Nicolai; J. Patino; S. V. Pasupulati; N. Samaan; S. Saylor; T. Siebert; T. Smith; M. Starke; R. Walling</i>	

<b>Reactive Power Compensation for Wind Power Plants</b> .....	2847
<i>Ernst Camm; M. R. Behnke; O. Bolado; M. Bollen; C. Brooks; W. Dilling; M. Edds; W. J. Hejduk; D. Houseman; S. Klein; F. Li; J. Li; P. Maibach; T. Nicolai; J. Patino; S. V. Pasupulati; N. Samaan; S. Saylor; T. Siebert; T. Smith; M. Starke; R. Walling</i>	
<b>Characteristics of Wind Turbine Generators for Wind Power Plants</b> .....	2854
<i>Ernst Camm; M. R. Behnke; O. Bolado; M. Bollen; C. Brooks; W. Dilling; M. Edds; W. J. Hejduk; D. Houseman; S. Klein; F. Li; J. Li; P. Maibach; T. Nicolai; J. Patino; S. V. Pasupulati; N. Samaan; S. Saylor; T. Siebert; T. Smith; M. Starke; R. Walling</i>	
<b>Wind Power Plant Substation and Collector System Redundancy, Reliability, and Economics</b> .....	2859
<i>Ernst Camm; M. R. Behnke; O. Bolado; M. Bollen; C. Brooks; W. Dilling; M. Edds; W. J. Hejduk; D. Houseman; S. Klein; F. Li; J. Li; P. Maibach; T. Nicolai; J. Patino; S. V. Pasupulati; N. Samaan; S. Saylor; T. Siebert; T. Smith; M. Starke; R. Walling</i>	

## **WIND POWER GENERATION (I)**

<b>Reliability and Performance of WECS by Full-State Feedback and Independent Blade Pitch Regulation</b> .....	NA
<i>Billy Muhando; Tomonobu Senjyu; Aki Uehara; Toshihisa Funabashi; Chul-Hwan Kim</i>	
<b>Energy Capture, Conversion, and Control Study of DFIG Wind Turbine Under Weibull Wind Distribution</b> .....	2865
<i>Shuhui Li; Tim Haskew</i>	
<b>Fractional Weibull Wind Speed Modeling for Wind Power Production Estimation</b> .....	2874
<i>Zuwei Yu; Akiner Tuzuner</i>	
<b>Hardware Simulator Development for PMSG Wind Power System</b> .....	2881
<i>ByongMoon Han; H. Lee; D. Yoon</i>	
<b>A Unified Model of DFIG for Simulating Acceleration with Rotor Injection and Harmonics in Wind Energy Conversion Systems</b> .....	2887
<i>Lingling Fan; Zhixin Miao; Subbaraya Yuvarajan</i>	
<b>Investigation of Control for Grid Integrated Doubly Fed Induction Wind Generator</b> .....	2893
<i>Jin Shu; Baohui Zhang; Chenggen Wang; ZhiQian Bo</i>	
<b>The Impact of Tower Shadow, Yaw Error, and Wind Shears on Power Quality in a Wind-Diesel System</b> .....	2900
<i>Roohollah Fadaeinedjad Bahramjerdi; Gerry Moschopoulos; Mehrdad Moallem</i>	

## **ADVANCES IN DISTRIBUTED ENERGY RESOURCES**

<b>The Renewable Energy and Storage (RES) Project: Summary of a Panel Session Presentation</b> .....	2901
<i>John Bzura; James Bing</i>	
<b>Multidisciplinary Modeling and Simulation of a Fuel Cell/Gas Turbine Hybrid Power System</b> .....	2905
<i>Atideh Abbasi; Zhenhua Jiang</i>	
<b>A Generic Fuel Cell Model for the Simulation of Fuel Cell Power Systems</b> .....	2912
<i>Njoya Motapon Souleman; Olivier Tremblay; Louis-A. Dessaint</i>	
<b>Self-Scheduling of a Joint Hydro and Pumped-Storage Plants in Energy, Spinning Reserve and Regulation Markets</b> .....	2920
<i>S. Jalal Kazempour; Majid Hosseinpour; Mohsen Parsa Moggaddam</i>	
<b>Determining Realistic Photovoltaic Generation Targets in an Isolated Power System</b> .....	2928
<i>Hillmon Ladner-Garcia; Efrain O'Neill-Carrillo</i>	
<b>Advanced Lithium Polymer Batteries</b> .....	2933
<i>Ziyad Salameh; Bong Kim</i>	
<b>Small-Signal Modeling and Analysis of Battery-Supercapacitor Hybrid Energy Storage Systems</b> .....	2938
<i>Yu Zhang; Zhenhua Jiang; Xunwei Yu</i>	
<b>Investigation of Plug-In Hybrid EVs ( PHEVs) and Their Effects on Power Distribution Systems in the NE and SW United States: Summary of a Panel Session Presentation</b> .....	2946
<i>Robert Broderick; John J. Bzura</i>	

## **AFRICA'S ECONOMIC RENAISSANCE GATHERS MOMENTUM**

<b>Power Supply Challenges in Southern Africa</b> .....	2950
<i>Lawrence Musaba; Pathmanathan Naidoo</i>	
<b>Proposed Principles for the Evaluation and Funding of DSM Projects</b> .....	2956
<i>Dhevan Pillay; Herman Claassen</i>	
<b>New Strategies for Harvesting Large Scale Bulk Energy from the Congo River Without a Conventional Dam</b> .....	2960
<i>Pathmanathan Naidoo</i>	
<b>A Micro Hydro Power Generation System for Sustainable Microgrid Development in Rural Electrification of Africa</b> .....	2964
<i>Li Wang; Dong-Jing Lee; Long-Yi Chen; Jyun-Ying Yu; Shen-Roug Jan; Su-Jen Chen; Wei Jen Lee; Ming-Hua Tsai; Wei-Taw Lin; Yuan-Chung Li; Bai K. Blyden</i>	
<b>Preserving Low Cost Electricity While Improving the Riverine Environment; Part Two-Model Results</b> .....	2972
<i>P. V. Preckel; Frederick Sparrow; Brian Bowen; Zuwei Yu; D. J. Gotham</i>	

## COMPUTATIONAL METHODS IN POWER FLOW AND STATE ESTIMATION

<b>Tracing Power Flow from Generators to Loads and Branches Using Incidence Matrix Multiplication</b> .....	2980
<i>Kaigui Xie; Chunyan Li; Yenren Liu</i>	
<b>A Divisional Alternant Iteration Algorithm of Power Flow for Large-Scale Interconnected Power Grid</b> .....	2987
<i>Anjia Mao</i>	
<b>Fast Newton-FGMRES Solver for Large-Scale Power Flow Study</b> .....	2993
<i>Yi-Shan Zhang; Hsiao-Dong Chiang</i>	
<b>Identifying Power Flow Control Infeasibilities in Large Scale Power System Models</b> .....	3000
<i>Joao Alberto Passos Filho; Nelson Martins; Djalma Mosqueira Falcao</i>	
<b>A New Continuation Power Flow Model for Simulating Time-Domain Dynamic Load Restoration</b> .....	3001
<i>Jinguan Zhao; Yi Wang</i>	
<b>Decoupled Load Flow and Its Feasibility in Systems with Dynamic Topology</b> .....	3008
<i>Mingyang Li; Qianchuan Zhao; Peter B. Luh</i>	
<b>A Hybrid Three-Phase Single-Phase Power Flow Formulation</b> .....	3016
<i>Jose Mauro Marinho; Glauco Taranto</i>	
<b>Complex Power Flow Tracing For Transmission Loss Allocation Considering Loop Flows</b> .....	3017
<i>Sobhy Abdelkader</i>	
<b>Massive Contingency Analysis with High Performance Computing</b> .....	3026
<i>Zhenyu Huang; Yousu Chen; Jarek Nieplocha</i>	
<b>Power System Observability Analysis Based on Gram Matrix and Minimum Norm Solution</b> .....	3034
<i>Madson Almeida; Eduardo Asada; Ariovaldo V. Garcia</i>	
<b>Indicators of Critical Conditions for State Estimation</b> .....	3035
<i>Milton Brown De Coutto Filho; Julio Stacchini de Souza; Johnny Villavicencio Tafur</i>	
<b>State Estimation with WAMS/SCADA Hybrid Measurements</b> .....	3041
<i>Dalu Li; Yuanzhang Sun; Han Chen</i>	
<b>PMU-Based Dynamic State Estimation for Electric Power Systems</b> .....	3046
<i>Evangelos Farantatos; George Stefopoulos; George Cokkinides; A. P. Meliopoulos</i>	
<b>Placement of PMUs with Channel Limits</b> .....	3054
<i>Mert Korkali; Ali Abur</i>	
<b>Identification of Network Parameter Errors Using Phasor Measurements</b> .....	3058
<i>Jun Zhu; Ali Abur</i>	
<b>Correcting Electrical Network Parameters</b> .....	3063
<i>Milton Brown De Coutto Filho; Julio Stacchini de Souza; Edwin Benito Mitacc Meza</i>	
<b>Defining Power Network Zones from Measures of Electrical Distance</b> .....	3070
<i>Seth Blumsack; Paul Hines; Mahendra Patel; Clayton Barrows; Eduardo Cotilla Sanchez</i>	
<b>Discrete Solutions of Nonlinear Electric Systems: A Differentiation Matrix and Newton-Based Approach</b> .....	3078
<i>Norberto Garcia-Barriga</i>	

## CONTROL CENTER ISSUES

<b>System Operator Testing/Evaluation/Assessment</b> .....	3084
<i>Patrick Everly</i>	
<b>Update on CIGRE D2.24 Initiative</b> .....	3085
<i>Paul Skare</i>	
<b>Impact of Regulatory Compliance on Control Center Operations</b> .....	3086
<i>Narinder Saini</i>	
<b>Operational Impacts from June 2008 Eastern Iowa Flooding</b> .....	3088
<i>David Acton</i>	

## DEVELOPMENTS IN DETERMINING POWER QUALITY DISTURBANCE SOURCES AND HARMONIC SOURCE CONTRIBUTIONS

<b>Flicker Emission Assessments and a New Method Based on RMS Measurements</b> .....	3089
<i>Xavier Yang</i>	
<b>A Method to Determine the Harmonic Contributions of Multiple Loads</b> .....	3096
<i>Wilsun Xu; Richard Bahry; Hooman Erfanian Mazin; Thavatchai Tayjasanant</i>	
<b>Location of Sources of Voltage Unbalance in an Interconnected Network</b> .....	3102
<i>Sarath Perera; Prabodha Paranavithana</i>	
<b>Allocated Harmonic Quantities as the Basis for Source Detection</b> .....	3108
<i>Timothy Browne; Victor Gosbell; Sarath Perera</i>	
<b>Harmonics Measurements and Customer Loads</b> .....	3114
<i>Bill A. Moncrief</i>	
<b>Identification of Individual Harmonic Sources and Evaluation Their Contribution in the Harmonic Distortion Level</b> .....	3117
<i>András Dán</i>	

## **DISTRIBUTION SUBCOMMITTEE**

<b>Some Features of Possible Solutions of Installing Telecontrolled Section Switches and Reclosers in the MV Overhead Network .....</b>	<b>3124</b>
<i>Petr Skala; Vaclav Detrich; Zdenek Spacek; Martin Paar</i>	

## **18 PANEL SESSION ON SIMULATION TOOLS FOR PEBB BASED EQUIPMENT & SYSTEMS**

<b>Impacts of Transformer Winding Configuration on Ferroresonance Behavior of Capacitive Divider Substations .....</b>	<b>3131</b>
<i>Afshin Rezaei-Zare; Reza Iravani; Majid Sanaye-Pasand</i>	

## **INCORPORATING SMART GRID INTO POWER SYSTEM PLANNING TO OPTIMIZE CAPEX/OPEX, SYSTEM RELIABILITY, AND CARBON FOOTPRINT**

<b>Power System Considerations of Plug-In Hybrid Electric Vehicles Based on a Multi Energy Carrier Model .....</b>	<b>3138</b>
<i>Matthias Galus; Göran:ersson</i>	
<b>A Review of Challenges to Real-Time Power Management of Microgrids .....</b>	<b>3146</b>
<i>Chris Colson; Hashem Nehrir</i>	

## **INTERNATIONAL PRACTICES FOR ALTERNATIVE ENERGY IN DEVELOPING COUNTRIES**

<b>Biomass Power Generation Development in Thailand .....</b>	<b>3154</b>
<i>Chai Chompoo-inwai; Chow Chompoo-inwai; Monthon Leelajindakraierk; Sulee Banjongjit; Pradit Fuangfoo; Wei-Jen Lee</i>	
<b>Detection of Voltage Variations Due to Distributed Energy Resources .....</b>	<b>3158</b>
<i>Norman C. F. Tse; Long Zhou</i>	
<b>A Practical Approach of Smart Metering in Remote Monitoring of Renewable Energy Applications .....</b>	<b>3163</b>
<i>Ping Kwong Lee; Loi Lei Lai</i>	
<b>A Novel Newton Current Equation Method on Power Flow Analysis in Microgrid .....</b>	<b>3167</b>
<i>Yanping Zhang; YuPing Lu</i>	
<b>Analysis of Regulating Wind Power for Power Systems .....</b>	<b>3173</b>
<i>Jizhong Zhu; Kwok Cheung</i>	
<b>Renewable Energy Generation in India: Present Scenario and Future Prospects .....</b>	<b>3179</b>
<i>S. N. Singh; Bharat Singh; Jacob Østergaard</i>	
<b>A Novel Wind Energy System .....</b>	<b>3187</b>
<i>Tze-Fun Chan; Loi Lei Lai</i>	
<b>Australian Electricity Market Power Analysis Under Potential Emission Trading Scheme .....</b>	<b>3193</b>
<i>Xun Zhou; Zhaoyang Dong; Ariel Liebman; Geoffrey C. James</i>	
<b>Wind Energy Development in China (WED)-The Danish-Chinese Collaboration Project .....</b>	<b>3200</b>
<i>Zhao Xu; Henrik Rosenberg; Poul Ejnar Sørensen; Hans Abildgaard; Ole Holmstrøm; Yongning Chi; Yan Li; Wenhui Shi; Zhen Wang; Weisheng Wang</i>	
<b>Acquiring Knowledge and Information on Alternative Energy from the World Wide Web .....</b>	<b>3207</b>
<i>Chun Che Fung; Wigrat Thanadechteemapat; David Harries</i>	
<b>Interface of a Fuel Cell Distributed Generator with Distribution System Network .....</b>	<b>3216</b>
<i>Tae-Il Choi; Kwang Y. Lee</i>	

## **INTERNATIONAL PRACTICES IN DEMAND SIDE MANAGEMENT: PRACTICES AND BARRIERS**

<b>Roadmap for Demand Response in the Korean Electricity Market .....</b>	<b>3224</b>
<i>Jin-Ho Kim; Tae-Kyung Hahn; Kwang-Seok Yang</i>	
<b>Danish DSM Activities – Current Results and Possible Developments .....</b>	<b>3230</b>
<i>Mikael Togeby</i>	
<b>Demand Side Management in Support for the Grid .....</b>	<b>3235</b>
<i>Russell Stewart</i>	
<b>Creating a Culture of Conservation in Ontario: Approaches, Challenges and Opportunities .....</b>	<b>3241</b>
<i>Steve Norrie; Peter Love</i>	
<b>Demand Side Management Road Map for India .....</b>	<b>3248</b>
<i>Saurabh Kumar</i>	

## **NEW TECHNIQUES FOR SYNCHRONIZED PHASOR DATA ANALYSIS**

<b>Application of Extended Kalman Filter Techniques for Dynamic Model Parameter Calibration .....</b>	<b>3256</b>
<i>Zhenyu Huang; Pengwei Du; Dmitry Kosterev; Bo Yang</i>	
<b>Electromechanical Mode Shape Estimation Based on Transfer Function Identification Using PMU Measurements .....</b>	<b>3264</b>
<i>Ning Zhou; Zhenyu Huang; Luke Dosiek; Daniel Trudnowski; John Pierre</i>	
<b>A Framework for Estimation of Power Systems Based on Synchronized Phasor Measurement Data .....</b>	<b>3271</b>
<i>Luigi Vanfretti; Joe H. Chow; Sanjoy Sarawgi; Dean Ellis; Bruce Fardanesh</i>	
<b>Double Line Outage Detection Using Phasor Angle Measurements .....</b>	<b>3277</b>
<i>Joseph Tate; Thomas Overbye</i>	
<b>Monitoring the North American Interconnections at Distribution Level .....</b>	<b>3282</b>
<i>Jingyuan Dong; Tao Xia; Yingchen Zhang; Yilu Liu; Lisa Beard; Terry Bilke</i>	
<b>Oscillation Monitoring System Using Synchrophasors .....</b>	<b>3290</b>
<i>Guoping Liu; Vaithianathan Venkatasubramanian; James Ritchie Carroll</i>	

## **OPERATION, CONTROL, SIMULATION OF SYNCHRONOUS MACHINES**

<b>Gradient Descent Based Optimization for Position and Speed Estimation of Permanent Magnet Synchronous Motor at Low Speed .....</b>	<b>3294</b>
<i>Ahmad Khan; Osama Mohammed</i>	
<b>Effect of Cooling Conditions on the Design and Operation of IPMSM .....</b>	<b>3298</b>
<i>Abdul Rehman Tariq; Carlos Nino; Elias Strangas</i>	
<b>Nonlinear High-Gain Observer Design for Operation of SPMS Machine Under Saturation .....</b>	<b>3308</b>
<i>Sinisa Jurkovic; Elias Strangas; Hasan Khalil</i>	
<b>A Novel Methodology for Power Angle Estimation of Synchronous Generator Based on Trajectory Sensitivity Analysis .....</b>	<b>3316</b>
<i>Elmer Pablo Tito Cari; Luis Fernando Costa Alberto; Newton Geraldo Bretas</i>	
<b>EMTP Simulation of Synchronous Machine from Standstill to Synchronization .....</b>	<b>3322</b>
<i>Ulas Karaagac; Jean Mahseredjian; Sébastien Denetière</i>	
<b>Development and Validation of a Comprehensive Synchronous Machine Model for a Real-Time Environment .....</b>	<b>3330</b>
<i>Ali Banitalebi Dehkordi; Prabhakar Neti; Aniruddha Gole; Trevor Maguire</i>	

## **OSCILLATIONS, STABILITY, & ISLANDING**

<b>A Refined Hilbert-Huang Transform with Applications to Inter-Area Oscillation Monitoring .....</b>	<b>3331</b>
<i>Dina Shona Laila; Arturo Roman Messina; Bikash Chandra Pal</i>	
<b>Development of a Tool for the Analysis of Power System Higher Order Oscillation .....</b>	<b>3332</b>
<i>Zhouqiang Wang; Qi Huang; Changhua Zhang</i>	
<b>Comparative Assessment of Kalman Filter and Prony Methods for Power System Oscillation Monitoring .....</b>	<b>3339</b>
<i>Jimmy Chih-Hsein Peng; Nirmal-Kumar C. Nair</i>	
<b>A Fast Method for Power System Splitting Boundary Searching .....</b>	<b>3347</b>
<i>Chenggen Wang; Baohui Zhang; Jin Shu; Peng Li; ZhiQian Bo</i>	
<b>Utilizing Distributed Power Flow Controller (DPFC) for Power Oscillation Damping .....</b>	<b>3355</b>
<i>Zhihui Yuan; Sjoerd deHaan; Braham Ferreira</i>	
<b>Nonlinear Hierarchical Global Controller Considering Wide-Area Information Delay .....</b>	<b>3360</b>
<i>Guangliang Yu; Baohui Zhang; Chenggen Wang; ZhiQian Bo</i>	
<b>Detection Tools for Disturbances and Protective Relay Operations Leading to Cascading Events .....</b>	<b>3365</b>
<i>Chengzong Pang; Mladen Kezunovic</i>	
<b>A Methodology to Study the Impact of an Increasingly Nonconventional Load Mix on Primary Frequency Control .....</b>	<b>3371</b>
<i>Hisham Omara; François Bouffard</i>	
<b>Bus-Based Indices for Assessing the Contribution of DG to the Voltage Security Margin of the Transmission Grid .....</b>	<b>3378</b>
<i>Hugo A. Gil; Mohamed El Chehaly; Geza Joos; Claudio Cañizares</i>	
<b>Network-Aided Strategy and Breaker Impacts on Voltage Instability Corrective Actions for Power Systems with DGs .....</b>	<b>3385</b>
<i>Lin Wang; Alexander Hamlyn; Helen Cheung; Rizwan Yasin; Celia Li; Richard Cheung</i>	
<b>Control Mechanism and Security Region for Intentional Islanding Transition .....</b>	<b>3392</b>
<i>Yu Chen; Zhao Xu; Jacob Østergaard</i>	
<b>A Hybrid Islanding Detection Technique Using Average Rate of Voltage Change and Real Power Shift .....</b>	<b>3398</b>
<i>Pukar Mahat; Zhe Chen; Birgitte Bak-Jensen</i>	
<b>Gas Turbine Control for Islanding Operation of Distribution Systems .....</b>	<b>3399</b>
<i>Pukar Mahat; Zhe Chen; Birgitte Bak-Jensen</i>	
<b>Management of a Multiple-Set Synchronous Island .....</b>	<b>3406</b>
<i>Robert Best; John Morrow; Chui Fen Ten; David Laverty; Peter A. Crossley</i>	
<b>Investigation of the Islanding Detection of Induction Generators .....</b>	<b>3412</b>
<i>Paulo Meira; Diogo Salles; Ahda Grilo; Walmir Freitas; João Paulo Vieira</i>	

## **PARAMETER MEASUREMENT, CONTROLLER DEVELOPMENT AND EMTP SOLUTIONS FOR PERMANENT MAGNET AND SYNCHRONOUS MACHINES**

<b>A Voltage-Behind-Reactance Induction Machine Model for the EMTP-Type Solution</b> .....	3418
<i>Liwei Wang; Juri Jatskevich</i>	
<b>The Development and Testing of a Scalar Double-Loop Controller for a 3(Phi) WM Inverter-Fed IPM Motor</b> .....	3419
<i>Saleh Saleh; M. Rahman</i>	
<b>A Simple Method for Measuring Cogging Torque in Permanent Magnet Machines</b> .....	3424
<i>Z. Q. Zhu</i>	
<b>Effect of Quadrature Axis Reactance of Large Cylindrical Synchronous Machine on Operation</b> .....	3428
<i>Daisuke Hiramatsu; Yoichi Uemura; Junji Okumoto; Hitoshi Hosaka; Shinji Uemoto; Takehiko Imai; Mikio Kakiuchi; Ken Nagkura; Masafumi Fujita; Toru Otaka; Ken Nagasaka</i>	
<b>Measurement of Parameters for Interior Permanent Magnet Motors</b> .....	3432
<i>P. Zhou; D. Lin; M. F. Rahman; M. A. Rahman</i>	

## **PHASORS, WIDE AREA MONITORING, & STATE ESTIMATION**

<b>Recent Experience with Hybrid SCADA PMU Online State Estimator</b> .....	3436
<i>Rene Avila-Rosales; Mark Rice; Jay Giri; Lisa Beard; Floyd Galvan</i>	
<b>A Unified Approach for the Optimal PMU Location</b> .....	3444
<i>Nabil Abbasy; Hanafy Ismail</i>	
<b>An Improved Phasor Assisted State Estimator</b> .....	3445
<i>Ranjana Sodhi; S. C. Srivastava; S. N. Singh</i>	
<b>Optimal PMU Placement to Ensure System Observability Under Contingencies</b> .....	3452
<i>Ranjana Sodhi; S. C. Srivastava; S. N. Singh</i>	
<b>Distributed State Estimation with PMU Using Grid Computing</b> .....	3458
<i>Qinghua Huang; Noel Schulz; Anurag Srivastava; Tomasz Haupt</i>	
<b>Grid Reduction Approach for State Identification of Distribution Grids</b> .....	3465
<i>Martin Wolter</i>	
<b>Geometrical Approach on Masked Gross Errors for Power Systems State Estimation</b> .....	3473
<i>Newton Geraldo Bretas; João Bosco Augusto London Jr; Luís Fernando Costa Alberto; Raphael A. S. Benedito</i>	
<b>Identification and Estimation of Power System Branch Parameter Error</b> .....	3480
<i>Madeleine Medrano Castillo; João Bosco Augusto London Jr; Newton Geraldo Bretas</i>	
<b>Non Iterative-State Estimation Based Neural Network for Short Term Load Forecasting of Distribution Systems</b> .....	3488
<i>Kamisetti Prakash; M. Sydulu</i>	
<b>FNET Observations on the Impact of Super Bowl XLII on the Power Grid Frequency</b> .....	3496
<i>Tao Xia; Robert Gardner; Yilu Liu</i>	

## **POWER SYSTEM RELAYING**

<b>Waveform Distortion Impact of TCSC in FCL Mode on Transmission Line Protection</b> .....	3501
<i>Mojtaba Khederzadeh</i>	
<b>Evaluation of Communication Technologies for IEC 61850 Based Distribution Automation System with Distributed Energy Resources</b> .....	3509
<i>Palak Kanabar; Mitalkumar Kanabar; Walid El-Khattam; Tarlochan Sidhu; Abdallah Shami</i>	
<b>A New Algorithm for Faults on Double-Circuit Lines in Phase Coordinates</b> .....	3517
<i>Anning Wang; Qing Chen</i>	
<b>Overview of Mathematical Morphology in Power Systems – A Tutorial Approach</b> .....	3523
<i>Suresh Gautam; Sukumar Brahma</i>	
<b>IEC 61850 Based Bus Protection – Principles and Benefits</b> .....	3530
<i>Alexander Apostolov</i>	
<b>Fourier Transform-Based Modified Phasor Estimation Method Immune to the Effect of the DC Offsets</b> .....	3536
<i>Sang-Hee Kang; Dong-Gyu Lee; Soon-Ryul Nam; Peter A. Crossley; Yong-Cheol Kang</i>	
<b>Measured Impedance by Distance Relay in Inter Phase Faults Considering Double Equivalent Model for Line Capacitance</b> .....	3537
<i>Hossein Shateri; Sadegh Jamali</i>	

## **POWER SYSTEM RELAYING PAPER FORUM #1**

<b>Hybrid Traveling Wave/Boundary Protection for Bipolar HVDC Line</b> .....	3545
<i>Xiaolei Liu; A. H. Osman; Om P. Malik</i>	
<b>An Adaptive Phasor Estimation Technique Based on LES Method Using Forgetting Factor</b> .....	3553
<i>Peyman Jafarian; Majid Sanaye-Pasand</i>	
<b>Faulty Feeder Detection of Single-Phase Earthed Fault Using Dominant Transient Frequency Admittance</b> .....	3561
<i>Xinhui Zhang; Bingyin Xu; Peiyu Wei</i>	

<b>Flow Transferring Identification Algorithm with Consideration of Transient Period</b> .....	3567
<i>Tianshu Bi; Huiming Xu; Shao Feng Huang; Qixun Yang</i>	
<b>Fault Section Estimation in Power Systems Based on Improved Optimization Model and Binary Particle Swarm Optimization</b> .....	3572
<i>Zhengyou He; Hsiao-Dong Chiang; Chaowen Li; Qingfeng Zeng</i>	

## **POWER SYSTEM RELAYING PAPER FORUM #2**

<b>Development of a Data Compression Index for Discrimination Between Transformer Internal Faults and Inrush Currents</b> .....	3580
<i>Mohammad Hossein Zendeheidi; Majid Sanaye-Pasand</i>	
<b>Investigation on the Phase Selection Criterion Based on Improved Modular Fault Component</b> .....	3587
<i>Xiangning Lin; Zhimin Zhao; ZhiQian Bo</i>	
<b>A Genetic Based Algorithm for Frequency Relaying Using FPGAs</b> .....	3593
<i>Denis V. Coury; Mario Oleskovicz; Alexandre C. B. Delbem; Eduardo V. Simoes; Tiago V. Silva; Janison R. de Carvalho; Daniel Barbosa</i>	
<b>Effects of UPFC on Measured Impedance by Distance Relay in Double-Circuit Lines</b> .....	3601
<i>Sadegh Jamali; Ahad Kazemi; Hossein Shateri</i>	
<b>Experimental Investigation of High Impedance Faults in Low Voltage Distribution Networks</b> .....	3609
<i>Tamer Kawady; Abd El-Maksoud Taalab; Mohamed Elgeziry</i>	

## **POWER SYSTEM RELAYING PAPER FORUM #3**

<b>A Novel Fault-Dependent-Time-Settings Algorithm for Overcurrent Relays</b> .....	3615
<i>Marija Prica; Marija D. Ilic</i>	
<b>Neural Network-Based Technique Used for Recovery the CCVT Primary Signal</b> .....	3624
<i>Saber Saleh; Essam Aboul-Zahab; El Sayed Tag Eldin; D. K. Ibrahim; M. I. Gilany</i>	
<b>Reliability and Availability Analysis of IEC 61850 Based Substation Communication Architectures</b> .....	3631
<i>Mitalkumar Kanabar; Tarlochan Sidhu</i>	
<b>Considering Failure Probability for Back-Up Relay in Determination of the Optimum Routine Test Interval in Protective System Using Markov Model</b> .....	3639
<i>Yaser Damchi; Javad Sadeh</i>	
<b>Evaluating the Role of Current Limiting Fuses for Wind Farm Protection Applications</b> .....	3644
<i>Tamer Kawady; Naema Mansour; Abd El-Maksoud Taalab</i>	
<b>Opportunities for Utilities as Innovators in the Area of Protection and Control Engineering</b> .....	3651
<i>Shinichi Imai; Tomoo Ohmori; Hiroaki Kitajima; Hiroshi Okamura</i>	

## **POWER SYSTEM SIMULATION AND APPLICATION OF INTELLIGENT TECHNIQUES**

<b>A Wide-Band Multi-Port System Equivalent for Real-Time Digital Power System Simulators</b> .....	3657
<i>Xi Lin; Aniruddha Gole; Ming Yu</i>	
<b>A Hardware-In-Loop FACTS Control System Design for Real-Time Power System Simulation</b> .....	3658
<i>Keyou Wang; Mariesa L. Crow; Ying Cheng; Bruce M. McMillin</i>	
<b>Implementation and Validation of a Five-Level STATCOM Model in the RTDS Small Time-Step Environment</b> .....	3668
<i>Li Qi; James Langston; Michael Steurer; Ashok Sundaram</i>	
<b>Implementation of a Distributed Parallel Computing Architecture for Transient Stability Constrained TTC Evaluation</b> .....	3674
<i>Libao Shi; Zijian Guo; Yixin Ni; Liangzhong Yao; Masoud Bazargan</i>	
<b>Multi-Agent Based Electricity Market Simulator with VPP: Conceptual and Implementation Issues</b> .....	3680
<i>Tiago Pinto; Zita Vale; Hugo Morais; Isabel Praça; Carlos Ramos</i>	
<b>A Multi-Agent Based Distributed Reactive Power Control Method</b> .....	3689
<i>Takeshi Nagata; Ryouzuke Hatano; Hiroshi Saiki</i>	
<b>Applying Genetic Algorithms to Reduce Information Asymmetry in the Brazilian Power Market</b> .....	3696
<i>Dorel Ramos; Guilherme Susteras</i>	
<b>A Reinforcement Learning Approach to Dynamic Optimization of Load Allocation in AGC System</b> .....	3704
<i>Yuming Wang; Qianjin Liu; Tao Yu</i>	
<b>A Reinforcement Learning Approach to Power System Stabilizer</b> .....	3710
<i>Tao Yu; Wei-Guo Zhen</i>	
<b>Near Optimal Control Policy for Controlling Power System Stabilizers Using Reinforcement Learning</b> .....	3715
<i>Ramtin Hadidi; Benjamin Jeyasurya</i>	
<b>Information Entropy Based Fuzzy Optimization Model of Electricity Purchasing Portfolio</b> .....	3722
<i>Yanan Zheng; Ming Zhou; Gengyin Li</i>	
<b>A Knowledge Based Expert System for the Pre-Feasibility Analysis of an Energy Storage System in a Wind-Diesel Isolated Power Grid</b> .....	3728
<i>Michael Ross; Rodrigo Hidalgo; Geza Joos</i>	

<b>A Novel Power System Stabilizer Based on Fuzzy Model Reference Adaptive Controller</b> .....	3736
<i>Sukumar Kamalasadani; Gerald Swann</i>	
<b>TVAC-PSO Based Optimal Reactive Power Dispatch for Reactive Power Cost Allocation Under Deregulated Environment</b> .....	3744
<i>Chira Achayuthakan; Weerakorn Ongsakul</i>	
<b>Economic Dispatch of a Differential Evolution Based Generator Maintenance Scheduling of a Power System</b> .....	3753
<i>Yusuf Yare; Ganesh Kumar Venayagamoorthy; Ahmed Saber</i>	

## **POWER SYSTEM STABILITY SUBCOMMITTEE AND RECENT APPLICATIONS OF LINEAR ANALYSIS TECHNIQUES PANEL SESSION**

<b>Application of Small-Signal Stability Tools and Techniques to a Large Power System</b> .....	3761
<i>Pouyan Pourbeik; Tom Cain; Robert Bottoms</i>	
<b>Overview of Algorithms for Estimating Swing Modes Form Measured Responses</b> .....	3772
<i>Daniel Trudnowski; John Pierre</i>	
<b>Analysis of Intra-Area and Interarea Oscillations in South-Eastern UCTE Interconnection</b> .....	3780
<i>Costas Vournas; Aigli Metsiou; Vassilis Nomikos</i>	
<b>Benchmark Testing Methodology for Continuous Modal-Estimation Algorithms</b> .....	3787
<i>David Vowles; Michael Gibbard; Donald Geddey; David Bones</i>	
<b>Computation and Analysis of Power System Voltage Oscillations from Interarea Modes</b> .....	3795
<i>Luigi Vanfretti; Joe H. Chow</i>	
<b>Invariant Subspace Based Eigenvalue Tracing for Power System Small-Signal Stability Analysis</b> .....	3803
<i>Cheng Luo; Venkataramana Ajjarapu</i>	
<b>Linear and Nonlinear Methods for Contingency Analysis in On-Line Voltage Security Assessments</b> .....	3812
<i>Hsiao-Dong Chiang; Licheng Jin; Matthew Varghese; Soumen Ghosh; Hua Li</i>	

## **PSCC NEW CONCEPTS SUBCOMMITTEE**

<b>Investigation of Broadband Over Power Line Channel Capacity of Shipboard Power System Cables for Ship Communication Networks</b> .....	3818
<i>Ayorinde Akinnikawe; Karen Butler-Purry</i>	
<b>Exploiting Intelligent Systems Techniques Within an Autonomous Regional Active Network Management System</b> .....	3827
<i>Euan Davidson; Stephen McArthur; Michael Dolan; James R. McDonald</i>	

## **PSCC SECURITY SUBCOMMITTEE**

<b>Facilitating NERC CIP Compliance with Secure Unified Remote IED Access Control</b> .....	3835
<i>Travis Jaffray; Ameen Hamdon; Ben Tatera</i>	
<b>Secure SCADA Network Supporting NERC CIP</b> .....	3840
<i>Mira Zafirovic-Vukotic; Roger Moore; Michael Leslie; Rene Midence; Marzio Pozzuoli</i>	
<b>Collaborative, Trust-Based Security Mechanisms for a Regional Utility Intranet</b> .....	3848
<i>Gregory Coates; Kenneth Hopkinson; Scott Graham; Stuart Kurkowski</i>	

## **RELIABILITY AND RISK IN POWER SYSTEMS**

<b>Probabilistic Reliability Evaluation of Power System Including Solar/Photovoltaic Cell Generator</b> .....	3849
<i>Jaeseok Choi; Jeongje Park; Wu Liang; Abdurrahim El-keib; Mohammad Shahidehpour; Roy Billinton</i>	
<b>Probabilistic Reliability Evaluation of Power Systems Including Wind Turbine Generators Using a Simplified Multi-State Model: A Case Study</b> .....	3855
<i>Liang Wu; Jeongje Park; Jaeseok Choi; Abdurrahim El-Keib; Mohammad Shahidehpour; Roy Billinton</i>	
<b>Composite Generation and Transmission System Adequacy Assessment Considering Wind Energy Seasonal Characteristics</b> .....	3861
<i>Yi Gao; Roy Billinton; Rajesh Karki</i>	
<b>Studies on Models and Algorithms of the Power System Probabilistic Production Simulation Integrated with Wind Farm</b> .....	3868
<i>Zhaohong Bie; Xin Zou; Zijing Wang; Xifan Wang</i>	
<b>Novel Method for Estimating the CF of Variable Speed Wind Turbines</b> .....	3875
<i>Mohammed Albadi; Ehab El-Saadany</i>	
<b>Small Hydro Power Plants Energy Availability Modeling for Generation Reliability Evaluation</b> .....	3881
<i>Carmen Borges; Roberto Pinto</i>	
<b>Comparison Between Two Probabilistic Load Flow Methods for Reliability Assessment</b> .....	3882
<i>Gan Li; Xiao-Ping Zhang</i>	

<b>Risk Based Maintenance Optimization of Overhead Distribution Networks Utilizing Priority Based Dynamic Programming</b> .....	3889
<i>Ehsan Abbasi; Mahmud Fotuhi-Firuzabad; Amir Abiri-Jahromi</i>	
<b>Risk-Based Optimal Power Flow and System Operation State</b> .....	3900
<i>Yuan Li; James McCalley</i>	
<b>Reserve Determination for System with Large Wind Generation</b> .....	3906
<i>Taiyou Yong; Robert Entriken; Pei Zhang</i>	
<b>A Reliability-Based Reserve Criterion for Market Settlement with Interruptible Loads</b> .....	3913
<i>Peng Wang; Lalit Goel; Yong Liu; Qiuwei Wu; Yi Ding; Wenping Qin</i>	
<b>Reliability Assessment of Power Systems Considering Reactive Power Sources</b> .....	3918
<i>Peng Wang; Wenping Qin; Xiaoqing Han; Yi Ding; Xinghui Du</i>	
<b>Estimating the Spinning Reserve Requirements in Systems with Significant Wind Power Generation Penetration</b> .....	3925
<i>Miguel A. Ortega-Vazquez; Daniel S. Kirschen</i>	
<b>Dynamic Factors in State-Space Models for Hourly Electricity Load Signal Decomposition and Forecasting</b> .....	3926
<i>Virginie Dordonnat; Siem Jan Koopman; Marius Ooms</i>	
<b>Using Copulas for Modeling Stochastic Dependence in Power System Uncertainty Analysis</b> .....	3934
<i>George Papaefthymiou; Dorota Kurowicka</i>	
<b>Significance of an Operational Measure of Distribution Network Reliability</b> .....	3935
<i>John McDonald; Bikash Chandra Pal; Peter Lang</i>	
<b>Estimation of Power Interruption Cost Using Causality Model for Industrial Sector in Iran</b> .....	3943
<i>Omid Ziaee; Ashkan Rahimi Kian; Mohsen Parsa Moggaddam</i>	

## **SHUNT CHARACTERISTICS, FUZZY LOGIC, TRANSIENT IMPROVEMENTS OF INDUCTION MACHINES**

<b>Fuzzy Logic Based Direct Torque Control of Induction Motor</b> .....	3948
<i>Rintu Khanna; Manisha Singla; Gurpreet Kaur</i>	
<b>Comparative Study of DFIG Power Control Using Stator-Voltage and Stator-Flux Oriented Frames</b> .....	3953
<i>Shuhui Li; Rajab Chaloo; Marty Nemmers</i>	
<b>Characteristics of Shunt, Short-Shunt and Long-Shunt Single-Phase Induction Generators</b> .....	3961
<i>M. H. Haque</i>	
<b>Improving the Transient Performance of Doubly Fed Induction Generators When Submitted to Voltage Sags</b> .....	3968
<i>João Paulo Vieira; Marcus Vinicius Nunes; Ubiratan Holanda Bezerra</i>	

## **SYSTEM IDENTIFICATION AND MODEL PREDICTIVE CONTROL**

<b>Security Constrained Coordinated Dynamic Voltage Stabilization Based on Model Predictive Control</b> .....	3979
<i>Licheng Jin; Ratnesh Kumar</i>	
<b>An Adaptive Wide-Area Damping Controller Based on Generalized Predictive Control and Model Identification</b> .....	3987
<i>W. Yao; L. Jiang; J. Y. Wen; S. J. Cheng; Q. H. Wu</i>	
<b>Control of Power System Static Stability Using Distributed Static Series Compensators</b> .....	3994
<i>Dumisani Simfukwe; Bikash Chandra Pal; Miroslav Begovic; Deepak Divan; Yang Song</i>	
<b>A Development of Dynamic Load Model Parameter Derivation Method</b> .....	4000
<i>Koji Yamashita; Minoru Asada; Kenji Yoshimura</i>	
<b>Trust-Tech Based Parameter Estimation and Its Application to Power System Load Modeling</b> .....	4008
<i>Byoung-Kon Choi; Hsiao-Dong Chiang; David Yu</i>	
<b>Simplified Time-Domain Simulation of Detailed Long-Term Dynamic Models</b> .....	4016
<i>Davide Fabozzi; Thierry Van Cutsem</i>	
<b>Simulation Model and Characteristics of Variable Frequency Transformers Used for Grid Interconnection</b> .....	4024
<i>Rongxiang Yuan; Ying Chen; Gesong Chen; Yong Sheng</i>	
<b>A Maximum Likelihood Based Dynamic Synchrophasor Estimator for Online Purpose</b> .....	4029
<i>Ruikun Mai; Zhengyou He; Kirby Brian; ZhiQian Bo</i>	
<b>Development of a Dynamic Equivalent Model for Ontario's External System</b> .....	4034
<i>Ahmed Maria; Hassan Ghaseemi</i>	

<b>Monitoring of Inter-Area Oscillations Under Ambient Conditions Using Subspace Identification .....</b>	<b>4039</b>
<i>Mats Larsson; Dina Shona Laila</i>	

## **TOWERS, POLES & CONDUCTORS WG9 MANAGEMENT OF EXISTING OVERHEAD TRANS. LINES**

<b>Design and Implementation of Power Line Sensornet for Overhead Transmission Lines .....</b>	<b>4045</b>
<i>Yi Yang; Deepak Divan; Ronald G. Harley; Thomas G. Habetler</i>	

## **TRANSFORMERS I**

<b>Experimental and Theoretical Analysis of Vacuum Circuit Breaker Prestrike Effect on a Transformer .....</b>	<b>4053</b>
<i>Marjan Popov; Rene Smeets; Lou van der Sluis; Hans de Herdt; Jan Declercq</i>	
<b>On the Effects of Subsynchronous Interharmonic Voltages on Power Transformers: Single Phase Units .....</b>	<b>4054</b>
<i>Roberto Langella; Alfredo Testa; Alexander E. Emanuel</i>	
<b>On the Effects of Subsynchronous Interharmonic Voltages on Power Transformers: Three Phase Units .....</b>	<b>4055</b>
<i>Roberto Langella; Alfredo Testa; Alexander E. Emanuel</i>	
<b>Parameter Estimation Methods for Five-Limb Magnetic Core Model .....</b>	<b>4056</b>
<i>Bruce Mork; Dmitry Ishchenko; Francisco Gonzalez; Sung Cho</i>	

## **TRANSFORMERS II**

<b>Criteria Revision of Dissolved Gas Analysis for Oil-Filled Transformers in Korea .....</b>	<b>4057</b>
<i>Sung-Min Cho; Jae-Chul Kim</i>	
<b>Determination of the Air-Core Reactance of Transformers by Analytical Formulae for Different Topological Configurations and Its Comparison with an Electromagnetic 3D Approach .....</b>	<b>4061</b>
<i>Michel Rioual; Yves Guillot; Cyrille Crepy</i>	
<b>Comprehensive Analysis of Load Noise of Power Transformers .....</b>	<b>4069</b>
<i>Ramsis Girgis; Mats Bernesjo; Jan Anger</i>	
<b>Hydrogen Gas Generation Due to Moderately Overheated Transformer Cores .....</b>	<b>4076</b>
<i>Ramsis Girgis; Ed Tenyenhuus</i>	

## **UNIT COMMITMENT**

<b>Reliability Unit Commitment in the New ERCOT Nodal Electricity Market .....</b>	<b>4083</b>
<i>Hailong Hui; Chien-Ning Yu; Sainath Moorthy</i>	
<b>Short Term Portfolio Optimization for Discrete Power Plant Dispatching .....</b>	<b>4091</b>
<i>Steffen Rebennack; Niko A. Iliadis; Josef Kallrath; Panos M. Pardalos</i>	
<b>Feasibility and Optimality Cuts for the Multi-Stage Benders Decomposition Approach: Application to the Network Constrained Hydrothermal Scheduling .....</b>	<b>4097</b>
<i>Tiago Santo; Andre Diniz</i>	
<b>Fuzzy Mixed Integer Programming: Approach to Security-Constrained Unit Commitment .....</b>	<b>4105</b>
<i>Hossein Daneshi; Ali Naderian Jahromi; Zuyi Li; Mohammad Shahidehpour</i>	
<b>Transmission Connected Wind Curtailment with Increasing Wind Capacity Connection .....</b>	<b>4111</b>
<i>Daniel Burke; Mark O'Malley</i>	

## **USE OF SIMULATORS IN TESTING NEW ELECTRICITY MARKETS**

<b>Simulating Demand Participation in Market Operations .....</b>	<b>4116</b>
<i>David Chassin; Steve Widergren</i>	
<b>The AMES Wholesale Power Market Test Bed: A Computational Laboratory for Research, Teaching, and Training .....</b>	<b>4121</b>
<i>Hongyan Li; Leigh Tesfatsion</i>	
<b>Use of an Operator Training Simulator in Testing New Real-Time Market of California ISO .....</b>	<b>4129</b>
<i>Enamul Haq; Mark Rothleder; Basssem Moukaddem; Strajul Chowdhury; Khaled Abdul-Rahman; James G. Frame; Ashmin K. Mansingh; Tushar Teredesai; Norman Y. Wang</i>	
<b>Market Simulation for LMP Forecasting .....</b>	<b>4137</b>
<i>Roderick Frowd; Alex Papalexopoulos</i>	
<b>Preliminary Evaluation of an Energy and Reserve Co-Optimization Market Design for the ISO New England .....</b>	<b>4143</b>
<i>Robert Entriken; Mario DePillis</i>	
<b>Using Multi-Agent Simulation to Test European Electricity Markets .....</b>	<b>4151</b>
<i>Guenter Conzelmann; Audun Botterud; Prakash Thimmapuram; Jianhui Wang</i>	

## **ADVANCED DISTRIBUTION SYSTEM MODELING AND ANALYSIS TECHNIQUES**

<b>State Estimation for Real Time Monitoring of Distribution Feeders .....</b>	<b>4153</b>
<i>Mesut E. Baran; Thomas E. McDermott</i>	
<b>Techniques for Analyzing Distribution System Efficiency Alternatives .....</b>	<b>4157</b>
<i>Robert Arritt; Roger Dugan; Daniel Brooks; Tom Short; Karen Forsten</i>	
<b>Decentralized Operating Modes for Electrical Distribution Systems with Distributed Energy Resources .....</b>	<b>4161</b>
<i>Nouredine Hadjsaid; Raphael Caire; B. Raison</i>	
<b>Overcurrent Protection Issues for Radial Distribution Systems with Distributed Generators.....</b>	<b>4165</b>
<i>Karen Butler-Purry; Hamed Fummilayo</i>	
<b>Constructive Back-Feed Algorithm for Online Power Restoration in Distribution Systems .....</b>	<b>4170</b>
<i>Sarina Adhikari; Fangxing Li; Zhenyuan Wang</i>	

## **ADVANCED TOOLS FOR INTEGRATION OF RENEWABLE RESOURCES**

<b>Short Circuit Currents Evaluation in Combined Heat Cooling and Power (CHCP) Systems .....</b>	<b>4175</b>
<i>Morris Brenna; Federica Foadelli; Mariacristina Roscia; Dario Zaninelli</i>	
<b>Energization of Step-Up Transformers for Wind-Farms: Modeling and Its Validation by Tests Performed on a 10 MW Site.....</b>	<b>4180</b>
<i>Michel Rioual; Jean-Christophe Reveret</i>	
<b>Distribution System Loss Minimization Using Optimal DG Mix .....</b>	<b>4187</b>
<i>Yasser Atwa; Ehab El-Saadany; Magdy Salama; Ravi Seethapathy</i>	
<b>A Unified Power Delivery Solution for Integrating DER Into Distribution Networks Through VSC Based DC System.....</b>	<b>4193</b>
<i>Abdelrahman Abbas; Peter Lehn</i>	
<b>Impact of Distributed Generation on Distribution Protection and Power Quality .....</b>	<b>4199</b>
<i>Juan Martinez; Jacinto Martin-Arnedo</i>	
<b>Probabilistic Approach for Renewable DG Placement in Distribution Systems with Uncertain and Time Varying Loads.....</b>	<b>4205</b>
<i>Arzoo Hadian; Mahmood-Reza Haghifam; Javad Zohrevand; Elham Akhavan-Rezai</i>	
<b>Coordinated Voltage Control for Active Network Management of Distributed Generation .....</b>	<b>4213</b>
<i>Maciej Fila; David Reid; Gareth Taylor; Peter Lang; Malcolm Irving</i>	
<b>Fault Current Limiter Allocation and Sizing in Distribution System in Presence of Distributed Generation.....</b>	<b>4221</b>
<i>Sayyed Ali Akbar Shahriari; Ali Yazdian; Mahmood-Reza Haghifam</i>	

## **APPLICATION OF HEURISTIC METHODS TO POWER SYSTEM OPTIMIZATION UNDER UNCERTAINTIES**

<b>MOPSO Based Day-Ahead Optimal Self-Scheduling of Generators Under Electricity Price Forecast Uncertainty .....</b>	<b>4227</b>
<i>N. M. Pindoriya; S. N. Singh</i>	
<b>Optimizing Economic/Environmental Dispatch with Wind and Thermal Units .....</b>	<b>4235</b>
<i>Ali Al-Awami; Eric Sortomme; Mohamed El-Sharkawi</i>	
<b>Optimal Operational Planning Considering Uncertainties for Energy Plants.....</b>	<b>4241</b>
<i>Shinji Kitagawa; Tetsuro Matsui; Ken Kikuchi; Koji Matsumoto; Yoshikazu Fukuyama</i>	
<b>Optimization Techniques for Distribution Planning: A Comparative Study.....</b>	<b>4247</b>
<i>Hussein Khodr; Zita Vale; Carlos Ramos; Pedro Faria</i>	
<b>Uncertainties in Real-Time External Modeling for State Estimation: A Heuristic Practice .....</b>	<b>4255</b>
<i>Jianwei Liu; Jing Liu; Hong Chen</i>	
<b>An Efficient Multi-Objective Memetic Algorithm for Uncertainties in Distribution Network Expansion Planning .....</b>	<b>4258</b>
<i>Hiroyuki Mori; Takafumi Yoshida</i>	

## **APPLICATION OF NEW MEASUREMENTS TO POWER SYSTEMS**

<b>Merging Unit Accuracy Testing.....</b>	<b>4264</b>
<i>Marcin Gurbiel; Przemyslaw Komarnicki; Zbigniew A. Styczynski; Franz Werner Gatzel; Cezary Dzienis</i>	
<b>Dynamic Characterization of PMU Using Step Signals .....</b>	<b>4270</b>
<i>Jinfeng Ren; Mladen Kezunovic; Gerard Stenbakken</i>	
<b>Paramater Identification of Unsymmetrical Transmission Lines Using Accurately Re-Synchronized Fault Records .....</b>	<b>4276</b>
<i>Roberto Schulze; Peter Schegner; Philipp Stachel</i>	
<b>Performance of Phasor Measurement Units for Wide Area Real-Time Control .....</b>	<b>4282</b>
<i>David Laverty; David John Morrow; Robert Best; Peter A. Crossley</i>	
<b>Micromachined Electric Field Sensor to Measure AC and DC Fields in Power Systems.....</b>	<b>4287</b>
<i>Gayana Wijeweera; Behraad Bahreyni; Cyrus Shafai; Athula Rajapakse; David Swatek</i>	
<b>On the Reliability of Real Measurement Data for Assessing Power Quality Disturbances .....</b>	<b>4288</b>
<i>Alexandre Nassif; Edwin Enrique Nino; Hooman Erfanian Mazin</i>	

<b>Field-Circuit Coupled Formulation of Transient Phenomena in Current Transformers</b> .....	4296
<i>Ganesh Kumbhar; Satish Mahajan</i>	
<b>Signal Processing-Based Direction Finder for Transient Capacitor Switching Disturbances</b> .....	4301
<i>Yong-June Shin</i>	

## **COMPUTATIONAL METHODS IN POWER SYSTEM MODELING AND ANALYSIS**

<b>Determination of Power System Response During Small Load Fluctuations</b> .....	4302
<i>Wuxing Liang; Tim Littler</i>	
<b>Large-Scale Transient Stability Simulation on Graphics Processing Units</b> .....	4310
<i>Vahid Jalili-Marandi; Venkata Dinavahi</i>	
<b>Multi-In-Feed HVDC Interaction Studies Using Small Signal Stability Assessment</b> .....	4316
<i>Chandana Karawita; Udaya Annakkage</i>	
<b>Computing Large-Scale System Eigenvalues Most Sensitive to Parameter Changes, with Applications to Power System Small-Signal Stability</b> .....	4317
<i>Nelson Martins; Joost Rommes</i>	
<b>Evaluation of the Effect of Modal Interaction Higher Than 2<sup>nd</sup> Order in Small-Signal Analysis</b> .....	4318
<i>Qi Huang; Zhouqiang Wang; Changhua Zhang</i>	
<b>Model Prediction Adaptive Control of Inter-Area Oscillations in Multi-Generators Power Systems</b> .....	4323
<i>Lin Wang; Helen Cheung; Alexander Hamlyn; Richard Cheung</i>	
<b>A Novel Construction Method of Decentralized Systems and Stability Analysis for Bulk Power System</b> .....	4330
<i>Suo Lian; Shoichi Minami; Satoshi Morii; Shunji Kawamoto</i>	
<b>Development and Applications of System-Wide Automatic Voltage Control System in China</b> .....	4336
<i>Hongbin Sun; Qinglai Guo; Boming Zhang; Wenchuan Wu; Jianzhong Tong</i>	
<b>Dynamic Performance Enhancement of a DFIG System Through Converter Controls</b> .....	4341
<i>Abu Rahim; I. O. Habiballah; Ed P. Nowicki</i>	
<b>A Novel Real-Time Hybrid Simulator Base on Two Personal Computers and Analog Interfaces for Data Exchange</b> .....	4349
<i>Shuqing Zhang; Luyuan Tong; Xu Liang; Chao Hong</i>	
<b>Elimination of Numerical Oscillation of Dynamic Phasor in HVDC System Simulation</b> .....	4356
<i>Shanning Hong; C. R. Liu; ZhiQian Bo</i>	
<b>Analog Emulation of Transmission Lines with Time-Varying Phasors</b> .....	4361
<i>Aaron St. Leger; Chika Nwankpa</i>	
<b>Optimal Transmission Switching – Sensitivity Analysis and Extensions</b> .....	4368
<i>Kory Hedman; Richard O'Neill; Emily Fisher; Shmuel Oren</i>	
<b>Parameter Estimation in Delayed-Switching Hybrid Dynamical Systems</b> .....	4369
<i>Matthew Hoffman; Steve Schaffer; Kevin Wedeward</i>	
<b>Trend Analysis Techniques for Incipient Fault Prediction</b> .....	4375
<i>Rohit Moghe; Mirrasoul Mousavi</i>	
<b>A Dynamic Model and Control Strategy for the Voltage Source Converter Based HVDC Transmission System Under Fault AC Conditions</b> .....	4383
<i>Yan Wang; Shu-zhen Zhao; Cheng Huang-fu; Jiang-jun Ruan; Qing-da Meng; Jia qi Zhao</i>	
<b>A Methodology for Managing Model Extensions When Using the Common Information Model for Systems Integration</b> .....	4389
<i>Terry Nielsen; Scott Neumann; Lee King</i>	

## **CONTROL SYSTEMS**

<b>Control Architecture of Power Systems: Modeling of Purpose and Function</b> .....	4394
<i>Kai Heussen; Arshad Saleem; Morten Lind</i>	
<b>The Roles of Energy Management System in Texas Nodal Power Market</b> .....	4402
<i>Xu Luo; Diran Obadina; Murali Boddeti</i>	
<b>A Configuration Manager for a Fully Transparent Distribution Management System</b> .....	4409
<i>Monika Ruh; Göran;ersson;reas Borer</i>	
<b>Problems and Solutions for Control Rooms in Future Active Distribution Networks</b> .....	4417
<i>Stephanie Hay; Graham Ault; James R. McDonald</i>	
<b>Agent Services for Situation Aware Control of Power Systems with Distributed Generation</b> .....	4422
<i>Arshad Saleem; Kai Heussen; Morten Lind</i>	
<b>Secondary Voltage Regulation Based on Wide-Area Network</b> .....	4429
<i>Gehao Sheng; Yadong Liu; Dapeng Duan; Yi Zeng; Xiuchen Jiang</i>	
<b>“Conservation Biased” Distribution Volt / Var / (KW) Management</b> .....	4436
<i>Tom Jauch</i>	
<b>Impact of Wind Turbine Control Strategies on Voltage Performance</b> .....	4443
<i>Ek Nath Vittal; Mark O'Malley; Andrew Keane</i>	
<b>A Power System Equivalent Impedance Based Voltage Control</b> .....	4450
<i>Abdelhamid Kechroud; J. M. A. Myrzik; W. L. Kling</i>	

<b>Very Short-Term Load Forecasting: Multilevel Wavelet Neural Networks with Data Pre-Filtering</b> .....	4455
<i>Che Guan; Peter B. Luh; Matthew Coolbeth; Yige Zhao; Laurent Michel; Ying Chen; Claude Manville; Peter Friedland; Stephen Rourke</i>	
<b>An Efficient Codification to Solve Distribution Network Reconfiguration for Loss Reduction Problem</b> .....	4463
<i>Edgar Manuel Carreno Franco; Rubén Romero; Antonio Padilha Feltrin</i>	
<b>A Modified Particle Swarm Algorithm for Distribution Systems Reconfiguration</b> .....	4464
<i>A. Y. Abdelaziz; S. F. Mekhamer; Mohamed Abdel-Latif Badr; F. M. Mohamed; Ehab El-Saadany</i>	

## **DC AND FLEXIBLE AC TRANSMISSION SYSTEMS PAPER SESSION**

<b>An Average Value Model-Based Design of a Deadbeat Controller for VSC-HVDC Transmission Link</b> .....	4472
<i>Hassan Ouquelle; Louis-A Dessaint; S. Casoria</i>	
<b>PWM Based VSC-HVDC Systems- A Review</b> .....	4478
<i>Abdelrahman Abbas; Peter Lehn</i>	
<b>Optimal Placement of Unified Power Flow Controllers (UPFCs) Using Mixed-Integer Non-Linear Programming (MINLP) Method</b> .....	4487
<i>F. Aminifar; Mahmud Fotuhi-Firuzabad; Amin Khodaei; S. O. Faried</i>	
<b>Influence of the AC System Faults on HVDC System and the Recommendations for Improvement</b> .....	4494
<i>Taoxi Zhu; Chao Wang; Jing Zhang</i>	
<b>Analytical Modeling of a Square-Wave Controlled Cascaded Multilevel STATCOM</b> .....	4500
<i>Romy Sternberger; Dragan Jovcic</i>	
<b>VAR Management in Power Systems: Basic Objectives, Solutions and Multi-Level Converters for STATCOM Applications</b> .....	4501
<i>Mikhail Slepchenkov; Keyue Ma Smedley</i>	
<b>Enhancement Circuit Breaker Reliability by Using Fault Current Limiter</b> .....	4509
<i>Mahmood-Reza Haghifam; Ahmad Ghaderi; Mehdi Abapour</i>	
<b>BtB DC Link Modeling, Control, and Application in the Segmentation of AC Interconnections</b> .....	4514
<i>Xinghao Fang; Joe H. Chow</i>	
<b>An Improved Representation of FACTS Controller Semiconductor Losses in EMT-Type Programs</b> .....	4521
<i>Athula Rajapakse; Aniruddha Gole; Rohitha Jayasinghe</i>	

## **DISPATCH TOPICS**

<b>Optimal Transmission Switching</b> .....	4522
<i>Emily Fisher; Richard O'Neill; Michael Ferris</i>	
<b>Transmission Constrained Energy and Reserve Dispatch by Harmony Search Algorithm</b> .....	4523
<i>Mohammad Afkousi-Paqaleh; Seyed Hamid Hosseini</i>	
<b>Optimal Reactive Power Dispatch Using the Concept of Dynamic VAR Source Value</b> .....	4531
<i>Abbas Rabiee; Mostafa Parmiani</i>	
<b>Optimal Power Flow for Autonomous Regional Active Network Management System</b> .....	4536
<i>Ali Ahmadi; Timothy Green</i>	
<b>Multiarea Optimal Power Flow Using Multiobjective Evolutionary Algorithm</b> .....	4543
<i>Elizete Amorim; Flávio Guilherme Melo Lima; Rubén Romero; José Roberto Mantovani</i>	
<b>Secant Method with PSO for Economic Dispatch with Valve Point Loading</b> .....	4551
<i>Karri Chandram; N. Subrahmanyam; M. Sydulu</i>	
<b>Model Predictive Economic/Environmental Dispatch of Power Systems with Intermittent Resources</b> .....	4557
<i>Le Xie; Marija D. Ilic</i>	
<b>Suppression of Short Term Disturbances from Renewable Resources by Load Frequency Control Considering Different Characteristics of Power Plants</b> .....	4563
<i>Ryosuke Oba; Goro Shirai; Ryuichi Yokoyama; Tak Niimura; Goro Fujita</i>	
<b>Heuristic Solution for the Nonconvex Dispatch of Generation in Power Systems with High Wind Power Share</b> .....	4570
<i>Irina Ciornei; Elias Kyriakides</i>	
<b>Multiple-Interval Power System Dispatch Considering Probabilistic Wind Generation</b> .....	4577
<i>Xinghua Liu; Jin Zhong; Chongqing Kang</i>	
<b>Security-Based Demand Response Allocation</b> .....	4585
<i>Ebrahim Shayesteh; Mojtaba Eliasi; Nadali Mahmoudi-Kohan; Mohsen Parsa Moghaddam</i>	
<b>Model-Based Predictive Control Applied to Multi-Carrier Energy Systems</b> .....	4592
<i>Michele Arnold; Rudy R. Negenborn; Göran Ersson; Bart De Schutter</i>	

## **DISTRIBUTION SYSTEM MODELING AND ANALYSIS**

<b>Non-Linear Load Modeling - Requirements and Preparation for Measurement</b> .....	4600
<i>Krzysztof Rudion; Hui Guo; Hans Abildgaard; Zbigniew A. Styczynski</i>	
<b>A Synthesis Load Model with Distribution Network for Power System Simulation and Its Validation</b> .....	4607
<i>Tang Yong; Zhang Hong-bin; Zhang Dong-xia; Hou Jun-xian</i>	

<b>Impacts of DFIG-Based Wind Farm on Load Modeling .....</b>	<b>4614</b>
<i>He Ren-Mu; Wang Ji-Li; Ma Jin; Xu Yan-Hui; Han Dong</i>	
<b>The Temperature Sensitivity of the Residential Load and Commercial Building Load .....</b>	<b>4620</b>
<i>Ning Lu; Todd Taylor; Wei Jiang; James Correia; Lai-Yung Leung; Pak C. Wong</i>	
<b>Demand-Side Integration for Customer Choice Through Variable Service Subscription .....</b>	<b>4627</b>
<i>Angela Chuang; Clark Gellings</i>	
<b>Improving WFA K-Means Technique for Demand Response Programs Applications .....</b>	<b>4634</b>
<i>Nadali Mahmoudi-Kohan; Mohsen Parsa Moghaddam; M. K. Sheikh-El-Eslami; S. M. Bidaki</i>	
<b>Direct Load Control Considering Interrupted Energy Assessment Rate in Restructured Power Systems .....</b>	<b>4639</b>
<i>Qiuwei Wu; Peng Wang; Lalit Goel</i>	
<b>Linearized Local Voltage Stability Index Considering Induction Motor Load .....</b>	<b>4647</b>
<i>Wei Gu; Q. Wan; P.Jiang</i>	
<b>Dual Three-Winding Transformer Equivalent Circuit Matching Leakage Measurements .....</b>	<b>4652</b>
<i>Francisco De Leon; Juan Martinez</i>	
<b>Measurement Placement in Distribution System State Estimation .....</b>	<b>4653</b>
<i>Ravindra Singh; Bikash Chandra Pal; Richard Vinter</i>	
<b>Approach on Performance Evaluation and Index Selection for Electricity Distribution Utilities .....</b>	<b>4654</b>
<i>Ming Zhou; Weijun Zhai; Gengyin Li</i>	
<b>Fault Section Estimation in Automated Distribution Substations .....</b>	<b>4660</b>
<i>Fabio Leão; Rodrigo Pereira; José Roberto Mantovani</i>	
<b>Study on the Impedance-Frequency Characteristic of HVDC Converter Under Asymmetric Faults in the AC System .....</b>	<b>4668</b>
<i>Li Zhikeng; Wang Gang; Li Haijeng; Li Xiaolin; Fu Chuang</i>	
<b>Including Voltage Measurements in Branch Current State Estimation for Distribution Systems .....</b>	<b>4674</b>
<i>Mesut E. Baran; Jaesung Jung; Thomas E. McDermott</i>	
<b>Thermal-Electric Simulink Model of Diesel Electric Generators with Economic Dispatch in Remote Standalone Systems .....</b>	<b>4679</b>
<i>Richard Wies; Larre Brouhard; Ron Johnson; Chuen-Sen Lin</i>	
<b>Economic Scheduling of Distributed Generators in a Microgrid Considering Various Constraints .....</b>	<b>4689</b>
<i>Seon-Ju Ahn; Seung-Il Moon</i>	
<b>Optimal Investment of Distributed Generation in Restructured Power System .....</b>	<b>4695</b>
<i>Seyyed Mohammad Madarshahian; Saeed Afsharnia; Mohammad Sadegh Ghazizadeh</i>	
<b>Cost Allocation of DG Embedded Distribution System by Game Theoretic Models .....</b>	<b>4701</b>
<i>Rohit Bhakar; V. S. Sriram; Narayana Prasad Padhy; Hari Om Gupta</i>	
<b>Evaluation of the Impact of Distributed Generation on Power Losses by Using a Sensitivity-Based Method .....</b>	<b>4708</b>
<i>Hugo Ayres; Luiz da Silva; Waldir Freitas; Madson de Almeida; Vivaldo da Costa</i>	

**EUROPE: IMPROVING TRANSMISSION CAPACITY OF POWER SYSTEMS WITH A HIGH LEVEL OF DISTRIBUTED AND RENEWABLE GENERATION - DYNAMIC PROTECTION AND SECURITY**

<b>Dynamic Protection and Security Assessment for Highly Loaded Power Systems .....</b>	<b>4714</b>
<i>Rainer Krebs; Edwin Lerch; Olaf Ruhle</i>	
<b>Small Signal Security Quantification of Highly Loaded Power Systems .....</b>	<b>4720</b>
<i>Uros Kerin; Edwin Lerch; Grega Bizjak</i>	
<b>Voltage Stability Analysis as Part on an Online DSA System .....</b>	<b>4725</b>
<i>Chris Heyde; Zbigniew A. Styczynski</i>	
<b>Protection Coordination - An Important Task for Network Security .....</b>	<b>4731</b>
<i>Johann Jaeger; Rafal Lubiatowski; Rainer Krebs; Gerhard Ziegler</i>	
<b>Defense Plan Against Major Disturbances of the Romanian EPS .....</b>	<b>4735</b>
<i>Florin Grigore Balasiu; Felicia Mihaela Lazar; Rodica Balaurescu</i>	
<b>Selected Problems of Protective Relaying for Distribution Network with Distributed Generation .....</b>	<b>4742</b>
<i>Wilhelm Rojewski; Zbigniew A. Styczynski; Jan Izykowski</i>	
<b>Power System Survivability Increase with Intelligent Support Tools .....</b>	<b>4748</b>
<i>Hermann Dellwing; Stefan Geretshuber; Christine Schwaegerl; Olaf Seifert</i>	

**GLOBAL FINANCIAL CRISIS AND THE INTERACTION BETWEEN LONG- AND SHORT-TERM ELECTRICITY MARKETS**

<b>Short- and Long-Term Nash Equilibria in Electricity Markets .....</b>	<b>4754</b>
<i>Javier Contreras; David Pozo</i>	

## **IMPACT OF WIND GENERATION ON CONTROL CENTER OPERATIONS AND NEW TOOLS TO MITIGATE RISKS**

<b>Wind Power Interconnection and Integration Roadmap: An RTO's Perspective</b> .....	4764
<i>Jianwei Liu; David Schweizer; Kenneth Seiler</i>	
<b>Impact of Wind Generation on System Operations in the Deregulated Environment: Ercot Experience</b> .....	4765
<i>Shun-Hsien Huang; David Maggio; Kenneth McIntyre; Vijay Betanabhatla; John Dumas; John Adams</i>	
<b>Managing Wind Energy: From Interconnection Planning to Real Time Operations, an Integrated Approach to Ensure Energy and Transmission Capacity</b> .....	4773
<i>Durgesh Manjure; Michael McMullen; Dede Subakti; Diwakar Tewari</i>	
<b>Impacts of Integrating Wind Resources Into the California ISO Market Construct</b> .....	4781
<i>Clyde Loutan; Taiyou Yong; Sirajul Chowdhury; A. A. Chowdhury; Grant Rosenblum</i>	

## **INTERNATIONAL PRACTICES IN BIOMASS - THEORY, CASE STUDIES AND PLANT OVERALL PERFORMANCE**

<b>Recent Advances of Sugarcane Biomass Cogeneration in Brazil</b> .....	4788
<i>Sergio Granville; Priscila Lino; Francisco Ralston; Luiz Augusto Barroso; Mario Veiga Pereira</i>	
<b>Biomass Power as a Firm Utility Resource: Bigger Not Necessarily Better or Cheaper</b> .....	4793
<i>William Carlson</i>	
<b>Biomass Development and Potential in South East Europe</b> .....	4799
<i>Niko A. Iliadis</i>	

## **ISLANDING AND LOCAL AREA GRID SYSTEMS**

<b>Isolation of Faults in Distribution Networks with Distributed Generators</b> .....	4801
<i>Nuwan Perera; Athula Rajapakse; Todd Buchholzer</i>	
<b>A Simple Technique for Islanding Detection with Negligible Non-Detection Zone</b> .....	4802
<i>Hatem Zeineldin; Jim Kirtley</i>	
<b>Operation and Control of Single Phase Micro-Sources in a Utility Connected Grid</b> .....	4803
<i>Ritwik Majumder; Arindam Ghosh; Gerard Ledwich; Firuz Zare</i>	
<b>Angle Droop Versus Frequency Droop in a Voltage Source Converter Based Autonomous Microgrid</b> .....	4810
<i>Ritwik Majumder; Arindam Ghosh; Gerard Ledwich; Firuz Zare</i>	
<b>A Fault Location and Protection Scheme for Distribution Systems in Presence of DG Using MLP Neural Networks</b> .....	4818
<i>Seyed Ali Mohammad Javadian; Mahmood-Reza Haghifam; Nazkhanom Rezaei</i>	
<b>Micro-Grid Operation of Inverter Based Distributed Generation with Voltage and Frequency Dependent Loads</b> .....	4826
<i>Hatem Zeineldin; Jim Kirtley</i>	
<b>Investigation of a Fast Islanding Detection Methodology Using Transient Signals</b> .....	4832
<i>N. Widanagama Arachchige Lidula; Nuwan Perera; Athula Rajapakse</i>	
<b>A Control Strategy for Islanded Operation of a Distributed Resource (DR) Unit</b> .....	4838
<i>Mohammad Delghavi; Amirnaser Yazdani</i>	
<b>Radial Distribution System Characterization Based on the Probability of Wind Turbine Sustainable Islanding</b> .....	4846
<i>Walid El-Khattam</i>	
<b>Grid Interface of Photovoltaic-Micro Turbine Hybrid Based Power for Voltage Support and Control Using VSI in Rural Applications</b> .....	4853
<i>Paulson Samuel; Rajesh Gupta; Dinesh Chandra</i>	

## **OPEN SOURCE SOFTWARE FOR POWER SYSTEMS**

<b>State of the Art and Future of OSS for Power Systems</b> .....	4859
<i>Federico Milano; Luigi Vanfretti</i>	
<b>Power Education Toolbox (P.E.T): An Interactive Software Package for State Estimation</b> .....	4866
<i>Ali Abur</i>	
<b>An Example of Integrating Open Source Modeling Frameworks: The Integration of GIS in PSAT</b> .....	4870
<i>Mathias Stifter; Federico Milano</i>	
<b>MATPOWER's Extensible Optimal Power Flow Architecture</b> .....	4875
<i>Ray Zimmerman; Carlos E. Murillo-Sanchez; Robert J. Thomas</i>	
<b>Open Model for Exchanging Power System Data</b> .....	4882
<i>Federico Milano; Mike Zhou; Guanji Hou</i>	

## OPERATIONAL EXPERIENCES IN HANDLING CONTINGENCIES IN CONTROL CENTERS

<b>Practices on Post-Contingency Congestion Mitigation with Market Force</b> .....	4889
<i>Jianwei Liu; Hong Chen</i>	
<b>Managing Contingencies in Real Time Using EMS Advanced Network Applications</b> .....	4892
<i>Veera Raju Vinnakota; Ziwen Yao; Djordje Atanackovic; Asher Steed; Qing Zhu</i>	
<b>The CAISO Experience of Implementing Automated Remedial Action Schemes in Energy Management Systems</b> .....	4897
<i>Matthew Varghese; Licheng Jin; Soumen Ghosh; Gordon Lin; Bunthath Pek</i>	
<b>Real-Time Contingency Analysis Methods to Mitigate Congestion in the ERCOT Region</b> .....	4902
<i>Chad Thompson; Kenneth McIntyre; Sarma Nuthalapati; Alfredo Garcia; Elias Villanueva</i>	
<b>Operational Experiences in Managing Contingencies at Western Regional Load Dispatch Center of India</b> .....	4909
<i>M. G. Raoot; P. Pentayya; S. A. Khaparde</i>	

## POWER SYSTEM DYNAMIC PERFORMANCE PAPER FORUM

<b>Analysis of Safe Integration Criteria for Wind Power with Induction Generators Based Wind Turbines</b> .....	4916
<i>Romeu Reginato; Marcos G. Zanchettin; Marcos Tragueta</i>	
<b>COI-Based Backstepping Sliding-Mode Emergency Frequency Control for Interconnected AC/DC Power Systems</b> .....	4924
<i>Zhaobin Du; Yao Zhang; Yixin Ni; Libao Shi; Liangzhong Yao; Masoud Bazargan</i>	
<b>Improving the Transient Performance of a High Penetration of Low Voltage Connected Microgeneration</b> .....	4930
<i>Abdullah Emhemed; Ryan Tumilty; Nand Singh; Graeme Burt; Jim McDonald</i>	
<b>Research on Emergency Control Algorithm Based on Dynamic Security Region</b> .....	4936
<i>Jian Xu</i>	
<b>Delay-Dependent Stability for Load Frequency Control with Constant and Time-Varying Delays</b> .....	4942
<i>L. Jiang; W. Yao; J. Y. Wen; S. J. Cheng; Q. H. Wu</i>	
<b>Tuning Power System Stabilizers to Damp Intra-Plant Modes Using an Automatic Procedure</b> .....	4948
<i>Rodrigo A. Ramos; Marcelo Castoldi; Carolina Rodrigues; Rafael Borges; Newton Geraldo Bretas</i>	
<b>Robust Adaptive Excitation Control Based on a New Backstepping Approach</b> .....	4955
<i>Kang Wang; Huanhai Xin; Deqiang Gan</i>	
<b>Ambient Signals Based Power System Oscillation Modes Identification Considering Model Order Selection</b> .....	4960
<i>Chao Wu; Chao Lu; Tian Wang; Tongwei Yu</i>	
<b>Application Research on Auto-Disturbance Rejection Controller in Superconducting Magnetic Energy Storage</b> .....	4967
<i>Xiaotao Peng; Jun Yang; Houzhen Cui; Jinyu Wen</i>	
<b>PMU Measurements and EMS Models Based Transient Stability On-Line Forecasting</b> .....	4974
<i>Mingsong Liu; Hongbin Sun; Boming Zhang; Liangzhong Yao; Min Han; Wenchuan Wu</i>	
<b>Comparison of Different Methods for Input/Output Signal Selection for Wide Area Power System Control</b> .....	4982
<i>Abdulaziz Almutairi; Jovica Milanovic</i>	
<b>A Case Study on Challenges for Robust Wide-Area Phasor POD</b> .....	4990
<i>Nilanjan Chaudhuri; Swakshar Ray; Rajat Majumder; Balarko Chaudhuri</i>	
<b>Wave-Front Arrival Time Analysis Using Wide-Area Frequency Measurements</b> .....	4996
<i>Jing Ma; Jinlong Li; Zengping Wang; Jie Wu; Tao Xia; Lang Chen; Yilu Liu</i>	
<b>A Novel Fast Transient Stability Prediction Method Based on PMU</b> .....	5001
<i>Xindong Liu; Ying Li; Z. J. Liu; Z. G. Huang; Y. Q. Miao; Qi Jun; Q. Y. Jiang; W. H. Chen</i>	
<b>Impact of Load Behavior on Transient Stability and Power Transfer Limitations</b> .....	5006
<i>Mark Gordon</i>	
<b>An Uniform Approach for Direct Transient Stability Analysis of Electric Power Systems</b> .....	5014
<i>Luis Fernando Costa Alberto; Hsiao-Dong Chiang</i>	
<b>Power System Robust Stability Analysis Using Structured Singular Value Theory and Model Reduction Method</b> .....	5021
<i>Huy Nguyen Duc; Louis-A Dessaint; Aimé Francis Okou</i>	
<b>Island Formation in Entergy Power Grid During Hurricane Gustav</b> .....	5029
<i>Sharma Kolluri; Sujit Mandal; Floyd Galvan; Mark Thomas</i>	
<b>Review on Blackout Process in China Southern Area Main Power Grid in 2008 Snow Disaster</b> .....	5034
<i>Qingqian Chen; Xianggen Yin; Dahai You; Hui Hou; Guangyi Tong; Bo Wang; Hui Liu</i>	
<b>A New Energy Storage System Based on Flywheel</b> .....	5042
<i>Jinbo Wu; Jinyu Wen; Haishun Sun</i>	

## POWER SYSTEM PLANNING AND IMPLEMENTATION COMMITTEE - PAPER FORUM

<b>Dallas Fort Worth SVC Project: Parkdale SVC</b> .....	5048
<i>Roy Boyer; Rafic ElFakir; David Larsson; Todd Rosenberger</i>	
<b>Analysis of Vulnerabilities in China's Southern Power System Using Data from the 2008 Snow Disaster</b> .....	5056
<i>Hui Hou; Xianggen Yin; Qingqian Chen; Guangyi Tong; Dahai You; Bo Wang; Xiongkai He; Hui Liu</i>	
<b>A Dynamic-RMS Modeling Method for Distributed Generation</b> .....	5063
<i>Egon Ortjohann; Worpong Sinsukthavorn; A. Mohd; Max Lingemann; S. Jaloudi; N. Hamsic; A. Schmelter; D. Morton</i>	
<b>Long-Run Incremental Cost Pricing Considering Uncertain Future Load Growth</b> .....	5071
<i>Chenghong Gu; Furong Li</i>	

<b>GENCO's Long Term Expansion Model in a Competitive Electricity Market</b> .....	5076
<i>Daniel Hernández-Gonzalez; Guillermo Gutiérrez-Alcaraz</i>	
<b>Reliability Evaluation of Islanded Microgrids with Stochastic Distributed Generation</b> .....	5083
<i>Scott Kennedy</i>	
<b>Short Term Load Forecasting by Clustering Technique Based on Daily Average and Peak Loads</b> .....	5091
<i>Amit Jain; B. Satish</i>	
<b>Risk-Based Var Allocation Considering Both Voltage Profile and Security Margin</b> .....	5098
<i>Yuan Li; James McCalley</i>	
<b>A Method for Studying Loss of Component Scenarios in a Power System Using Stochastic Point Processes</b> .....	5104
<i>Carlos J. Zapata; Alvaro Torres; Daniel S. Kirschen; Mario A. Rios</i>	
<b>Voltage Stability Improvement by Multi-Objective Placement of SVC Using Modified Artificial Immune Network Algorithm</b> .....	5112
<i>Milad Khaleghi; Malihe M. Farsangi; Hossein Nezamabadi-pour; Kwang Y. Lee</i>	
<b>A Planning Model for Investor Firms in the Generation Sector and Financial Analysis</b> .....	5119
<i>Deepak Sharma; Kankar Bhattacharya</i>	
<b>Regional Transmission Planning for Large-Scale Wind Power</b> .....	5126
<i>Lingling Fan; Dale Osborn; Jarred Miland; Zhixin Miao</i>	

### **RELIABILITY, HARMONIC MINIMIZING AND CONTROL OF INVERTERS FOR MOTOR DRIVES**

<b>Z - Source Inverter Based Permanent Magnet Brushless DC Motor Drive</b> .....	5132
<i>Amitava Das; Ajeet Kumar Dhakar</i>	
<b>A Unity PF Rectifier-Inverter Under Unbalanced Supply</b> .....	5137
<i>Ali Maswood; Fangrui Liu</i>	
<b>Reconfigurable Active Front-End of Adjustable Speed Drives for Power Quality Improvement</b> .....	5143
<i>Siyu Leng; Il-Yop Chung; Wenxin Liu; David Cartes</i>	
<b>Elimination of Low-Order Harmonics Using a Modified SHE-PWM Technique for Medium Voltage Induction Motor Applications</b> .....	5151
<i>Hussain Bierk; Arif Al-Judi; Abu Hamed M. A. Rahim; Ed P. Nowicki</i>	
<b>Reliability Comparison of Multi-Level Inverters for Motor Drive</b> .....	5159
<i>Liang Zhou; Keyue Ma Smedley</i>	

### **RESEARCH AND EDUCATION FOR INTEGRATION OF RENEWABLE RESOURCES INTO POWER SYSTEMS**

<b>Integration of Renewable Energy in Electrical Engineering Curriculum</b> .....	5166
<i>Mohamed El-Sharkawi</i>	
<b>Renewable Energy System Research and Education at the NSF FREEDM Systems Center</b> .....	5170
<i>Alex Huang</i>	
<b>Electricity, Resources, and Building Systems Integration at the National Renewable Energy Laboratory</b> .....	5176
<i>David Mooney; Benjamin Kroposki</i>	
<b>Operation of Dispersed Synchronous Generators When Region of Distribution Network Is Islanded from Main Utility Grid</b> .....	5179
<i>Peter A. Crossley; Chui Fen Ten</i>	
<b>Large-Scale Photovoltaic Solar Power Integration in Transmission and Distribution Networks</b> .....	5181
<i>Rajiv Varma; Magdy Salama; Ravi Seethapathy; Carole Champion</i>	
<b>Future of Renewable Energy Development and Deployment</b> .....	5185
<i>Thomas Key</i>	

### **TRANSFORMERS III**

<b>Genetic Programming Feature Extraction with Bootstrap for Dissolved Gas Analysis of Power Transformers</b> .....	5186
<i>Almas Shintemirov; Wenhui Tang; Henry Wu; J. Fitch</i>	
<b>Construction of Transformer Core Model for Frequency Response Analysis with Genetic Algorithm</b> .....	5192
<i>Almas Shintemirov; Wenhui Tang; Henry Wu</i>	
<b>Thermal Modeling and Simulation of Transformers</b> .....	5197
<i>Asaad El Moudi</i>	
<b>A New Method to Identify CT Saturation Based on the Time Difference Algorithm</b> .....	5201
<i>EnShu Jin; Tao Chen; ZhiQian Bo; Andrew Klimek; Ming Fang Yang</i>	
<b>Application of a 3D Computer Simulation Tool as a Decision Making Tool for Optimizing Transformer Protection</b> .....	5205
<i>Ryan Brady; Guillaume Perigaud; Sébastien Muller; Margareta Petrovan-Boiarciuc; Ben Landis</i>	

## **WIND POWER GENERATION (II)**

<b>Active Use of DFIG Based Wind Farms for Transient Stability Improvement During Grid Disturbances</b> .....	5213
<i>Lasantha Meegahapola; Damian Flynn; Jason Kennedy; Tim Littler</i>	
<b>Variable Speed Wind Turbines Capability for Temporary Over-Production</b> .....	5221
<i>Germán Tarnowski; Philip Kjaer; Poul Soerensen; Jacob Østergaard</i>	
<b>Simulation of Faults in DFIG-Based Wind Farms</b> .....	5228
<i>Viraj Mahadanaarachchi; Rama Ramakumar</i>	
<b>Control of DFIG for Rotor Current Harmonics Elimination</b> .....	5236
<i>Lingling Fan; Rajesh Kavasseri; Haiping Yin; Chanxia Zhu; Mingqiang Hu</i>	
<b>A Series Dynamic Resistor Based Converter Protection Scheme for Doubly-Fed Induction Generator During Various Fault Conditions</b> .....	5243
<i>Jin Yang; John Fletcher; John O'Reilly</i>	
<b>Coordinated Reactive Power Control of DFIG Rotor and Grid Sides Converters</b> .....	5251
<i>Rasool Aghatehrani; Lingling Fan; Rajesh Kavasseri</i>	
<b>Variable Rotor Resistance Control of Wind Turbine Generators</b> .....	5257
<i>David J. Burnham; Surya Santoso; Eduard Muljadi</i>	

## **WORLD WIDE USAGE OF CIM STANDARD BY ELECTRIC UTILITIES**

<b>Role of Interoperability Tests in Standardizing CIM</b> .....	5263
<i>Margaret Goodrich</i>	
<b>Use of the CIM Standard for Managing Assets at the Long Island Power Authority</b> .....	5267
<i>Predrag Vujovic; Gregory Robinson</i>	
<b>European Electric Power System on the Way Towards Implementation of CIM Based Data Exchange Format</b> .....	5273
<i>Chavdar Ivanov; David Chury</i>	
<b>Applications and Extension of CIM Standard in Chinese Electrical Power Control Centers</b> .....	5278
<i>Hongbin Sun; Boming Zhang; Wenchuan Wu</i>	
<b>CIM and IEC 61850 Integration Issues: Application to Power Systems</b> .....	5282
<i>Yemula Pradeep; P. Seshuraju; S. A. Khaparde; Vinoo S. Warrior; Sushil Cherian</i>	
<b>First EMS Experience Building, Validating and Maintaining a Network Model Using CIM</b> .....	5288
<i>Enrique Margalejo; Per-Anders Lof; Xiaodong Liu; Philippe Picard</i>	
<b>CIM Extensions for ERDF Information System Projects</b> .....	5294
<i>Jérôme Fremont; Eric Lambert; Claude Bouquet; Olivier Carre; Didier Ilhat; Patrick Metayer</i>	
<b>Author Index</b>	