International Association of Science and Technology for Development

IASTED International Conference on Power, Energy, and Applications

PEA 2006

"Science and Technology for Development in the 21st Century"

September 11-13, 2006 Gaborone, Botswana

Printed from e-media with permission by:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571 www.proceedings.com

ISBN: 978-1-60560-093-2

Some format issues inherent in the e-media version may also appear in this print version.

Proceedings of the IASTED International Conference on Power, Energy, and Applications, held September 11–13, 2006, Gaborone, Botswana.

SPONSORS

The International Association of Science and Technology for Development (IASTED)

• Technical Committee on Power and Energy Systems

World Modelling and Simulation Forum (WMSF)

PLATINUM SPONSORS

Botswana Power Corporation BCL Mining Company







HOST ORGANIZATION

University of Botswana



EDITOR

G.O. Anderson - University of Botswana, Botswana

OFFICIAL OPENING

By The Honourable Pelonomi Venson-Moitoi, Minister of Communications, Science, and Technology

LOCAL ARRANGEMENTS COMMITTEE

G.O. Anderson – Head, Electrical Engineering Department, University of Botswana

A. Masizana – Department of Computer Science, University of Botswana

E. Maje – Department of Electrical Engineering, University of Botswana

C. Kiravu – Department of Electrical Engineering, University of Botswana

Secretary

P. Kenabatho – Department of Environmental Science, University of Botswana

Member

G. Lebitsa – Department of Civil Engineering, University of Botswana

Member

E. Bakaya – Department of Electrical Engineering, University of Botswana

Member

KEYNOTE SPEAKER

M. Al-Dabbagh - Hydro Tasmania Consulting, Australia

INVITED SPEAKER

L. Musaba – Director of SAPP Control Center, Zimbabwe

Member

SPECIAL SESSION ORGANIZERS

V. Snasel – VSB – Technical University of Ostrava, Czech Republic M. Bojic – University of Kragujevac, Serbia

J. Sakala - Department of Electrical Engineering, University of Botswana

TUTORIAL PRESENTER

D. Koval – University of Alberta, Canada

INFORMATION ON PUBLICATION

For each IASTED conference, the following review process is used to ensure the highest level of academic content. Each full manuscript submission is peer reviewed by a minimum of two separate reviewers on the International Program Committee/Additional Reviewers list. The review results are then compiled. If there are conflicting reviews, the paper is sent to a third reviewer.

Copyright © 2006 ACTA Press

ACTA Press P.O. Box 5124 Anaheim, CA 92814–5124 USA ACTA Press B6, Suite #101, 2509 Dieppe Ave SW Calgary, Alberta T3E 7J9 Canada ACTA Press P.O. Box 354 CH–8053 Zurich Switzerland

Publication Code: 506

International Association of Science and Technology for Development

IASTED International Conference on Power, Energy, and Applications 2006

TABLE OF CONTENTS

REGULATION MANAGEMENT AND ECONOMICS

Development of a Hierarchical Distribution System Costs Model	1
New Method AGREPREF for the Priority Location of Remote Controlled Disconnectors in the Distribution Network	7
Software Application for Analysing the Efficiency Benchmarking of the Electricity Distribution Companies	15
Study on Trade Benefits for SAPP Electricity Market and Exploitation of Available Transfer Capability of Interconnected Inter-Utility Power Systems	21
A Hybrid Intelligent Decision Support System for Spare Parts Inventory Control using Neural Network and Gene Algorithms Approach	32
Energy in Schools — An Energy Audit Case Study	37
ELECTRICAL NETWORKS WORKSHOP	
A Framework for an Analysis of Failure Data in Electrical Power Networks	45
Power Fault Data Analysis and Visualisation via SOM Neural Networks	47
Economical Aspects of Electrical Energy Supply Reliability in Industry	52
Prediction of the Electric Energy System State with the Help of Artificial Neural Networks	54
V. Galina, J. Jirí, H. Dušan, S. Václav Reliability Analysis of Electric Power Networks	59
Modelling of Economical Aspects of a Power System Failure	61

POWER SYSTEMS STABILITY AND CONTROL

A Probabilistic Model for Assessment of the Reliability Benefits from Transmission Expansion Projects	67
Function Study of Hydrogen Powered Car	73
Contribution to Problems of Emergency Feeding of Induction Motor by Injected Currents	77
A P-Q Decoupled Control Scheme using Fuzzy-Neural Controllers for the Unified Power Flow Controller	83
A New Technique for Feedback Linearisation and an Application in Power System Stabilisation	90
Application of Reliability Centered Maintenance in Electricity Distribution Company S. Rusek, R. Gono, V. Král	96
Fuzzy Compensated PI Controller Design for Load Frequency Control	102
Modeling and Steady-State Analysis of Single-Phase Unified Power Quality Controllers D. Momoh, O. Ojo	107
Controlled Power Flow Capacitive Divider for Electric Power Tapping	113
Adaptive Bilinear Control of Thyristor Controlled Series Capacitor in Power System Transient Stability	119
ALTERNATIVE ENERGY AND ENVIRONMENT	
Design of Solar-Aqua-Ammonia Absorption Refrigeration for Rural Areas of Botswana	123
A Horizontal-Axis Wind Turbine Design Basis with Inspiration from Axial Gas Turbine Theory	128
Fuel Cells Laboratory of VŠB-TU Ostrava	132
Sustainable House for Botswana	138

Speed Variable Operation of a High-Speed Steam Turbine PM Synchronous Generator Set	143
Performance Evaluation of Commercial Solar Cookers under Equal Loading Conditions R. Gayapershad, S.T. Dladla, M.J. Brooks	149
A Maximum Power Point Tracking for PV Cells	154
Power Cable Thermal Field Sensitivities using Finite-Elements	159
POWER TRANSMISSION AND GENERATION	
Design and Performance of ZCS-ZVS Combined Snubber Network in a DC-DC Application	164
Filters for Three Phase Unbalanced Voltage Systems	170
The Study of Voltage Stability of 13-bus Power Grid Network with Power World Software G.O. Anderson, C. Kiravu, H. Kierstead	175
The Challenges of the Network Operation in the Nordic Electricity Distribution Business Heading for Year 2030	182
Flux Analysis of Three-Phase Transformer for Inrush Current under Current Non-Sinusoidal Excitation	190
Two Bus Bar Power System Shunt Compensation	196
Energy Saving Compiler Framework on Embedded Systems	203
A Study of the Impact of Broken Neutral in a Distribution System	209
LOW ENERGY BUILDINGS	
Lower Energy Consumption of a Building due to Later Start of Thermal Comfort Support	214
Passive Architecture as "Green Design" Strategy, at Botec Building, Gaborone	220
Interzone Short Wave Radiative Couplings Through Windows and Large Openings: Proposal of a Simplified Model	226

ADDITIONAL PAPER

Control and Modelling of a New Space-Vector PWM Strategy for Improved	
Induction Motor Drive Reliability	232
J. Kliíma, L. Schreier	
Author Index	