

Welcome Message

Welcome to all the participants in the second IEEE Electric Ship Technologies Symposium, ESTS 2007. ESTS 2007 continues the focus set by the first conference in 2005 of bringing together the Navy, industry, and university researchers to discuss technical to make future electric ships more capable and less costly. The range of technology options is impressive ranging from propulsion hardware to controls software with much in between. With the needs for increasing capability and fuel economy, this is an exciting time to be developing electric ship technology.

ESTS 2007 is co-sponsored by six IEEE societies (Power Engineering, Power Electronics, Industry Applications, Ocean Engineering, Dielectrics and Electrical Insulation, and Vehicular Technology) and 2 IEEE inter-societies councils (Systems & Sensors) with participation from ASNE (American Association of Naval Engineers) and IMarEST (Institute of Marine Engineering, Science and Technology). At the time of this letter, sponsorship from the Office of Naval Research and industrial companies are pending.

The symposium is focusing on the progress and future of electric ship technologies. By mixing oral paper presentations with invited special and panel discussions and standards working group activities we have worked to establish a forum for the exchange of a broad spectrum of view points (end users, designers, manufacturers, researchers, etc.) by bringing together the knowledge of the entire scientific and technical community working in the field.

The organizers have tried to structure this meeting so it can be valuable to the participants. We encourage your participation to help make this a seminal event in the development of electric ships.

Dr. Robert Hebner
ESTS Chair, 2007
Director, Center for Electromechanics
University of Texas at Austin

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Robert Dent IEEE Power Engineering Society

Bichlien Hoang IEEE Technical Activities

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Dr. Yuri Khersonsky IEEE IAS Industrial Power Converters Committee

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James Irvine Strathclyde University

Moni Islam Northrop Grumman

Tim McCoy US Navy (ret)

Antonello Monti University of South Carolina

Paul Norton MOD

Lynn Peterson Office of Naval Research

Paulo Ribeiro Calcin College

George Robinson L-3 Power Paragon

John Schwarzenberg L-3 SPD Electrical Systems

Sid Suryanarayanan FSU Center for Advanced Power Systems

Zareh Soghomonian General Atomics

Scott Sudhoff Purdue University

Fred Wang Virginia Tech

May 21, 2007

7:00 PM Welcome Reception

May 22, 2007

7:00 AM Breakfast

8:00 AM Opening Remarks and Keynote Address

8:40 AM Plenary Session 1

Plenary 1 “Electric Ship Total System Engineering”

Moderator: C. Hodge, BMT Defence Services, UK/US

Sizing Power Generation and Fuel capacity of the All-Electric Warship

Norbert H. Doerry

Integrated Electric Power and Propulsion System on Land – An Overview

M. Benatmane and Ralph Maltby

Impact of Marine Power System Architectures on IFEP Vessel Availability and Survivability

J.D. Schudderbeurs, C.D. Booth, G.M. Burt and J.R. McDonald

Model as the Specification for Total Ship Engineering*

Terry Ericson

10:40 AM Coffee Break

11:00 AM Parallel Sessions P1, T1, and T2

P1 “Ship Integration”

Chair: D. Clayton, NavSea 05

Performance Metrics for Electric Warship Integrated Engineering Plant Battle Damage Response

Aaron M. Cramer, Scott D. Sudhoff and Edwin L. Zivi

U.S.S. Makin Island: Simulation-Based Analysis and its role in Electric-Plant Control System Design

J. Turso, W. Ainsworth, L. Dusang, D. Miller and L. Smith

Large-Signal Stability Analysis in Power Systems with a Synchronous Generator Connected to a Large Motor Drive

Sebastian Rosado, Rolando Burgos, Fred Wang and Dushan Boroyevich

System-Level Thermal Management for All-Electric Ships*

T. Kiehne, S. Haag, T. Webb, C. Holsonback, and P. Paullus

Impedance Identification of Integrated Power System Components using Recurrent Neural Networks

Peng Xiao, Ganesh K. Venayagamoorthy and Keith A. Corzine

T1 “Propulsion”

Chair: *Capt. N. Doerry, USN*

The Reduction of Simulation Software Execution Time for Models of Integrated Electric Propulsion Systems through Partitioning and Distribution

Paul T. Norton, Peter Deverill, Paul Casson, Malcolm Wood, Graham Dudgeon and Andrew Bennett

Modeling and Simulation of Electric Propulsion Systems for All-Electric Cruise Liners

S. Castellan, R. Menis, M. Pigani, G. Sulligoi and A. Tessarolo

Multi-Objective Design Optimisation of Submarine Electric Drive Systems

Benjamin A. Skinner, Patrick R. Palmer and Geoffrey T. Parks

Suppression of the Thrust Loss for the Maximum Thrust Operation in the Electric Propulsion Ship

So-Yeon Kim, Young-Doo Yoon and Seung-Ki Sul

Modelling and Analysis of Electro-Mechanical Interactions between Prime-Mover and Load in a Marine IFEP System

I.M. Elders, P.J. Norman, J.D. Schuddebeurs, C.D. Booth, G.M. Burt, J.R. McDonald, J. Apsley, M. Barnes, A. Smith, S. Williamson, S. Loddick and I. Myers

T2 “Design Tools”

Chair: *P. Chapman, University of Illinois*

Software in Maritime: Cost efficient Quality Management and Control

Torbjørn Skramstad, Lars Bratthall, Egil Johansen and Asgeir Torstensen

Improved System Operational Availability (Ao) through Autonomous Data Transfer Analysis

Dong Shao, David VanBuskirk, Roger Rosenberger and Paul Kessel

Dynamic Simulation based Analysis of a New Load Shedding Scheme for a Notional Destroyer Class Shipboard Power System

Z. Ding, S.K. Srivastava, D.A. Cartes and S. Suryanarayanan

Modeling and Testing of Protection Devices for SPS using MATLAB/Simulink and VTB

Yujie Zhang, Jimena L. Bastos, Noel N. Schulz and Daxa Patel

Graph Trace Analysis based Shipboard HM&E System Priority Management and Recovery Analysis

D.L. Kleppinger, K.J. Russell and R.P. Broadwater

1:00 PM Lunch

2:00 PM Parallel Sessions P2, T3, and T4

P2 “Standards”

Chair: *M. Islam, Northrop Grumman Ship*

Meeting Harmonic Limits on Marine Vessels

I.C. Evans, A.H. Hoevenaars and P. Eng

Insulated Bus Pipe (IBP) for Shipboard Applications

Richard Worth, Ruth H. Pater, Moni Islam and Charles Smith

Standard Tools for Hardware-in-the-Loop (HIL) Modeling and Simulation

R. McNeal and M. Belkhat

* Presentation only ** Panelist only – Presentation in another session

ABS Naval Vessel Rules (NVR) for Mission Critical Networks, Software Development, and Safety Critical Control Systems

Mike Roa

T3 “Materials and Components”

Chair: *S. Beermann-Curtin, DARPA*

270 kVA Solid State Transformer based on 10 kV SiC Power Devices

Tiefu Zhao, Liyu Yang, Jun Wang and Alex Q. Huang

Fatigue of High Temperature Superconductors for Naval Applications*

R. Holtz

Evolutionary Design of Electromagnetic and Electromechanical Devices

B.N. Cassimere, R.R. Chan, J. Cale, A.M. Cramer and S.D. Sudhoff

A Diode Rectifier with a Special Coupled Reactor and Additional Active Power Filter in the Marine Local Power Network Supply Conditions

Piotr Mysiak, Ryszard Strzelecki and Daniel Wojciechowski

Aging of High Voltage Cables by Switching Impulse

S. Grzybowski, P. Trnka and J.C. Fulper

T4 “Power Systems Reconfiguration”

Chair: *S. Suryanarayanan, Florida State*

Distributed Approaches for Determination of Reconfiguration Algorithm Termination

Pinak Tulpule, Karl Schoder, Ali Feliachi and Hong-Jian Lai

Models for Optimal Dynamic Reconfiguration and Simulation of Ship Power Systems in SIMULINK with Stateflow

Edoe Mensah, Harry Kwatny, Dagmar Niebur, Jean-Etienne Dongmo, Gaurav Bajpai and Carole Teolis

Self-Reconfigurable Electric Power Distribution System using Multi-Agent Systems

Janeth G. Gomez-Gualdrón, Miguel Vélez-Reyes and Luis J. Collazo

Perspectives on Power System Reconfiguration for Shipboard Applications

Keerthi C. Nagaraj, Johnson Carroll, Thomas Rosenwinkel, Ari Arapostathis, Mack Grady and Edward J. Powers

Practical Considerations in Implementing Shipboard Power System Reconfiguration Control Schemes

Michael Shasteen, Kent Davey, Raul Longoria and William Shutt

4:00 PM Coffee Break

4:15 PM Parallel Sessions P3, T5, and T6

P3 “Protection”

Chair: *P. Norton, MOD UK*

Circuit Breaker Technologies for Advanced Ship Power Systems

Slobodan Krstic, Edward L. Wellner, Ashish R. Bendre and Boris Semenov

State Estimation and Fast Fault Detection for Ship Electrical Systems

George L. Kusic

* Presentation only ** Panelist only – Presentation in another session

Experimental Evaluation of Lightning Protection Zone Used on Ship

S. Grzybowski

Overcurrent Protection in DC Zonal Shipboard Power Systems using Solid State Protection Devices

Mesut E. Baran, Sercan Teleke and Subhasish Bhattacharya

An Adaptive Protection Scheme for Shipboard Power System

Oluwaseun A. Amoda and Noel N. Schulz

T5 “Motors”

Chair: *S. Sudhoff, Purdue University*

Coupled Field Analysis Needs in the Design of Submersible Electric Motors

Shehab Ahmed and Hamid A. Toliyat

Application of a Time-Frequency Algorithm for Adaptive Estimation of Transfer Function of a Notional High-Temperature Superconducting Motor

N. Senroy, S. Suryanarayanan, M. Steurer and S.L. Woodruff

High Frequency Modeling of PM Synchronous Machine for use in Integrated Motor Drive

O.A. Mohammed, S. Ganu, N. Abed, Z. Liu and S. Liu

Modeling and Characterization of Induction Motor Internal Faults using Finite Element and Discrete Wavelet Transform

O.A. Mohammed, N.Y. Abed and S.Ganu

Utilizing Vibration to Determine the Rotor Speed/Position of a High Performance Induction Drive*

S. Pekarek

T6 “Analytical Tools”

Chair: *A. Monti, University of South Carolina*

Magnetic Equivalent Circuit Simulations of Electrical Machines for Design Purposes

Marco Amrhein and Philip T. Krein

Accelerated Steady-State Analysis for Switch-Mode Power Converters*

W. Keng

Sequential Experimental Design based Modeling of a Notional All-Electric Ship AC/DC Conversion System for Sensitivity and Uncertainty Analysis

J. Langston, A. Martin, J. Simpson, M. Steurer, N. Senroy, S. Suryanarayanan and S.L. Woodruff

Methods of Optimal Lyapunov Function Generation with Application to Power Electronic Converters and Systems

Charles J. Sullivan, Scott D. Sudhoff, Edwin L. Zivi and Stanislaw H. Zak

Out-of-Core LU Decomposition on a Multiple-DSP Platform

Guanglei Wang, Antonello Monti and Gang Quan

6:00 PM Break

7:30 PM Dinner

May 23, 2007

7:00 AM Breakfast

8:00 AM Plenary Session 2

Plenary 2 “DC Power Systems”

Chair: T. Ericson, ONR

Presentation to be Determined*

J. Amy

Presentation to be Determined*

J. Zgliczynski

Robert S. Balog and Philip T. Krein Bus Selection in Multibus DC Power Systems

Robert S. Balog and Philip T. Krein

DC Link Stability Design Tool

R. McNeal and M. Belkhaty

DC Protection on the Electric Ship

Hymiar Hamilton and Noel N. Schulz

10:00 AM Coffee Break

10:15 AM Parallel Sessions P4, T7, and T8

P4 “Power Quality”

Chair: P. Cho, ONR Asia Systems

Electric Ship Surge Environment

Ronald W. Hotchkiss and Andrea T. Haa

Voltage Dips in Ship Systems

J. Prousalidis, E. Styvaktakis, E. Sofras, I.K. Hatzilau and D. Muthumuni

Investigating the Impact of Pulsed Power Charging Demands on Shipboard Power Quality

M. Steurer, M. Andrus, J. Langston, L. Qi, S. Suryanarayanan, S. Woodruff and P. Ribeiro

Improving Power Quality in All Electric Ships using a Voltage and VAR Integrated Regulator

Vittorio Arcidiacono, Roberto Menis and Giorgio Sulligoi

Power Quality Assessment and Management in an Electric Ship Power System

Philip Crapse, Jingjiang Wang, John Abrams, Yong-June Shin and Roger Dougal

* Presentation only ** Panelist only – Presentation in another session

T7 “Generators”

Chair: *J. Schwartzberg, L-3 SPD Electrical Systems*

Load Following Ability of a Ship Generating Plant Comprising a Mixed Set of High-Speed and Synchronous Turbo-Generators

Zimin W. Vilar and Roger A. Dougal

Directly-Coupled Gas Turbine Permanent Magnet Generator Sets for Prime Power Generation On Board Electric Ships

S.Z. Vijlee, A. Ouroua, L.N. Domaschk and J.H. Beno

Simulations of Islanded Generators Synchronization in a Notional Integrated Power System*

M. Andrus, S. Woodruff, and S. Suryanarayanan

A Generic Digital Model of Multiphase Synchronous Generator for Shipboard Power System

Minglan Lin, Anurag K. Srivastava and Noel N. Schulz

On-Board Electrical Network Topology using High Speed Permanent Magnet Generators

Raed A. Ahmad, Zhiguo Pan and Dan M. Saban

T8 “Modeling and Simulation”

Chair: *N. Schulz, Mississippi State*

Summary of Recent Work on Reduction Techniques Applied to Electromechanical Modeling

A. Davoudi, L. Qu and P.L. Chapman

Thermal-Electrical Coupled Transient Simulations for Future All Electric Ships*

T.Chiochhio, J.Kahn, A.Monti, J.Ordonez, M.Sloderbeck, and S.Woodruff

Graph Trace Analysis Approach to Optimizing Power and Heat Flow for Clustered Computing

John W. Rapp, Robert Broadwater

ASD System Condition Monitoring using Cross Bicoherence

Taekhyun Kim, Wonjin Cho, Edward J. Powers, W. Mack Grady and Ari Arapostathis

12:00 PM Lunch

1:00 PM Parallel Sessions P5, T9, and T10

P5 “University R&D”

Chair: *N. Hingorani, Consultant*

Multi-Rate Simulation Techniques for Electric Ship Design

Roy E. Crosbie, John J. Zenor, Richard Bednar, Dale Word, Narain G. Hingorami

Shipboard Power Systems Research Activities at Mississippi State University

Quili Yu, Sarika Khushalani, Jignesh Solanki, Noel N. Schulz, Herbert L. Ginn III, Stanislaw Grzybowski, Anurag Srivastava and Jimena Bastos

A PC-Cluster based Real-Time Simulator for All-Electric Ship Integrated Power Systems Analysis and Optimization

Yanhui Xie, Gayathri Seenamuni, Jing Sun, Yifei Liu and Zhen Li

High Dimensional Stochastic Simulation and Electric Ship Models

Josh Taylor and Franz Hover

* Presentation only ** Panelist only – Presentation in another session

Controlled Series Compensation of High Speed Brushless Flux Switching Generators for Direct Drive Variable Speed Application

K.N. Ochije and C. Pollock

T9 “Testing”

Chair: *Z. Soghomonian, General Atomics*

T-AKE Lewis and Clark Class Auxiliary Dry Cargo/Ammunitions Ship Sea Trials

Xavier Goy and Robert Clarence

Simulink Model of the Hybrid Power System Test-Bed

M.C. Knauff, C.J. Dafis, D. Niebur, H.G. Kwatny, C.O. Nwankpa and J. Metzger

Enhancement and Application of a Voltage Sag Station to Test Transient Load Response

Matthew Rylander, W. Mack Grady, Ari Arapostathis, Edward Powers

Test Bed for Studying Real-Time Simulation and Control for Shipboard Power Systems

Karen L. Butler-Purry, Gayatri R. Damle, N.D.R. Sarma, Fabian Uriarte and Derek Grant

An Integrated Electric Shipboard Power System Testbed

Pradeep Pant, Karl Schoder and Ali Feliachi

T10 “Hardware-in-Loop and VTB”

Chair: *F. Wang, Virginia Tech University*

Applying Controller and Power Hardware-in-the-Loop Simulation in Designing and Prototyping Apparatuses for Future All Electric Ship

W. Ren, M. Steurer and S. Woodruff

Hardware in the Loop Test for Relay Model Validation

Sunil Palla, Anurag K. Srivastava and Noel N. Schulz

Hardware-in-the-Loop Experiments on the use of Propulsion Motors to Reduce Pulse-Load System Disturbances

Stephen L. Woodruff, Li Qi and Michael J. Sloderbeck

System-Level Dynamic Thermal Modeling and Simulation for an All-Electric Ship Cooling System in VTB

Ruixian Fang, Wei Jiang, A. Monti, M. Zerby, G. Anderson, P. Bernotas and J. Khan

Modeling of Multifunctional Voltage Source Converters for Shipboard Power Systems in the Virtual Test Bed

Konstantin Borisov and Herbert Ginn

2:45 PM Parallel Sessions P6, T11, and T12

P6 “Industrial R&D”

Chair: *R. Hepburn, SAIC*

The Moog Naval Motor Controller*

S. Smith and R. Gunderson

Development of a Low-EMI Advanced Variable Speed Drive for Shipboard Applications

Erik R. Limpaecher, Mark P. Holveck and B.J. Ryder

Circuit Breaker Technologies for Advanced Ship Power Systems**

S. Kristic, E. Wellner, A. Bendre, and B. Semenow

* Presentation only ** Panelist only – Presentation in another session

Shipboard Application of Power Node Control Center*

J. Schwartzberg, M. Furyk, J. Ykema, and J. Roberts, Al Michaud

T11 “Power Systems”

Chair: *L. Petersen, ONR*

Single-Phase Ac Impedance Modeling for Stability of Integrated Power Systems

Jing Huang, Keith Corzine and Mohamed Belkhat

Performance Prediction and Dynamic Simulation of Electric Ship Hybrid Power System

Wei Jiang, Ruixian Fang, Jamil Khan and Roger Dougal

Distributed Simulation Applied to Shipboard Power Systems

Qinghua Huang, Jian Wu, Jimena L. Bastos and Noel N. Schulz

Intelligent Placement of Meters/Sensors for Shipboard Power System Analysis

Sandhya Sankar and Noel N. Schulz

T12 “Controls”

Chair: *R. Ashton, Naval Postgraduate School*

Networked Intelligent Instrumentation and Control for Switchboards

Chris Gartner, David Johnson and Joan Provine

Optimal Power Generation Scheduling of a Shipboard Power System

Wei Wu, Daifeng Wang, Ari Arapostathis and Kent Davey

Using the Non-Intrusive Load Monitor for Shipboard Supervisory Control

Robert W. Cox, Patrick L. Bennett, T. Duncan McKay, James Paris and Steven B. Leeb

Variable Structure Design of a Fault Tolerant Control System for Induction Motors

Jean-Etienne Dogmo, Harry G. Kwatny, Chica Nwankpa, Gaurav Bajpai and Carole Teolis

4:30 PM Closing