

Dr. ALEX PAPALEXOPOULOS

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EDUCATIONAL HISTORY

- M.E. and E.E. Diploma, National University of Athens, Greece, June 1980
- M.S., E.E., Georgia Institute of Technology, September 1982
- Ph.D., E.E., Georgia Institute of Technology, September 1985

AWARDS AND HONORS

- Fellow of IEEE, 2000
- Recipient of the 1996 IEEE First Price Paper Award for the paper entitled “An Implementation of a Neural Network Based Load Forecasting Model for the EMS”, 1996
- Honorary member of the first class to be inducted into Georgia Institute of Technology’s Council of Outstanding Young Engineering Alumni, 1995
- PG&E’s Wall of Fame Award, 1992
- Certified As An In-Company Diversity Awareness Trainer, 1992
- PG&E’s Research and Development Department’s Pathfinder Award, 1991
- Member of Sigma Xi
- Protective Relaying Conference Certificate of Appreciation, 1982
- National Fellowship Foundation Award for Best Academic Achievement at the National Technical University of Athens, Greece, 1980

EMPLOYMENT HISTORY

- ECCO International, Inc., President and Founder, June 1998-present
- PG&E, Director, Electric Industry Restructuring Group, 1997-June 1998
- PG&E, Project manager, Western Power Exchange (WEPEX), 1995-1997
- PG&E, Team Leader, Systems Engineering/Operations Research, 1993–1995
- PG&E, Supervisor, Systems Engineering/Operations Research, 1992–1993
- PG&E, Senior Systems Engineer, 1991–1992
- PG&E, Systems Engineer, 1989–1991
- PG&E, Energy Control Center rotational assignment, 1988–1988
- PG&E, Systems Engineer, Energy Management System (EMS) development, 1985–1988
- Georgia Institute of Technology, Research and Teaching Graduate Student, 1980–1985
- Public Corporation of Electricity, Athens, Greece (while a student), 1979–1980

QUALIFICATIONS SUMMARY

Dr. Papalexopoulos has an extensive background in power systems design, simulation, analysis and computational techniques with specialization in grid and merchant functions, pricing, power systems operations, power generation, transmission planning, transmission and power contracts, system dynamics and real time control. He has made substantial contributions in the field of power engineering and is an authority in the areas of network grid optimization and pricing, ancillary services, congestion management, competitive bidding, and implementation of EMS advanced applications and real time control functions and forecasting in a utility environment. He has extensive experience in project management, planning, preparation of capital and expense budgets, and system integration of large scale software projects and large scale R&D projects for solving complex power system grid, merchant and operational problems, large engineering and planning relational databases and information systems. These systems are currently used at PG&E to improve access to data and support the PG&E's regulatory filings and advocate its computer-modeling and data-access interests before regulators.

He is currently involved in the restructuring of several electricity markets in North America, Europe, Asia and around the world. He has been involved in the development of the software systems to support the electricity market at the IMO in Toronto, Canada. He was also heavily involved in the California industry restructuring efforts. As a director of the Electric Industry Restructuring Group at PG&E, he was one of the key market designers of the California Power Exchange (PX) and the Independent System Operator (ISO). Specifically, Alex was a major player in developing the rules and protocols for the energy auction and bidding, trading and business systems, ISO ancillary services auction, ISO transmission pricing and ISO operations and implementing policies to facilitate PG&E's Direct Access program. In 1995 he led PG&E's Business Team during the Phase I filing with the FERC for the formation of the ISO and the PX. In 1996 he led PG&E's ISO Business Rules and Protocols Team and worked with the other California IOUs, Munis, regulators, major customers and other stakeholders, for developing the ISO's policies and business functions. In 1997 he led the development and implementation of the ISO Business Systems. In the first part of 1998 he was responsible for coordinating the implementation and testing of all PG&E systems that interface with the California PX and the ISO. He was also heavily involved in developing policies to advance PG&E's business interests in the new competitive environment.

Since June of 1998 Alex is president and founder of ECCO International, Inc., an Energy Consulting Company, that provides consulting services within and outside the U.S. to a wide range of clients such as Regulators, Governments, Utilities, Independent System Operators, Power Exchanges, Marketers, Brokers and Software vendors. These services range from strategic planning, particularly industry restructuring and the introduction of competition into traditional utility markets, competitive bidding, market trading, direct access planning, public policy analysis, auditing utility practices, simulation and optimization, market design, pricing negotiation and strategy, and related topics concerning industrial organization and information economics.

PROFESSIONAL EXPERIENCE

ECCO International, Inc., President and Founder, June 1998 – Present

ECCO International, Inc., and its associates, provides consulting services on energy issues to:

- 1.) **California Independent System Operator (CAL ISO);** Provides expert advice on the design and software development of various market operations functions to improve the California electricity market. This includes the redesign of the Ancillary Services markets, the congestion management market, Reliability Must Run (RMR) scheduling, the real time and forward markets, RTO design, and various settlements and billing functions. It also includes various activities at the CAL ISO to ensure FERC compliance. He is currently heavily involved in the redesign of the CAL ISO markets, consistent with FERC's SMD, including forward and real time markets, scheduling, settlements, CRR market, LMP transmission pricing, and network modeling, and the development and implementation of the software systems to support the new CAL ISO markets.
- 2.) **Cap Gemini Ernst & Young LLC;** Dr. Alex Papalexopoulos is a special consultant to the ISO Solutions Group in the Cap Gemini Ernst & Young's Energy and Utilities Consulting Practice. He provides expert advice to CGE&Y clients around the world on electric industry restructuring, market design and software systems issues for developing Independent System Operators and Power Exchanges. He assists CGE&Y in their bid efforts for developing software systems for the electricity markets for various clients in North America and Europe. These clients include CAL ISO, IMO Canada, ISO New England, RTO Alliance, Grid America, Portland General Electric, Pacific Corp., and Entergy. He assists CGE&Y in developing strategy and products to serve various market participants that participate in the ISO and PX markets.
- 3.) **Electric Power Research Institute (EPRI);** Provides expert advice on electric industry restructuring and market design issues to utility EPRI members around the world.
- 4.) **Poland, PSE;** Provides consulting services in developing and implementing various elements of the wholesale energy markets in Poland, including scheduling, RMR scheduling, and real-time markets.
- 5.) **Japan, Kyushu;** Provides expert advice on the various aspects of unbundling utility functions and on the market design and transmission operations of various ISOs in the US and Europe.
- 6.) **Greece, Regulatory Authority of Energy (RAE);** Provides expert advice on the development and implementation of various markets in the Greek energy sector, including, scheduling, day-ahead and real-time markets, and a capacity market to ensure generation adequacy and sufficient reserve margins.
- 7.) **A Municipal Utility;** Provides consulting and software development services on settlements and billing functions and expert advice on market design issues.
- 8.) **A Generator;** Provides consulting services on market development and design issues in the Mid West and Eastern United States.
- 9.) **A Software Developer;** Provides expert advice on market design issues, including scheduling, forward energy market, capacity markets and CRR markets.
- 10.) **A Software Developer;** Provides consulting services on scheduling and Unit Commitment functions, electric industry restructuring, market design and software subjects.
- 11.) **Bonneville Power Administration;** Provided expert advice on electric industry restructuring matters.
- 12.) **World Bank;** Provided expert advice on electric industry restructuring and the ancillary services markets.

- 13.) **Government of Argentina;** Provided expert advice to the Ministry of Energy and Economy on various matters concerning the electricity market in Argentina, including generation bidding, transmission, auction of Firm Tradable Rights, generation capacity auctions, etc.
- 14.) **Pacific Gas and Electric Company;** Provides consulting services and power system analysis expertise on various planning, operational and settlement functions. It performs various interconnection studies for new generation capacity in California.
- 15.) **Spain, Regulators;** Provided expert advice on electric industry restructuring and market design issues related to physical bilateral contracts.
- 16.) **Baltic States, Utilities;** Provided consulting services on electric industry restructuring and market design issues related to pooling arrangements.

Major Accomplishments at ECCO International, Inc., include:

- Played a key role in every redesign effort in the CAL ISO markets.
- Participated in the design of the CAL ISO FTR market.
- Played a key role in the CAL ISO's Congestion Management Reform (CMR) effort including the development of congestion management, real-time dispatch, the development of the Commercial Model.
- Led a CAL ISO study for conducting an analysis of the locational nodal price dispersion within the ISO Controlled Grid.
- Led a CAL ISO study for analyzing the benefits and potential problems of the Market Separation principle in the CAL ISO's congestion management.
- Led a CAL ISO study for analyzing the benefits and problems of the Zonal and Nodal based congestion management methodologies.
- Led a CAL ISO study with the Los Alamos National Lab for evaluating the feasibility of producing locational marginal prices for the entire Western Transmission Grid.
- Participated in the CAL ISO's Market Stabilization Core Team to design a Unit Commitment based Forward Energy Market.
- Heavily involved in the redesign of the CAL ISO markets under the MD02 Initiative and consistent with FERC's SMD, including, LMP transmission pricing, Full Network Model development, CRR market design, development, RFP development and vendor selection, and system implementation, Forward Market design, development, RFP development and vendor selection, and system implementation.
- Involved in drafting and commenting on various CAL ISO positions in response to FERC Rulings.
- Drafted a major recommendation for Detroit Edison for Resolving the Loop-Flow Problem between Detroit Edison and the IMO, in Toronto, Canada. The Analysis and results were presented to the Minister of Energy, Science and Technology, Ontario, Canada.
- Assisted CGE&Y in the implementation of business software systems to support the wholesale energy market at the IMO, Toronto, Canada.
- Assisted CGE&Y in the implementation of the software systems to support the wholesale energy market at the RTO Alliance.
- Assisted Siemens in the design of the real-time markets and the implementation of the software for real-time markets at the RTO Alliance.
- Provided major revisions to PSE in Poland for improving the real-time market.
- Developed an integrated analytical approach for identifying and resolving gaming opportunities in the Polish wholesale energy market.

- Developed an integrated analytical approach for incorporating the RMR units in the day-ahead market scheduling in the Polish wholesale energy market.
- Developed key design rules for the capacity market in the Greek energy sector to ensure generation supply adequacy and reserve margins.
- Proposed activity rules in the market design for eliminating gaming in the real-time market of the Greek energy sector.
- Proposed an overall framework for developing a real time market in Kyushu, Japan, with the focus on the benefits and problems of uniform price auctions vs. pay-as-bid energy auctions.

Pacific Gas and Electric Company, 1985 – June 1998

Dr. Papalexopoulos joined PG&E at the end of 1985 and got heavily involved in developing advanced applications for PG&E's Energy Management System (EMS). This included the definition of PG&E's needs and functional and design specifications, development, implementation, factory acceptance testing, field testing, installation, training, customization, maintenance, migration strategies, support and consulting for power, network, forecasting, scheduling and training EMS applications. He also worked on the development of power system analytical methods and software in a number of other areas, including optimization, grid modeling, dynamic and voltage stability, internet/intranet applications for the QFs, bidding systems for resource acquisitions, and costing methodologies for transmission services. He was also heavily involved in developing models and software to support the PG&E's policies in various California Public Utilities Commission (CPUC) and Federal Energy Regulatory Commission (FERC) electric industry restructuring proceedings.

Dr. Papalexopoulos was responsible over the past several years for the development and implementation of advanced methodologies and models, software and systems to support the new market structures in the emerging energy marketplace in California. Prior to his restructuring experience he was responsible for the development of methodologies, advanced models, software, large databases and information systems to support PG&E's Energy Management System, system operations, grid and merchant operations, transmission planning, transmission and power contracts and power generation. He was also involved in providing consulting services to internal PG&E clients on integrating computer systems, such as the Energy Management System with Unix workstations and PG&E LAN/WAN systems.

Major accomplishments while at PG&E include:

- Led PG&E's Business Team for developing the Phase I filing with the Federal Energy Regulatory Commission (FERC) for the formation of the California ISO and the PX.
- Led PG&E's Business Team for developing the Phase II filing with the FERC for the formation of the California ISO and the PX.
- Heavily worked in the process of obtaining regulatory approval for the formation of the ISO and the PX from the FERC. Heavily involved in advising Cameron McKenna LLP, the law firm in charge of the FERC filings, on policy and technical matters related to the ISO and PX filings.
- Played the role of the key interface of technical and business issues between the ISO and the California market participants, the Scheduling Coordinator User Group, during the development phase of the ISO as directed by the ISO/PX Restructuring Trust.
- Led PG&E's definition team for developing the rules and protocols for the ISO Business Systems.

- Led the ISO's Business Team for designing the ISO Business Systems as part of the initial ISO start-up team. In that capacity, he led a) the negotiations with the ISO vendor of the ISO Business Systems development contract (ISO Alliance contract), b) the translation of complex ISO Tariff requirements into detailed statements of work, c) the resolution of ISO systems staging and policy issues, d) the oversight of software construction and testing, e) the management of contract change orders and f) the management of the interfaces between the ISO Business and Operational Systems.
- Heavily involved in developing the rules and protocols for pricing transmission in the California electricity markets.
- Heavily involved in developing the rules and protocols for the ISO operations.
- Heavily involved in developing the rules and protocols for the PX energy auction and the PX Business Systems.
- Heavily involved in the design of the PX Business Systems.
- Heavily involved in the development of the RFPs for the procurement of the operational, scheduling, market and business software systems for the California ISO.
- Led the coordination and integration efforts of all PG&E software systems that interface with the California ISO and the PX.
- Served as an invited member of the Inter-Market Efficiency Group (IMEG), organized by the ISO/PX Restructuring Trust, to study the interactions between the ISO and the PX sequential energy, congestion and ancillary services markets and develop rules and protocols to improve the overall efficiency of the California market.
- Heavily involved in defining and developing methodologies and software to advance PG&E's policies in the areas of bidding, congestion management, transmission, settlements and billing, over-generation protocols, scheduling, losses, load aggregation, load profiling and metering and ancillary services for the PX and the ISO.
- Involved in developing rules and protocols for Direct Access at PG&E.
- Involved in the development of the technical specifications and business rules for direct access data management in the new California energy market. Resulting specifications were adopted by the CPUC and are now implemented into various metering services systems.
- Involved in the development of PG&E's metering data system for providing metering data to the PX for real-time settlements.
- Involved in the development and design of the ISO's Unaccounted-for-Energy and load profiling functions and PG&E's distribution loss factor calculation methodologies.
- Heavily involved in preparing the ISO and PX development schedules and cost estimates including facilities, hardware, software and Quarterly Expenditure plans.
- Heavily involved in developing the specifications, proposal evaluation and contract resolution for the PG&E's EMS.
- Developed and implemented PG&E's External Network Equivalent program for the EMS.
- Led PG&E's efforts in defining, designing, developing and implementing PG&E's Optimal Power Flow (OPF) function for the EMS. Established PG&E's performance requirements for OPF algorithms for on-line control.
- Led PG&E's efforts in defining, designing, developing and implementing PG&E's Transmission Constrained Economic Dispatch (TCED) function for the EMS. This development was the first of its kind in the utility industry in enhancing a power system's real time control capabilities.
- Led PG&E's efforts in defining, designing, developing and implementing PG&E's Short-Term System Load Forecasting function for the EMS.

- Led PG&E's efforts, over the course of several years, in defining, developing, testing, enhancing and bringing into production use the Real-Time Sequence functions that form the foundation of all advanced EMS applications functions that assist operators in managing the electric generation and transmission system in a secure, reliable and optimal manner. The developed models are in production use by system operators at PG&E.
- Led PG&E's efforts in defining, developing, testing, enhancing and bringing into production support software for the Real-Time Sequence functions to optimally install SCADA units in PG&E's service territory and to estimate network parameters in real-time.
- Directed the application and enhancement of a computer program to evaluate the impact of generation additions at different PG&E locations on the system losses and on the loading of the transmission system. The developed model was instrumental in influencing the California Public Utilities Commission (CPUC) to adopt virtually every PG&E position in the Biennial Resource Plan Update (BRPU) proceedings.
- Managed the development of transmission planning projects that enable PG&E to assess the vulnerability of the transmission system to voltage instability and evaluate its steady state security margins. The developed models are in production use by operations planners.
- Led PG&E's efforts in defining, designing, developing and implementing PG&E's Artificial Neural Network Based Short-Term System and Area Load Forecasting function for system operations.
- Led PG&E's efforts in defining, designing, developing and implementing a distributed processing-based system for Security Analysis.
- Led PG&E's efforts in defining, designing, developing and implementing an OPF-based voltage control optimizer to manage voltage control in real-time.
- Led PG&E's efforts in defining, designing, developing and implementing an OPF-based power transfer evaluator to maximize power transfers in real-time.
- Led PG&E's efforts in defining, designing, developing and implementing an External Network Equivalent program suitable for OPF applications.
- Led PG&E's efforts in defining, designing, developing and implementing a large database to manage Inter-Utility energy transactions.
- Led PG&E's efforts in defining, designing, developing and implementing a large internet based information system for managing more than \$130 million in payments to Qualifying Facilities.

Georgia Institute of Technology, 1980–1985

Teaching: Experienced in teaching and organizing electrical engineering courses in senior level.

Research and Development: Participated in EPRI sponsored R&D projects to develop techniques for analysis and design of power system systems. Co-investigator on the following research projects: “Power System Grounding” and “Soil Parameter Estimation.” Programs are being marketed by EPRI.

Ph.D. Dissertation:

“Modeling Techniques for Power Systems,” Ph.D. Dissertation, Georgia Institute of Technology, 1985.

Public Corporation of Electricity, Athens, Greece

Developed, while a student, a computer program to regulate system voltages in the distribution level.

SCIENTIFIC AND PROFESSIONAL SOCIETIES

- Member: IEEE, Power Engineering Society, Control Systems Society
- Member: U.S. Expert Advisor to CIGRE Task Force 38-04-02, “Application of Optimization Techniques to Study Power System Network Performance”
- Co-chair IEEE Subcommittee on Intelligent Systems
- Member: Sigma Xi
- Member: Technical Chamber of Greece
- Fellow Member of IEEE

IEEE POWER ENGINEERING SOCIETY

- Computer and Analytical Methods Subcommittee
- System Control Subcommittee
- Power System Operations Subcommittee
- Power System Control Centers Working Group
- Static Security Assessment Working Group
- Dynamic Security Assessment Working Group
- Voltage Stability Working Group
- Operating Economics Working Group
- Intelligent Systems Applications Working Group
- Load Forecasting Working Group
- Transmission Access and Non-Utility Generation Task Force

ADVISORY COMMITTEES

- Member: IEEE Power Engineering Society (PES) Editorial Board of the IEEE Power Engineering Review, 1997-present.
- Member: Power Industry Computer Applications (PICA) Technical Committee, 1997-2003.
- Member: Power Systems Computation Conference (PSCC) Technical Committee, 1997-1999.
- Member: Technical Program Committee for the 1995 IEEE International Symposium on Circuits and Systems, 1994–1995.
- Member: EPRI’s Dynamic Security Analysis Project, 1993–1996.
EPRI industry advisor to several EPRI sponsored projects, 1991–1996.

REFEREE

Frequent reviewer of IEEE transaction papers and NSF large scale proposals over \$1 million and invited panelist in engineering roundtable meetings and conferences.

INVITED PRESENTATIONS

Invited speaker and consultant on electric industry restructuring issues and application of information technologies to power system grid and merchant business lines in the U. S. and other countries including Switzerland, Baltic States, Greece, Spain, Austria, Poland, Japan, Australia, Hong Kong and Argentina. Most recent examples include:

“Wholesale Energy Market Design: Lessons Learned and Market Design of Various Markets,” Tutorial, invited speaker at the MED 2002 Conference, Athens Greece, November 7, 2002.

“The California Energy Crisis: What Went Wrong and What Is the Likely Framework of the New Market Structure,” invited speaker at the Hong Kong Symposium on Deregulation, Hong Kong, May 21, 2001

“Enabling Technologies & Systems for the Business-Driven Electric Utility Industry,” invited speaker at the 2nd European Conference sponsored by the EPRI and organized by Decision Systems International, Vienna, Austria, November 2-4, 1999

“Competitive Generation in a restructured electric industry,” invited speaker at the 3rd Greek National Energy Conference on Energy & Development '98 sponsored by the European Union, Athens, Greece, May 7-8, 1998

“Market design for Power Exchanges and Independent System Operators,” invited speaker at Siemens Empros Power Systems Control, Minneapolis, Minnesota, March 2-3 1998.

“The California Experience: Numerous Private Power Companies,” invited speaker at the 2nd Meeting of the Electrical Sector, Madrid, Spain, March 11-12, 1997

“Electric Industry Restructuring in California,” invited seminar in the series “Aula de regulacion Para La Industria Electrica” at the Instituto de Investigacion tecnologica (IIT), Madrid, Spain, June 11, 1996.

“Congestion Management in a competitive market structure,” IBERDROLA, Madrid, Spain, June 12, 1996.

“Operational requirements for an implementation of an on-line Optimal Power Flow and experience with various OPF packages in a practical environment,” invited speaker at the SVOR/ASRO Conference, Zurich, Switzerland, October 14–16, 1992.

IEEE INVITED PRESENTATIONS

Invited speaker and panelist in almost every IEEE/PES Winter and Summer meeting and other scientific conferences since 1990 on various areas including utility operations, real time control, operations planning, transmission planning, power generation, and electric industry restructuring subjects related to Power Exchanges and Independent System Operators. Few recent examples include:

"Overview of the New SMD-based Market Design in California," to be presented at the IEEE/PES General Power Meeting, Toronto, Canada, July 13-17, 2003.

"Experience with the Strategic Behavior in California Markets," IEEE/PES Summer Meeting, Chicago, Illinois, July 23, 2002.

"Industry Perspective on FERC's Standard Market Design," IEEE/PES Summer Meeting, Chicago, Illinois, July 23, 2002.

"On the Operation and Pricing of Real-Time Competitive Electricity Markets," IEEE/PES Winter Meeting, New York, New York, January 29, 2002.

"The Alliance RTO Market Design," IEEE/PICA Conference, Sydney, Australia, May 22, 2001.

"The Role of Analytical Modeling and Software in California's Deregulated Electricity markets," IEEE/PES Summer Meeting, Seattle, Washington, July 19, 2000.

"Firm Transmission Rights," IEEE/PES Summer Meeting, Edmonton, Alberta, Canada, July 22, 1999.

"Competitive Electricity Market: The Role of Transmission," IEEE/PICA Conference, Santa Clara, California, May 18, 1999.

"Electric De-Regulation: One Year after in California," IEEE, Industry Applications Society, Oakland East Bay Chapter, April 22, 1999.

"Key Issues in Energy Trading," IEEE/PES Winter Meeting, New York, New York, February 2, 1999.

"Congestion Management Practices," IEEE/PES Winter Meeting, New York, New York, February 2, 1999.

"Congestion Management by an Independent System Operator," University of California Energy Institute, Berkeley, California, March 20, 1998.

“The California Independent System Operator & Power Exchange: Current Status, Predictions and Observations,” IEEE/PES Winter Meeting, Tampa, Florida, February 3, 1998.

“Developments in OPF and Congestion Management,” IEEE/PES Winter Meeting, Tampa, Florida, February 4, 1998.

“Are we ready for Retail Wheeling in California in 1998,” 18th Annual North America Conference of USAEE/IAEE on International Energy Markets, Competition and Policy, San Francisco, California, September 9-10, 1997.

“Power Marketing, Generation Bidding and Power Exchange Groups,” IEEE/PES, PICA '97, Columbus, Ohio, May 13, 1997.

“Intelligent Systems Applications in a Competitive Industry Environment,” IEEE/PES Winter Meeting, New York, New York, February 4, 1997.

“Optimal Power Flow: Advances and Current Issues,” IEEE/PES Summer Meeting, Denver, Colorado, August 1, 1996.

“Technical Challenges Under Open Access,” IEEE/PES Winter Meeting, Baltimore, Maryland, January 25, 1996.

“Load Forecasting and Procurement in the New Competitive Environment,” IEEE/PES Summer Meeting, Portland, Oregon, July 27, 1995.

“Industrial Research in Electric Power Engineering,” IEEE/PES Summer Meeting, Portland, Oregon, July 25, 1995.

“Intelligent Load Forecasting,” IEEE/PES Winter Meeting, New York, New York, February 1, 1995.

“Challenges to On-Line OPF Implementation,” IEEE/PES Winter Meeting, New York, New York, January 31, 1995.

“Load Forecasting: A Contact Sport,” IEEE/PES Summer Meeting, San Francisco, California, July 27, 1994.

SHORT COURSES

Invited speaker in numerous short courses related to utility business and electric industry restructuring organized by IEEE, EPRI and other educational and private organizations. Few recent examples include:

“Investment and Trading in Electric Energy in the Restructured Environment,” Workshop organized by Decision Systems International, Madrid, Spain, September 18-20, 2000.

“Ancillary Services Markets in the Restructured Electric Power Industry,” Workshop organized by Decision Systems International, Madrid, Spain, September 20-22, 2000.

“Investment and Trading in Electric Energy in the Restructured Environment,” Workshop organized by Decision Systems International, Montreal, Quebec, Canada, May 15-17, 2000.

“Ancillary Services Markets in the Restructured Electric Power Industry,” Workshop organized by Decision Systems International, Montreal, Quebec, Canada, May 17-19, 2000.

“Optimizing Transmission Business Practices,” Workshop organized by the Center for Business Intelligence, Chicago, October 18-19, 1999.

“The Post-Implementation ISO Operations, Markets & ISO alternatives,” Workshop organized by the International Business Communications, Sacramento, California, October 28-30, 1998.

“Forward Power Markets & Price Forecasting,” Workshop organized by the Center for Business Intelligence, Washington DC, October 15-16, 1998.

“Baltic Countries Electric Industry Restructuring Workshop,” USAID/Electrotek Concepts Inc., Riga, Latvia, March 9-13, 1998.

“Winning Strategies and Practical Risk Management in the California Electric Power Market,” Workshop organized by CALPOL, San Francisco, California, January 14-15, 1998.

“Succeeding in the California Power Market,” Workshop organized by Infocast Inc., San Francisco, California, December 4-5, 1997.

“PX Seminar Series on Real-Time Operations,” San Diego Gas and Electric (SDG&E) Headquarters, San Diego, California, November 17, 1997.

“Transmission and Pricing,” The Center for Business Intelligence, Houston, Texas, November 13-14, 1997.

“Security Issues in an Open Access Environment,” EPRI Workshop on Dynamic and Voltage Security Assessment, Palo Alto, California, October 10, 1997.

“CENTREL Roundtable Energy Forum,” USAID/Electrotek Concepts Inc., Warsaw, Poland, September 16-18, 1997.

“Database Implications of Retail Wheeling and State Requirements,” 14th Biennial IEEE/PES Control Center Workshop, Minneapolis, Minnesota, October 21-23, 1996.

“Utility Restructuring: Operational, Institutional & Economic Issues,” Workshop organized by Decision Systems International, San Francisco, California, March 26-28, 1996.

“Baltic Power Pooling Workshop,” USAID/Electrotek Concepts Inc., Riga, Latvia, February 27-March 1, 1996.

“Modern Load Forecasting for Control & Operation in the Competitive Era,” Workshop organized by Decision Systems International, San Francisco, California, November 13-15, 1995.

COMMUNITY ACTIVITIES

Member of World Affairs Council of Northern California.

PUBLICATIONS

- (1) “Current Division in Substation Grounding Systems,” (with A. P. Meliopoulos and R. P. Webb), *Proceedings of the 1982 Protective Relaying Conference*, Atlanta, Georgia, May 1982.
- (2) “Estimation of Soil Parameters from Driven Rod Measurements,” (with A. P. Meliopoulos, R. P. Webb and C. Plattner), *IEEE Transactions on Power Apparatus and Systems*, Vol. PAS-103, No. 9, pp. 2579–2585, September 1984.
- (3) “Frequency Depended Modeling of Grounding Systems,” (with A. P. Meliopoulos), *Midwest Power Symposium*, 1985.
- (4) “Interpretation of Soil Resistivity Measurements: Experience with the Model SOMIP,” (with A. P. Meliopoulos), *IEEE Transactions on Power Apparatus and Systems*, Vol. PWRD-1, No. 4, pp. 1420–150, October 1986.
- (5) “Frequency Dependent Characteristics of Grounding Systems,” (with A. P. Meliopoulos), *IEEE Transactions on Power Apparatus and Systems*, Vol. PWRD, No. 41, pp. 1073–1080, October 1987.
- (6) “Short-Term Electric Load Forecasting Using Linear Regression,” (with Timothy C. Hesterberg), *American Statistical Association Proceedings*, pp. 608–612, New Orleans, August 1988.
- (7) “Large-Scale Optimal Power Flow: Effects of Initialization, Decoupling and Discretization,” (with Carl F. Imparato and Felix F. Wu), *IEEE Transactions on Power Apparatus and Systems*, Vol. PWR5-4, pp. 748–759, May 1989.
- (8) “A Regression-Based Approach to Short-Term System Load Forecasting,” (with Timothy C. Hesterberg), *IEEE Transactions on Power Systems*, Vol. 5, pp. 1535–1547, Nov. 1990.
- (9) “Real-Time Control And Operation of Power Systems,”(with L. H. Fink, B. Avramovic, M. M. Adibi, L. S. Van Slyck, F. F. Wu), *Proceedings from the Workshop On Real-Time Control And Operation Of Electric Power Systems* (sponsored by the U. S. Department of Energy), pp. 75–87, Denver, Colorado, Nov. 19–21, 1991.
- (10) “The Discrete Shunt Controls in a Newton Optimal Power Flow,” (with W-H. Edwin Liu and William Tinney), *IEEE Transactions on Power Systems*, Vol. 7, pp. 1509–1518, Nov. 1992.
- (11) “A Least Squares Solution for Post Optimal Power Flow Sensitivity Calculation,” (with S. V. Venkatesh and W-H. Edwin Liu), *IEEE Transactions on Power Systems*, Vol. 7, pp. 1394–1401, August 1992.
- (12) “Operational Requirements For An Implementation of An On-Line Optimal Power Flow And Experience With Various OPF Packages In A Practical Environment,” *SVOR/ASRO Conference*, Zurich, Switzerland, October 14–16, 1992.
- (13) “Short-Term System Load Forecasting Using an Artificial Neural Network,” (with Shangyou Hao and Tiemao Peng), presented at the *Second International Forum on Applications of Neural Networks to Power Systems*, Yokohama, Japan, April 19–22, 1993.
- (14) “Discrete Shunt Device Based Voltage Control In An Adjusted Power Flow Solution,” (with W-H. Edwin Liu and Joseph Bright), presented at the *11th Power Systems Computation Conference (PSCC)*, Avignon, France, August 30–September 4, 1993.

- (15) “Application of Neural Network Technology to Short-Term System Load Forecasting,” (with Shangyou Hao and Tiemao Peng), presented at the *Athens Power Tech Conference*, Athens, Greece, September 5–8, 1993.
- (16) “External Network Modeling-Recent Practical Experience,” (with Ken Kato, W. L. Snyder, S. Vemuri, M. L. Oats, G. C. Contaxis, J. Singh, R. A. Smith, S. C. Savulescu), *IEEE Transactions on Power Systems*, Vol. 9, pp. 216–228, February 1994.
- (17) “Cost/Benefits Analysis of An Optimal Power Flow: The PG&E Experience,” (with Shangyou Hao, W-H. Edwin Liu, Ziad Alaywan, Ken Kato), *IEEE Transactions on Power Systems*, Vol. 9, pp. 796–804, May 1994.
- (18) “An Implementation of a Neural Network Based Load Forecasting Model For the EMS,” (with Shangyou Hao and Tiemao Peng), *IEEE Transactions on Power Systems*, Vol. 9, pp. 1956–1962, November 1994.
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