FILE

BEFORE

THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Complaints of S.G. Foods, Inc.; Miles Management Corp., et al.; Allianz US Global Risk Insurance Company, et al.; and Lexington Insurance Company, et al.,	)	
Complainants,	)	Case Nos. 04-28-EL-CSS
	)	05-803-EL-CSS
v.	)	05-1011-EL-CSS
	)	05-1012-EL-CSS
The Cleveland Electric Illuminating Company, Ohio Edison Company, Toledo Edison Company, and American Transmission Systems, Inc.	)	
Respondents.	)	

2007 AUG 22 PM 2:55

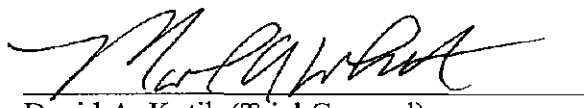
NOTICE OF FILING

Please take notice that Respondents American Transmission Systems, Inc. ("ATSI"), Ohio Edison Company ("Ohio Edison"), The Cleveland Electric Illuminating Company ("CEI"), and Toledo Edison Company ("Toledo Edison") (collectively, "Respondents") hereby file the attached Summaries of Opinions and Curriculum Vitae of the expert witnesses of Complainants in Case Nos. 05-1011 and 05-1012 (collectively, "Complainants"). Pursuant to the Attorney Examiner's Entry dated October 26, 2006, Respondents have reviewed the attached Summaries of Opinions and Curriculum Vitae and have determined that those documents do not contain any critical energy infrastructure information ("CEII"). Therefore, it is not necessary for Respondents to redact portions of those documents under Rule 4901-1-24(D), Ohio

Administrative Code, and the attached Summaries of Opinions and Curriculum Vitae are hereby filed in their entirety.

August 22, 2007

Respectfully submitted,



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CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing Notice of Filing was served by facsimile (without attachments) and by ordinary U.S. mail (with attachments) to the following this 22nd day of August, 2007.

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	)	05-1012-EL-CSS
The Cleveland Electric Illuminating Company, Ohio Edison Company, Toledo Edison Company, and American Transmission Systems, Inc.	)	
Respondents.	)	

CERTIFICATE OF SERVICE

I hereby certify that a copy of Complainants' Experts' Summary of Opinions and their Curriculum Vitaes were sent via Email and U.S. Mail this 15th day of August, 2007 to the following:

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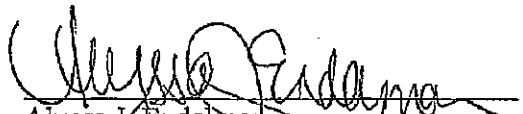

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BEFORE

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Respondents.	)	

SUMMARY OF OPINION OF ALISON SILVERSTEIN

A. Alison Silverstein Qualifications and Background

- Professional Qualifications
  - Independent Consultant – 3 years consulting to US Dept of Energy, Environmental Protection Agency, and numerous private clients
  - FERC, Senior Energy Policy Advisor to Chairman Pat Wood III – 3 years working on electricity, natural gas, hydro cases
  - Public Utility Commission of Texas, Advisor to Chairman Pat Wood III – 6 years working on electricity and telephone issues and cases
  - PG&E – 10 years in five different positions
  - ICF Inc – 2 years, consulting
  - Environmental Law Institute – 1 year, consulting
  - US Dept of Interior – 2 years

- Education
  - MBA, Stanford University
  - MSE, Systems Analysis, Johns Hopkins University
  - BA, Economics, Johns Hopkins University

B. Background on the US-Canada Blackout Investigation

- US-Canada Power System Outage Task Force created by President Bush and Prime Minister Chretien on 8/15/03, chaired by US Secretary of Energy Abraham and Minister of Natural Resources Canada Dhaliwal. Silverstein was appointed as co-chair of the Electric System Working Group investigation on 8/27/03. The ESWG included representatives from each of the affected states (including Ohio PUC Chairman Schriber) and Ontario. The President and Prime Minister ordered the Task Force to fully investigate and determine the causes of the blackout and to prepare a formal report to the nations on those causes.

- The mission of the Task Force was to find the cause of the August 14, 2003 blackout and to prove it conclusively. The investigation team was given access to any needed resources by all involved federal agencies and full independence of action and conclusion over the course of the investigation.

- In addition to the three co-chairs (including Silverstein), the Electric System investigation team included 7 FERC staff engineers, engineers from the Oak Ridge National Lab and Lawrence Berkeley National Lab, NERC senior staff engineers, expert engineers loaned from US and Canada utilities, and consultants hired by NERC, FERC and DOE.

- The electric system investigation team collected an immense amount of data (including interviews, grid condition information, workshop transcripts, control room transcripts, relay data, and computer modeling and simulation results) from FE and other utilities and grid entities, and conducted extensive analyses based on these data. Both the data and analyses remain housed at NERC under protection as Confidential Energy Infrastructure Information (although legally speaking, only FERC has the regulatory ability to label information as CEII and protect it from disclosure). The most important data and analytical findings are included in the Interim and Final Blackout Reports and the Vegetation Management Report.

- Because FERC staff played an integral role in the investigation, FERC took formal notice of the interim and final blackout reports, issuing a letter order on 12/24/03 (105 FERC ¶ 61,372) reflecting the interim report findings and referencing the final blackout report in numerous orders, including the Commission's review and conditional approval of NERC reliability standards.

- Silverstein was actively engaged working with all of the technical investigation teams within the electric system investigation, receiving briefings, providing feedback and guidance, suggesting new lines of inquiry, managing the FERC engineering and legal teams supporting the investigation, and writing the interim and final blackout reports.

- The veracity and credibility of the Interim and Final Blackout Reports are demonstrated by the fact that every member of the Electric System Working

Group (including Ohio PUC Chairman Alan Schriber), the Chairman of the FERC, and US DOE Secretary Abraham all signed statements agreeing with and accepting the findings of the reports, which makes it a formal government document and a public record of those agencies (FERC and DOE).

- The Final Blackout Report has become a "learned treatise", in that it has been widely accepted as correct by the electric industry and academia. It has been cited extensively in industry, trade and academic public presentations and its recommendations served as the basis for extensive revisions of FE and industry practices.

C. Before August 14, 2003 -- FE Planning, Energy Management System and Training

1. FE did not conduct adequate, rigorous studies of its system to understand its capabilities and vulnerabilities.

   - FE did not conduct multiple contingency analyses or assessments of extreme conditions. While other utilities routinely conducted extensive modeling to determine the impacts of the loss of critical transmission assets, FE did not do so; FE's 2003 Summer Study focused on single-contingency events and thermal limits and did not consider multiple-contingency events.

   - Following severe overloads on the South Canton transformer in 2002, AEP conducted extensive modeling of the consequences of the loss of this asset, finding that it would cause significant low voltages and overloads on both the AEP and FE systems. Although AEP shared these results and subsequent similar findings with FE in January and May, 2003, FE did not conduct additional analyses.

   - Regional system assessments by ECAR did insufficient reactive power analysis and did not identify any voltage-constrained import criteria. They found no contingency combinations that resulted in 345 kV line overloading or voltage violations on 345 kV buses.

2. FE failed to conduct sufficient voltage analyses for its Ohio control area.

   - FE did not monitor and manage reactive reserves for contingency conditions as required by NERC Policy 2, Section B, Requirement 2. [Note – these were the NERC rules in place in 2003-04; they have since been revised and toughened to reflect the blackout report's findings, and wholly reorganized and renumbered.]

3. FE failed to ensure that its Real-Time Contingency Analysis was a functional, effective monitoring tool.

- FE did not ensure that its Real-Time Contingency Analysis tool was a functional and effective EMS application, as required by NERC Policy 2, Section A, Reqmt 1.

- FE's operational monitoring equipment was not adequate to provide a means for its operators to evaluate the effects of the loss of significant transmission or generation facilities, as required by NERC Policy 5, Section C, Reqmt 3.

4. FE failed to instruct its system dispatchers to periodically use the State Estimator or CA tools.

   - Dispatcher depositions indicate that they did not use the state estimator or contingency analysis tools because those tools were either not consistently functional, or they took so long to solve that they were not helpful.

5. FE allowed its system dispatchers to become overly dependent upon the alarm system.

   - FE dispatcher depositions indicate that operators consistently assumed that their system was in good shape on August 14 because they were not receiving any alarms that would indicate otherwise.

   - Dispatcher depositions indicate that absent alarms suggesting operational violations or changes in system conditions, the dispatchers did not review any other operational data sources and discounted calls reporting system problems and events.

6. FE failed to provide a means to alert its dispatchers to the failure of their alarm system and other monitoring tools, and failed to train its dispatchers to recognize the failure of their system monitoring tools.

   - FE lacked procedures to ensure that its operators were continually aware of the functional state of their critical monitoring tools.

7. FE failed to develop and train its dispatchers to use multiple, redundant means to monitor and understand its system conditions (e.g., a dynamic mapboard) in the event that its alarm system failed.

8. FE failed to train system dispatchers to recognize and understand deteriorating system and emergency conditions, and how to respond to those conditions.

   - FE's operations personnel were not adequately trained to maintain reliable operations under emergency conditions, as required by NERC Policy 8, Section 1.

9. FE failed to devise and implement automatic or manual load-shedding procedures.

10. FE failed to properly maintain the dispatchers' training simulator for operator training.

- FE dispatcher depositions indicate that the training simulator was not maintained and not used for dispatcher training.

11. FE failed to establish protocols and systems for communication of critical information between system dispatchers, and between dispatchers and IT staff.

12. FE failed to anticipate or plan for alternative data collection and interpretation mechanisms for use in the event of failure of its EMS and alarm systems.

- FE's alarm system had failed on other occasions before August 2003, leading to the loss of alarming for system events; thus the problem could have been recognized, anticipated, and mitigated through a variety of procedural and operational means.

- FE did not have additional or back-up monitoring tools to understand or visualize the status of their transmission system to facilitate its operators' understanding of transmission system conditions after the failure of their primary monitoring and alarm systems.

- FE's monitoring equipment was not sufficient to alert the operators to the deviations on the system, in violation of NERC Policy 4, Section A.

13. FE failed to maintain its EMS and alarm system in effective working order.

- Although the GE Harris XA21 EMS system was brought into service in 1995, the last major update or revision to the system was implemented in 1998; in 2003 it was not running the most current version of XA21 software.

- FE's alarm system had failed on other occasions before August 2003, leading to the loss of alarming for system events.

14. FE failed to anticipate and understand conditions needed to protect their nuclear plant, or to protect their service area from the unexpected loss of that plant.

- The blackout investigation team could find no contingency plans or operational procedures for operators to manage the FE control area and protect the Cleveland-Akron area from the loss of the Perry plant.

- The Perry plant is crucial to the voltage stability of the Cleveland-Akron area, and had it been lost on 8/14/03 after the loss of the Harding-Chamberlin line at 15:05 EDT, the area would have been close to voltage collapse.

- FE did not have an adequate automatic under-voltage load-shedding program in the Cleveland-Akron area.

15. FE failed to conduct proper line rating analyses, allowing several 345 kV lines to operate in excess of their safe operating conditions.

    - The presence of numerous tall trees within its rights-of-way compromised the FE's line rating system as well as the operational capability of the relevant lines. An effective vegetation management program is necessary to fulfill NERC Policy 2, Section A, Reqmt 1.

D. Performance of FE Equipment and Personnel on August 14, 2003

1. FE failed to recognize the deteriorating system conditions and emergency conditions.

    - FE's operational monitoring equipment was not adequate to alert FE's operators regarding important deviations in operating conditions and the need for corrective action, as required by NERC Policy 4, Section A, Requirement 5.

    - Despite the loss of alarms and the frozen EMS, FE dispatchers had extensive evidence that there were problems on its system, including multiple phone calls from its own power plants, AEP, MISO and PJM warning of line losses and dangerously low voltage, and FE customers losing power.

    - FE's dispatch center lights blinked when the circuit serving the Wadsworth dispatch center lost power and the center switched over to its emergency generator.

2. FE control room and IT staff failed to recognize when the alarm system and computer screens stopped working properly.

3. FE failed to use other available tools to monitor the state of its system even after they know that the alarm system had failed.

    - FE personnel did not use their state estimation and contingency analysis tools to assess system conditions, violating NERC Operating Policy 5, Section C, Requirement 3, and Policy 4, Section A, Reqmt 5.

4. FE dispatchers failed to communicate information between themselves and failed to listen to or act upon information supplied by others.

- FE dispatchers did not effectively share condition information between themselves within the control room, either verbally or in system logs.

- FE dispatchers did not effectively offer information about the condition of their system with MISO, PJM, AEP or other neighboring utilities, nor did they understand system condition information offered by AEP, MISO and AEP.

5. FE dispatchers took little or no remedial action on August 14, 2003.

   - FE did not act to return its system to safe operating state after the loss of any of its transmission line outages, as required by NERC Policy 2, Section A, Standards 1 and 2, or Policy 5, General Criteria.

   - FE attempted to call up additional generation to support voltage, but little additional reactive power resources were available or effective.

   - FE did not proactively shed load (manually or automatically) within its service territory, as required by NERC Policy 5, General Criteria, otherwise reduce load as required by NERC Policy 2, Section A, Reqmt 1.2. The only load-shedding that occurred was due to the loss of individual industrial customers because their local feeders were experiencing such low voltage that the customer equipment disconnected automatically to protect itself.

   - FE did not demonstrate the application of effective emergency operating procedures as required by NERC Policy 6, Section B, Emergency Operations Criteria.

   - FE did not proactively notify any of its electrical neighbors (utility or ISO/RTO) to alert them to the growing problems on their system or ask for assistance, nor to alert them of the emergency operating conditions as required by NERC Policy 5, Section A.

6. FE operators failed to recognize in real time that grid conditions were unsafe and they were about to lose their nuclear power plant.

   - When the Perry operator called the FE dispatch center at 13:43, 15:36:51 and 15:42:49 EDT to ask about low voltages and warn about the need to trip off the turbine, FE operators did not offer any guidance or direction to the nuclear plant operator.

   - FE dispatcher transcripts indicate that they did not recognize any problem and begin assessing system conditions until 15:42 EDT, when a FE operator told IT that the alarm systems were not operating.

7. FE IT personnel failed to provide adequate computer support and communications for reliable real-time grid operations.

- FE IT personnel failed to inform system dispatchers that their EMS system servers had failed.

- FE IT personnel failed to advise system dispatchers that the alarm system was lost when the EMS servers were lost.

- FE IT personnel did not check to verify that the alarm system was functional after the reboot at 15:46 EDT.

8. FE failed to operate its system with appropriate voltage criteria and remedial measures.

- NERC Policy 2, Section A required that an electrical system be able to correct and re-adjust within 30 minutes to prepare for the next contingency; FE did not do so.

E. Conclusion

1. All of the grid events occurring between 12:15 and 16:08 EDT, leading to extensive loss of power within FE's Ohio control area, occurred on transmission lines and substations within or immediately electrically connected to FE's Ohio transmission network. Since this included multiple operations and loss of 4 345 kV transmission lines, 15 138 kV transmission lines, one computer system, and loss of service to numerous industrial customers – and few comparable events occurred on any neighboring utility systems – the totality of these failures indicates that FE caused the Ohio blackout.

2. The blackout in Ohio and across the Northeast could have been prevented had FE done more before and on August 14, 2003 to understand, anticipate, prepare for and respond to potential problems on its system.

- Had FE done better system modeling and planning, the vulnerable conditions of August 14 might not have been present.

- Had FE conducted more effective tree-trimming in its transmission rights-of-way for the decade before August 14, three of its transmission lines would not have sagged into 40' or taller trees while operating within normal operating loading levels and limits.

- Had FE developed better operational protocols and conducted better dispatcher training for both normal and emergency operating situations, its operators would have been better able to recognize and respond to the deteriorating conditions in the Cleveland-Akron area.

- Had FE maintained its EMS better, the alarm and EMS failures might have been prevented.

- Had FE established better communications protocols for emergency operations between IT and dispatch operations, its operators could have recognized the loss of their EMS and alarm systems and responded appropriately.

3. Evidence of FE's critical role as the primary causer of the blackout is contained in the recommendations contained in the Final Blackout Report and the NERC Corrective Actions recommendations (2/10/04, Attachment A to Recommendation 1), both of which address FE failures that must be remedied.

- FE's acceptance of these recommendations is evidenced by its Certification of Completion of these items. (Jones letter to Gent, 6/30/04)

- FERC's letter order requiring FE to conduct extensive remedial planning and voltage analysis further proves the inadequacy of FE's pre-August 2003 practices and analyses. (FERC 105 FERC ¶ 61,372)

- The Ohio PUC's order to FE (PUCO Entry of November 25, 2003) requiring that utility to remedy the causes of the blackout identified in the Interim Blackout Report indicate that the Commission has already recognized some FE role in causing the Ohio portion of the blackout.

Alison Silverstein

ALISON SILVERSTEIN

Dated: August 14, 2007

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SUMMARY OF OPINION OF KEVIN ECKERT

1. First Energy's (FE) documented utility vegetation management (UVM) program was generally in conformance with industry standards and practices that include:
    - A tree inventory and work management system to plan, schedule and report work;[1]
    - Regularly scheduled inspections of field conditions to identify potential tree conflicts;[2]
    - Procedures to address potential tree conflicts or nonconforming conditions found by periodic inspections;[3]
    - Regularly scheduled UVM for all r/w;[4]
    - Technically-based tree pruning and removal definitions, procedures and specifications;[5] and
    - Auditing inspections of completed work and processes to address unsatisfactory work.[6]

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[1] FE002354 - Information reporting form, dated October 10, 2003.
[2] FE002632 - Response to "DOE Task Force's October 17, 2003 Information Requests", dated December 11, 2003.
[3] FE002618 - Response to "DOE Task Force's October 17, 2003 Information Requests", dated October 31, 2003.
[4] FE002618 - Response to "DOE Task Force's October 17, 2003 Information Requests", dated October 31, 2003.
[5] FE002664 -First Energy Vegetation Management Specifications, dated January 1, 2003.

The primary cause of tree-related outages on August 14, 2003 was FE's failure to adequately conform to its standards, practices and specifications, and properly conduct inspections and mitigation work in a manner that effectively prevented tree growth from interfering with electric service along transmission lines.

2. FE permitted trees to grow too close to 345 kV electric transmission lines causing electrical grounding and the interruption of electrical flow over affected circuits.

   FE employees and contractors[7] identified tree-related electrical contacts at the subject 345 kV locations. Testimony by Ms. Rebecca Spach describes her visits to each of the three subject locations where she witnessed damage consistent with electrical contacts to trees.[8] Mr. Gerald Western visited the three subject locations where he witnessed damage consistent with electrical contacts to trees.[9] Ms. Katrina Schnobrich describes the damaged tree on the Hanna – Juniper 345kV line and attributes it to electrical contact.[10] Upon the request of the Department of Energy investigators, FE identified locations on the Hanna – Juniper 345kV line, Star-South Canton 345-kV, and Harding-Chamberlin 345-kV lines as sites where evidence of tree contacts were observed and electrical interruption occurred on August 14, 2003.[11]

   Testimony from FE employees describing observations of burns on trees and the ground are consistent with electrical contacts. I have witnessed the response of trees and electrical conductors during and immediately after tree-line contacts. The bright flash and ball of electricity described by the Nelson Tree Company crew at the time of the August 2003 outage is consistent with my experience with tree-line contacts. The descriptions of burned bark, destroyed tree tops, and burned ground near to trees is consistent with my experience and observations of damage resulting from tree contacts with high voltage electric lines.

   My extensive experience designing and administering electric utility line clearance programs has demonstrated that when trees contact high voltage conductors and energized equipment, electrical ground faults and interruptions of electric service often occur. These ground faults cause burning of the parts of the tree that contact the energized equipment and may burn along a track down the tree trunk to ground. Significant contacts often result in burns and disruption of the soil near the tree base. These ground faults often will destroy parts of the tree in close proximity of the contact, especially when transmission voltages are involved.

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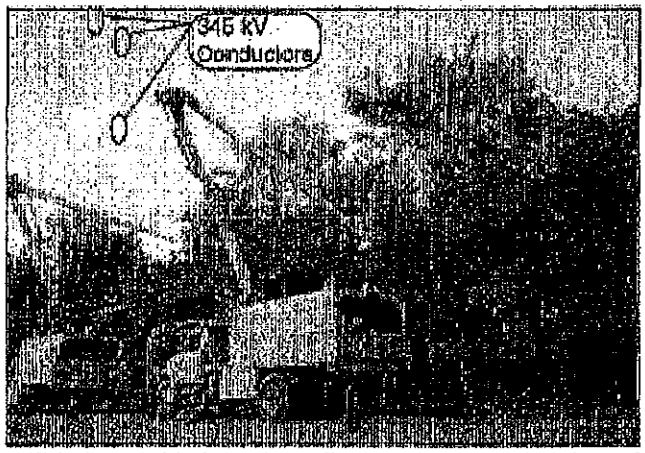
[6] FE002672 - 73 -First Energy Vegetation Management Specifications, dated January 1, 2003. Deposition of David Conner, dated May 30, 2007.
[7] Deposition of Gerald Western, June 5, 2007.
[8] Deposition of Rebecca Spach, May 16, 2007.
[9] Deposition of Gerald Western, June 5, 2007.
[10] Deposition of Katrina Schnobrich, June 25, 2007.
[11] *Final Report on August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations*, dated April 2004. Pages 59-64.

3. FE did not remove or prune trees consistent with FE specifications, the National Electric Safely Code (NESC), or industry practices during the previous maintenance cycle in a manner that would maintain adequate line clearance. This omission resulted in tree growth too near to lines and subsequent electrical grounding that contributed to the August 14, 2003 outage.

   FE specifications state that "Pruning for the transmission corridor is dependent on the voltage of the conductor and shall be done in such a manner to achieve a minimum of five years of clearance. In cases where five years of clearance is unattainable ... Transmission lines operating above 138kV shall be cleared 30' (thirty feet) from the conductor."[12] At the time of the routine right-of-way UVM work prior to the August 2003 outage, the subject trees did not possess the minimum five years of clearance as evidenced by the electrical contacts observed on and immediately after August 14, 2003. Further, these trees would likely have been within the 30 foot clearance zone required by FE specifications for faster growing species when 5 years of clearance cannot be achieved. Clearances of the subject trees at each right-of-way site during the time of the previous regular maintenance period prior to the August 14, 2003 outage are estimated to be as follows:

   - Hanna – Juniper 345kV line was scheduled for regular UVM in 2003.[13] According to FE's schedule, this right-of-way would have last been maintained 5 years previous to the 2003 outage. Based on the evidence of contact observed by FE staff immediately after the August 2003 outage, the subject black walnut tree did not possess the required 5 years of clearance. No measurements exist of the subject tree at the time of the August 14, 2003 outage. However, photographs show the tree removal operation conducted immediately after the outage and identify a very tall tree under the conductors as the subject tree. This tree appears to be significantly taller than surrounding trees and to be very close to the overhead conductors. Five years previous to the 2003 outage and at the time of the most recent regular maintenance, this tree would have clearly encroached into the 5 year conductor security zone. Given its slow growth rate, reported by FE as 1.0 – 1.5 feet per year[14], this tree would have been only 5 to 8 feet shorter than it was in August 2003 and within the 15 foot minimum clearance zone identified by Mr. Western.[15]

[12] FE002664 -First Energy Vegetation Management Specifications, dated January 1, 2003.
[13] FE002618 - Response to "DOE Task Force's October 17, 2003 Information Requests", dated October 31, 2003.
[14] FE002623 - Response to "DOE Task Force's October 17, 2003 Information Requests", dated October 31, 2003.
[15] Deposition of Gerald Western, June 5, 2007.



This August 14 photo shows the tree that caused the loss of the Hanna-Juniper line (tallest tree in photo). Other 345-kV conductors and shield wires can be seen in the background. Photo by Nelson Tree. [16]

- Harding-Chamberlin 345-kV line was scheduled for regular UVM in 2003.[17] According to FE's schedule, this right-of-way would have last been maintained 5 years previous to the 2003 outage. Based on the evidence of contact observed by FE staff immediately after the August 2003 outage, the subject black locust tree did not possess the required 5 years of clearance. Given its growth rate, reported by FE as 1.5 to 2.8 feet per year,[18] 5 years previously this tree would have at most only been 14 feet shorter than at the time of the outage and not in conformance with required clearances.
- Star-South Canton 345-kV line was scheduled for regular UVM in 2005.[19] According to FE's schedule, this right-of-way would have last been maintained 3 years previous to the 2003 outage. Based on the evidence of electrical contact observed by FE staff immediately after the August 2003 outage, the subject cottonwood tree did not possess the required 5 years of clearance, especially since it had only been 3 years since the previous maintenance. Using the 30 foot minimum clearance requirement within the specifications for fast growing species, the subject tree would likely have violated this standard also. Given its growth rate, reported by FE as 4.0 to 4.5 feet per year,[20] 3 years previously this tree would have at most only been 13.5 feet shorter than at the time of the outage and well within the 30 foot clearance zone. In my experience, utility vegetation managers recognize the

[16] *Final Report on August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations*, dated April 2004. Page 62.
[17] FE002618 - Response to "DOE Task Force's October 17, 2003 Information Requests", dated October 31, 2003.
[18] FE002623 - Response to "DOE Task Force's October 17, 2003 Information Requests", dated October 31, 2003.
[19] FE002618 - Response to "DOE Task Force's October 17, 2003 Information Requests", dated October 31, 2003.
[20] FE002623 - Response to "DOE Task Force's October 17, 2003 Information Requests", dated October 31, 2003.

fast growth rate of this species and take extra care to remove or prune these trees to prevent future line contacts.

FE did not conform to tree clearance requirements as described within the NESC given the fact that evidence and eyewitness reports confirmed tree contacts with the overhead electric lines. The NESC, Section 218, requires that "Trees that may interfere with ungrounded supply conductors should be trimmed or removed. NOTE: Normal tree growth, the combined movement of trees and conductors under adverse weather conditions, voltage, and sagging of conductors at elevated temperatures are among the factors to be considered in determining the extent of trimming required."[21]

Industry standards and practices are to remove or prune trees within and adjacent to the electric utility rights-of-way to prevent electric service interruptions. In my experience, utility management diligence and focus is much heightened relative to tree conditions within transmission line rights-of-way. It has been clearly recognized by utility management that trees can cause interruptions resulting in large-scale service interruptions on a regional basis. At various times during the 1980s and 1990s I was personally directed by utility executives managing transmission lines within territories that covered States in the Northeast US to insure that trees were not near to transmission lines such that sag or blow-out could cause contacts. On certain instances I was directed to conduct emergency aerial inspections to ensure proper tree clearance along electric transmission lines.

4. FE did not conduct tree clearance inspections according to FE specifications and industry practices or in a manner that could reasonably identify and effectively mitigate potential tree conflicts. FE specifications state that "FirstEnergy has the responsibility for inspecting and approving work performed under these specifications. ...An authorized FirstEnergy representative shall make a final inspection of the completed work, to insure all line clearance work has been completed in accordance with the line clearance specification." [22]

   FE personnel did not satisfactorily inspect right-of-way tree conditions and identify nonconforming tree height and clearances immediately after completion of regular UVM work. Given the estimated clearance of the subject trees and the fact that they grew tall enough to cause electrical grounding, it is obvious that line clearance was inadequate to conform to specifications and industry standards. Diligent, comprehensive post-work inspections should have identified the subject trees at that time and proper mitigation work should have been conducted to remove or prune them. Mitigation work should have been verified by further inspection.

   Aerial inspections of rights-of-way were not conducted according to industry practices and in a manner that permitted identification of potentially dangerous trees.

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[21] National Electrical Safety Code, American National Standards Institute, Institute of Electrical and Electronics Engineers, Inc.

[22] FE002672 - 73 -First Energy Vegetation Management Specifications, dated January 1, 2003.

Numerous aerial inspections were conducted prior to the August 2003 outage, including one as recently as 4 months prior, and no records identify the subject trees that were clearly hazards. Industry practices require that a trained and focused vegetation manager regularly conduct aerial inspections of rights-of-way for vegetation conditions and tree clearance. My experience administering UVM programs for three electric utilities and in communication with numerous electric utility vegetation managers throughout the US demonstrate that utilities regularly conduct separate UVM aerial inspections specifically to identify tree clearances and develop management plans. UVM managers have long recognized that inspectors charged with line and structure inspections cannot adequately focus on and identify tree conditions.

FE aerial inspectors did not likely possess the training and ability to adequately conduct aerial inspections for vegetation and tree conditions. Mr. Carlos Munoz, the FE person responsible for aerial inspections prior to the outage had no UVM training and could not produce any evidence of training or qualification of the inspectors.[23] In my experience, overhead line or engineering personnel are commonly used for transmission line structure and equipment aerial inspection, but not tree and vegetation inspection. Overhead line or engineering personnel usually have very limited knowledge and understanding of tree and vegetation growth and cannot effectively interpret many tree condition observations. Further, they are often intensively focused on inspection of structures and conductors and do not see tree conditions.

Trees that contacted lines on August 14, 2003 were clearly visible to aerial inspectors for at least the previous 2 years, but were never identified despite 4 aerial patrols.

- Photographs of the subject black walnut tree on the Hanna – Juniper 345kV line show a very tall tree under the conductors identified as the subject tree[24]. This tree appears to project significantly taller than surrounding trees and to be very close to the overhead conductors. Given its slow growth rate, this tree would have been only 2 to 3 feet shorter at most than it was in August 2003 and should have been very visible to inspectors.
- Calculations of the height of the subject black locust tree on the Harding-Chamberlin 345-kV line indicate that this tree would be at most only 5.5 feet shorter 2 years prior to the outage and clearly visible to inspectors as too close to the overhead conductors. Additional growth for the 2 years until the August 2003 outage would bring it even closer to the conductors and more visible to subsequent inspections.
- Calculations of the height of the subject cottonwood tree on the Star-South Canton 345-kV line indicate that this tree would be at most only 9 feet shorter 2 years prior to the outage and clearly visible as too close to the overhead conductors. Additional growth for the 2 years until the August

[23] Deposition of Carlos Munoz. June 20, 2007.
[24] *Final Report on August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations*, dated April 2004. Page 62.

2003 outage would bring it even closer to the conductors and more visible to subsequent inspections. In my experience, qualified utility vegetation managers are trained to recognize fast growing species, such as cottonwoods, during aerial inspections and take extra care to identify and manage these species before they get within the defined conductor clearance zone.

FE did not develop or maintain formal records of post-inspection work instructions to contractors.[25] Industry practices are to document and retain instructions to contractors and the results of inspections. This documentation is to ensure proper communication of work requirements, ensure that all corrective work is clearly communicated and addressed, and to provide for contractual enforcement in the event that work is unsatisfactory.

The annotations listed to support opinions are not intended to be definitive, but only identify key references. The facts and basis of my opinions may be supplemented based on further review of available or additional references.

By: Kevin Eckert

Dated: August 14, 2007

[25] Deposition of Katrina Schnobrich, June 25, 2007.

BEFORE

THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Complaints of S.G. Foods, Inc.; Miles Management Corp., et al.; Allianz US Global Risk Insurance Company, et al.; Lexington Insurance Company, et al,	)	
Complainants,	)	Case Nos. 04-28-EL-CSS
	)	05-803-EL-CSS
v.	)	05-1011-EL-CSS
	)	05-1012-EL-CSS
The Cleveland Electric Illuminating Company, Ohio Edison Company, Toledo Edison Company, and American Transmission Systems, Inc.	)	
Respondents.	)	

SUMMARY OF EXPERT OPINIONS OF DR. MOHAMMED SHAHIDEHPOUR

In my opinion, August 14, 2003 issues at FE which resulted in a widespread Ohio and the Northeast blackout can be itemized as follows:

1. Lack of comprehensive system studies including multiple contingencies / extreme condition assessment to identify bottlenecks in the 2003 FE system.

2. FE failed to provide day-ahead and hour-ahead operational planning for identifying emergency conditions.

3. Lack of situational awareness including failure to detect alarm processor malfunctions for an extended period of time on a heavily loaded system.

4. FE failed to utilize EMS components, such as state estimator and RTCA, periodically as real time operating tools for identifying contingencies and restoring normal operation after the occurrence of contingencies.

5. FE failed to provide dynamic display in its control center for emergency system visualization.

6. FE failed to establish protocol for communication of critical information between dispatchers.

7. FE failed to provide means of alerting FE dispatchers to failure of alarm system or other monitoring tools.

8. Wadsworth IT personnel were at fault for not communicating the situation to FE dispatchers.

9. FE failed to provide proper training to FE personnel and effective utilization of DTS for responding to emergencies.

10. FE failed to plan proper operating practices such as scheduling a sufficient supply of reactive power for maintaining proper bus voltage limits on heavily loaded transmission lines.

11. FE failed to implement automatic or manual load shedding to restore normal operating conditions.

12. FE system dispatchers took no remedial action on August 14, 2003.

I have discussed the above planning and operational issues further in the following categories:

1. Lack of comprehensive system studies including multiple contingencies / extreme condition assessment to identify bottlenecks in the 2003 FE system.

   In my opinion, FE operational and planning studies were not sufficiently comprehensive to ensure system reliability because they did not include a full range of sensitivity studies based on the 2003 Summer Base Case. ECAR Documentation No.1 "Reliability Criteria for Evaluation and Simulated Testing of the ECAR Bulk Power Supply Systems, identifies a range of possible contingencies and sets corresponding expectations for system performance under several categories of possible events, ranging from everyday probable events to extreme events that may involve substantial loss of customer load and generation in a widespread area. I believe that, on August 14, 2003, FE lacked a comprehensive range of operational and planning studies which would have involved analyses of all operating scenarios likely to be encountered, including those for unusual operating conditions such as lack of reactive power supply and planned outages of large generating units and potential disturbance scenarios in 2003 summer.

2. FE failed to provide day-ahead and hour-ahead operational planning for identifying emergency conditions.

There is no indication that FE performed any day-ahead operations planning studies on August 13 to ensure that FE had adequate resources to return the system to within contingency limits following the possible loss of their largest unit, Perry 1. There is also no indication that once Eastlake 4 was forced out on August 13, the operational plan was modified for the possible loss of the largest generating unit, Perry 1. It is my opinion that the gradual decline of voltage over the early afternoon of August 14 was consistent with the increase of load over the same time period, particularly given that FE had no additional generation within the Cleveland-Akron area load pocket to provide additional reactive support. Unknown to the dispatchers, the alarm processor failure eventually spread to a failure of multiple EMS servers and remote consoles, substantially degrading the capability of dispatchers to effectively monitor and control the FE system.

3. Lack of situational awareness including failure to detect alarm processor malfunctions for an extended period of time on a heavily loaded system.

   It is my opinion that, on August 14, FE dispatchers relied heavily on audible and on-screen alarms, plus alarm logs, to reveal any significant changes in their system's conditions. I believe that after 14:14 EDT, FE dispatchers were working under a significant handicap without such alarm processing tools. It believe very strongly that that FE dispatchers must have noticed the alarm processing system failure on August 14 once the alarms ceased to appear in the FE control room for an extended period of time (1 ½ hours on a hot August day in Ohio). It is my belief that an alternative means of readily visualizing overall system conditions, including the status of critical facilities, would have enabled FE dispatchers to become aware of forced line outages in a timely manner even though the alarms were nonfunctional. Unlike many other transmission grid control rooms, FE control center did not have a map board (for displaying schematically all major lines and plants in the control area on the wall in front of dispatchers), which might have shown the location of significant line and facility outages within the FE control area. I believe that a dynamic display could have provided a system status overview for quick and easy recognition by FE dispatchers. I also believe that this deficiency precluded FE dispatchers from detecting the degrading system conditions, taking corrective actions, and alerting neighboring systems.

4. FE failed to utilize EMS components, such as state estimator and RTCA, periodically as real time operating tools for identifying contingencies and restoring normal operation after the occurrence of contingencies.

   It is my opinion that the periodic utilization of monitoring tools such as RTCA on August 14, and particularly after the outage of Eastlake 5 unit, could have identified potential spots for a much wider catastrophe in the FE system. The RTCA model at FE was presumed functional, as long as the EMS server was operational, but was not consulted at any point in the afternoon of August 14. There are indications that FE

dispatchers ran contingency analysis manually as needed rather than executing it periodically and after each contingency. I believe that since RTCA was not used by FE to assess the FE's condition after the forced outage of Eastlake 5, the FE system was not within single (N-1) contingency limits from 15:06 to 16:06 EDT which exposed the FE system to further deterioration once additional system components were more heavily loaded.

5. FE failed to provide dynamic display in its control center for emergency system visualization.

   I believe FE dispatchers relied heavily on the alarm processor for situational awareness since they did not have large-scale visualization tools such as a dynamic map board to identify emergencies. I believe that FE dispatchers were not trained properly for such chaotic circumstances, and did not use other tools to monitor the system and interpret manually the SCADA information they were receiving. It is my opinion that FE dispatchers would have only been partially handicapped without the alarm processor had they known it had failed. However, by not knowing that they were operating for an extended period without an alarm processor, the FE dispatchers did not recognize the deteriorating system conditions and were not receptive to the alarming telephone calls and information received later from neighboring systems.

5. FE failed to establish protocol for communication of critical information between dispatchers.

   It is my opinion that, on August 14, control center communications regarding conditions in northeastern Ohio were ineffective and, in some cases, confusing. It is apparent that poor communications in the FE control center was a significant factor because it exacerbated the FE dispatchers' lack of situational awareness and precluded effective actions to prevent the cascade. It is my opinion that FE did not have an effective plan for communications in the control center during system emergency. The communications were not effective in helping the dispatchers focus on the most urgent problem in front of them — the emerging system and computer failures. I also believe that systematic and effective one-on-one phone calls during an emergency would have been essential to ensure all parties were getting timely and accurate information with a minimum number of calls.

6. FE failed to provide means of alerting FE dispatchers to failure of alarm system or other monitoring tools.

   It is my opinion that the knowledge of alarm processor failure would have allowed FE dispatchers to be more receptive of degrading system conditions. This knowledge could have also allowed FE dispatchers to warn other systems of the loss of a critical monitoring function in the FE control center. It is my opinion that such warnings would have put neighboring systems on alert to monitor FE conditions more closely.

Furthermore, FE lacked procedures to ensure that its dispatchers were continually aware of the functional state of their critical monitoring tools. FE control center computer support staff and operations staff did not have effective internal communications procedures. I believe that FE lacked procedures to test effectively the functional state of its monitoring tools after repairs were made. I also believe that FE did not have additional or back-up monitoring tools to understand or visualize the status of their transmission system to facilitate its dispatchers' understanding of transmission system conditions after the failure of their primary monitoring/alarming systems.

8. Wadsworth IT personnel were at fault for not communicating the IT situation to FE dispatchers.

   I believe that IT personnel at FF were at fault for not advising FE system dispatchers that servers had failed. IT personnel also failed to advise system dispatchers that alarm system was lost with concurrent loss of servers.

9. FE failed to provide proper training to FE personnel and effective utilization of DTS for responding to emergencies.

   It is my opinion that FE relied upon on-the-job experience as training for its dispatchers in handling the routine business of a normal day and provided an insufficient level of formal simulator training for recognizing and responding to emergencies. Although FE dispatchers were NERC certified, NERC certification of dispatchers addresses basic operational considerations but offers little insight into emergency operations issues. It is my opinion that DTS tools were essential if dispatchers and other FE staff were to respond adequately to emergencies. I believe that this training deficiency contributed to the lack of situational awareness and failure to declare an emergency on August 14 while dispatcher intervention was still possible (before events began to occur at a speed beyond human control).

10. FE failed to plan proper operating practices such as scheduling a sufficient supply of reactive power for maintaining proper bus voltage limits on heavily loaded transmission lines.

    ECAR Documentation No.1 "Reliability Criteria for Evaluation and Simulated Testing of the ECAR Bulk Power Supply Systems identifies well-established P-V and Q-V techniques for adequate voltage stability analyses. In my opinion, such studies were not performed thoroughly for analyzing the summer 2003 loading conditions of FE. Such studies would have detected insufficient reactive power supply in emergencies based on operating scenarios that included the Eastlake 5 outage on August 14. I believe that FE was operating in apparent violation of its own historical

planning and operating criteria that were developed and used by Centerior Energy Corporation (The Cleveland Electric Illuminating Company and the Toledo Edison Company) prior to 1998 to meet the relevant ECAR standards and criteria. It is apparent that FE reduced its operating voltage lower limits in 1999 in the Cleveland-Akron area compared to those criteria used in prior years. These reduced minimum operating voltage limits were disclosed in FE's 1999–2003 Planning & Operating Criteria Form 715 submittal to FERC. It is my opinion that more accurate operational and long term planning studies of 2003 summer system would have identified various bottlenecks in the FE operating system which could have indicated potentials for a widespread failure on a heavily loaded FE system.

11. FE failed to implement automatic or manual load shedding procedures.

ECAR document No. 12, "Automatic Load Shedding and Special Protection Systems," has discussed in detail the procedure for mitigating loads for restoring the normal operation. It is my opinion that FE dispatchers made no major effort for shedding a credible amount of load in the Cleveland-Akron area to restore the normal operation of FE system on August 14. They lacked sufficient awareness of FE system conditions because the monitoring system had failed at that time and had no effective means to shed an adequate amount of load quickly.

12. FE System dispatchers took no remedial action on August 14, 2003.

FE dispatchers did not believe the transmission line failures reported by AEP and MISO were real until 15:42 EDT, after FE conversations with the AEP and MISO control rooms and calls from FE IT staff to report the failure of their alarms. I believe that, at that point in time, FE dispatchers began to think that their system might be in jeopardy—but they did not act to restore any of the lost transmission lines, clearly alert their reliability coordinator or neighbors about their chaotic situation, or take other possible remedial measures (such as load shedding) to stabilize their system. I also believe that under-voltage load shedding could have been employed by FE as an automatic remedial action to prevent cascading.

_____

Dr. Mohammed Shahidehpour

Date: _____

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Independent consulting and communications in electric reliability, infrastructure security, energy efficiency, and electricity technology and marketstrategy.

EXPERIENCE:

Consultant, Pflugerville TX

8/2004 to present Working independently with a variety of private and federal clients, providing advice, research, and writing on strategic, marketing and regulatory matters. Public speaking on electric transmission, electric reliability, energy efficiency, demand response, energy policy, and more. Recent work includes:

- Lead author of U.S. Department of Energy report, "National Transmission Congestion Study" (8/06)
- Co-author of U.S. Department of Energy report, "The Value of Economic Dispatch" (11/05)
- Editor of U.S. Department of Energy report, "The Benefits of Demand Response" (2/06)
- Author of report by the ISO-RTO Council, "The Value of Independent Grid Operators" (11/05)
- Author of a chapter on energy infrastructure security issues in The Forgotten Homeland: A Century Foundation Task Force Report on homeland security and critical infrastructure, edited by Richard A. Clarke and Rand Beers, June 2006.
- Author of unreleased U.S. Department of Energy report, "Preparing for the Next Blackout Investigation" (completed 5/05)
- Staff support to the U.S. Department of Energy on a variety of projects including National Action Plan for Energy Efficiency and assessment of transmission and distribution R&D programs and projects.
- Private client work includes contributions to capacity market design testimony, market assessment reports, regulatory and market entry strategy for a demand response provider, and regulatory and legislative strategy and testimony for a private generator.
- Speeches including 2005 LSI New England conference on energy infrastructure security issues, Western Energy Coordinating Council 2005 Mid-C conference on transmission prospects, National Association of Energy Service Companies 2005 conference, World Energy Engineering Conference 2005 keynote on national energy policy, ACEEE 2004 Summer Study keynote on reliability and energy efficiency, Quanta 2004 and 2005 Utility Perspectives conferences, facilitator for George Mason University 2005 workshop on energy infrastructure and cost recovery, U.S. Combined Heat and Power 2004 on regulatory issues, U.S. Department of Energy Gridworks workshop on regulation and R&D, Gulf Coast Power Association on market power, Bonneville Power Administration's 2004 "Energizing the Northwest" conference, testimony at FERC 2006 technical conference on demand response, and AMI-MDM Working Group 2006 keynote.
- Member, GridWise Architecture Council, promoting development of standards for electric system interoperability.

Federal Energy Regulatory Commission, Washington DC

7/01-7/2004 Senior Energy Policy Advisor to Chairman Pat Wood, III – Assisted top federal regulatory official in policy guidance and implementation for the nation's wholesale electric and gas markets. Worked on rulemakings and orders to promote new infrastructure development, make wholesale markets more competitive, and protect wholesale customers from potential market dysfunction and abuse. Assisted in agency management, with leadership role in

information technology operations and investment. Involvement in electric and natural gas market cases and competitive market assessments. Industry leadership in infrastructure protection and cyber-security, distributed generation and demand response, and more. Co-chair of U.S.-Canada Blackout Investigation, principal author of interim and final blackout reports. Extensive public speaking schedule.

Public Utility Commission of Texas, Austin, Texas

6/95 - 6/2001 Advisor to Chairman Pat Wood, III -- Assisted top state regulatory official in policy guidance and implementation for Texas' $18 billion electric and $9 billion local telephone industries, working on all market design cases and analyses. Advised on administrative law cases and rulemakings, legislative and public policy strategy and communications to promote fair, effective, pro-competitive outcomes. Assisted in managing and supervising $12 million, 240 person state agency.

Pacific Gas & Electric Co., San Francisco, California

1992 - 94 Supervisor, Information & Communication Services, Research & Development
1990 - 91 Senior Communications Planner
1988 - 89 News Representative
1986 - 87 Nuclear Rate Case Coordinator
1984 - 85 Rate Economist

ICF, Incorporated, Washington DC

1980 - 81 Associate

Environmental Law Institute, Washington DC

1979 Economist

U.S. Department of Interior, Office of Policy Analysis, Washington DC

1977 - 78 Operations Research Analyst

EDUCATION:

MBA, Stanford University
MSE, Systems Analysis and Economics, The John Hopkins University, Department of Geography and Environmental Engineering
BA, Economics, The John Hopkins University

Kevin K. Eckert
Curriculum Vitae

Education:

- B.S. Forestry — West Virginia University
- B.S. Recreation & Park Management — West Virginia University

Professional Certifications

- International Society of Arboriculture Certified Arborist - WE-1785
- International Society of Arboriculture Certified Utility Specialist

Awards:

- Award of Merit - 2007, Western Chapter - International Society of Arboriculture: Highest award category of the Western Chapter recognizes outstanding, meritorious service in advancing the principles, ideals and practices of progressive arboriculture.
- Honorary Life Membership – 2007 International Society of Arboriculture: Recognition of significant contributions in support of annual conference.
- Kuhina Award - 2002, Hawaii Visitors & Convention Bureau: Recognizes contribution to Hawai'i's visitor industry through lead role in the procurement of the International Society of Arboriculture conference in Hawai'i.
- Utility Arborist Award - 1998, International Society of Arboriculture: Highest award category for the Utility Arborist Association recognizes significant contributions to utility arboriculture.
- Certificate of Appreciation -1997, Edison Electric Institute Vegetation Management Task Force: Recognizes leadership role in the formulation and direction of this national industry policy and lobbying association.

Employment:

- Arbor Global LLC/Arbor Global Hong Kong Ltd. (President and Managing Director): 2002 - present
- Hawaiian Electric Company (System Forester): 1994 - 2002
- Eastern Utilities Associates (System Forester): 1989 - 1994
- New England Power Service Company (Right-of-Way Forester): 1982 - 1989
- Asplundh Environmental Services, Inc. (Now Environmental Consultants Inc.) (Project Manager/Field Supervisor-Data Collection Technician): 1980 - 1982
- Maryland Forest Service (Temporary District Forester): 1979 - 1980
- Maryland Park Service (Seasonal Conservation Aide/Ranger/Interpretive Naturalist): Summers 1977 and 1978
- Practicing Arborist (Supervisor/Climber): 1983 - present

Membership:

- International Society of Arboriculture: 1989 - present
  - Chair, ISA 2007 Annual Conference Committee: 2005 - present
  - Hawaii State Arborist Certification Liaison: 1996 - present
  - Chair of Western Chapter Arborist Certification Committee: 1998 - present
  - International Society of Arboriculture Certification Liaison Committee: 1998 – present
  - Chair of Western Chapter Utility Committee: 1995 - 1998
- Utility Arborists Association: 1989 - present
  - President: 2002 - 2003
  - Board of Directors: 2000 - 2004
- Kaulunani, Hawaii the Beautiful, Council (Federal and State sponsored Urban & Community Forestry Program): 1994 - present
  - Chair: 1996 - present
- Aloha Arborists Association (Local Professional Association): 1994 - present

- Green Hawaii Committee (Tree Preservation, Planting and Community Beautification Team): founding in 2000 - present
- The Outdoor Circle (Environmental Association): 1994 - present
- The Nature Conservancy (International Environmental Association): 1990 - present
- Edison Electric Institute Vegetation Management Task Force: founding in 1990 - 2002
  - Vice-Chair 1993-95
  - Chair: 1995-97
- Hawaiian Sugar Planters Assoc. Pesticide Management Council: 1996

Activities:

- As President and Managing Director of Arbor Global, provide full technical, administrative and executive services for both US and Hong Kong corporations. Actively provide services that include the development, design, oversight, direction and provision of arboriculture and vegetation management consulting services to electric utilities, government operations agencies, regulatory agencies, environmental organizations, corporate clients, and property owners and managers within Hawaii, the mainland United States, the Pacific Rim and Asia. Services include tree risk assessment, tree valuation, tree preservation during construction, program assessment and development, performance auditing, consultation on tree selection, care and maintenance, technical training in professional arboriculture standards and practices, and expert witness services.
- As System Forester for HECO and EUA, led the design and administration of measurably successful tree and vegetation management programs that provided cost-effective, environmentally sound and technically correct line clearance and access to facilities along cross-country rights-of-way.
- As Managing Director and chief consultant for Hawaiian Electric Company Integrated Vegetation Management Services (IVMS), provided expert arboriculture and vegetation management consulting services to electric utility clients within Hawaii, the mainland United States, and Hong Kong.
- Design and conduct of comprehensive program audits and recommendations for municipalities and an audit of a major West Coast electric utility for the Public Utility Commission.
- Preparation and conduct of professional arborist and tree worker education programs in all aspects of arboriculture, including aerial rescue and electrical hazards awareness programs.
- Preparation and conduct of chain saw safety and field maintenance education program for government agencies, tree companies and Spanish-speaking tree workers.
- Preparation and conduct of educational classes for ISA Arborist Certification and Western Chapter ISA Certified Tree Worker candidates across the United States and the Pacific Rim;
- Leadership in the development of the revised Western Chapter ISA Certified Tree Worker Exam;
- Preparation and conduct of Pesticide Certification/Re-Certification classes at request of State agencies in four New England States, California, and Hawaii;
- Preparation and presentation of informational and educational programs for numerous professional and civic organizations, corporate executives, and managers on topics including utility best management practices, work performance auditing, proper pruning practices, tree identification, right tree/right place programs, tree planting and care, integrated vegetation management, electrical safety, tree appraisal, hazard tree identification and tree problem diagnosis;
- Design and conduct of numerous research projects on integrated vegetation management methods, herbicide application and tree growth regulators;
- Preparation and presentation of expert testimony to legislative subcommittees, regulatory agencies, attorneys, and the courts.

Articles in Refereed Journals:

Eckert, K. K. and P. Simpson. May 1994. "Assessing the Feasibility of Collaborative Utility-Municipal Tree Removal and Planting." International Society of Arboriculture. Journal of Arboriculture. Volume 20, Number 3.

Recent Articles in Industry Publications:

Eckert, K. K. "Could Your Company Benefit From Effective Work Crews?" Transmission & Distribution World. Volume 57, Issue 6. June 2005.

Eckert, K. K. "Proper Chain Saw Sharpening." Tree Care Industry Magazine. Volume XVI, Number 4 – April 2005.

Eckert, K. K. "Utility Tree and Vegetation Management (UVM): An Introduction and Description of Successful Programs." EnergyPulse – www.energycentral.com. July 2004.

Eckert, K. K. "Performance Audits: Effective, Objective Contract Crew Performance Field Audits Are Required to Ensure Cost-Effective Program Performance" Proceedings of the CBI Strategic Utility Vegetation Management Conference. Arlington, VA. June 2004.

Eckert, K. K. "How to Successfully Prepare for the ISA Certification Exam." Arborist News. International Society of Arboriculture. Spring 2004.

Eckert, K. K. "Utility Vegetation Management (UVM): How Does it Work and What Are the Procurement Challenges." Proceedings of the CBI 2nd Annual Strategic Supply Chain Management for Utilities Best Practices. Orlando, FL. January 2004.

Eckert, K. K. "When to Consider Tree Removal and Replacement." Hawaii Landscape. March/April 2000.

Eckert, K. K. "Integrated Vegetation Management: Considerations to Specific Site Conditions." Hawaii Landscape. November/December 1999.

Eckert, K. K. "Integrated Vegetation Management: An Overview of Control Options." Hawaii Landscape. September/October 1999.

Eckert, K. K. "Integrated Vegetation Management: What it is and Does it Work?" Hawaii Landscape. July/August 1999.

Eckert, K. K. "Maintaining Plants to Grow and Thrive." Hawaii Landscape. March/April 1999.

Eckert, K. K. "Planting Procedure." Hawaii Landscape. January/February 1999.

Eckert, K. K. "Plant Selection at the Nursery." Hawaii Landscape. November/December 1998.

Eckert, K. K. "Right Tree/Right Place." Hawaii Landscape. September/October 1998.

Books

Eckert, K. K. 2003. *Chain Saw Safety and Field Maintenance – A Photo Guide.*_Hot Pixel Press/Arbor Global LLC. Kailua, HI.

Expert Witness Testimony:

Case	Date	Activity	Trial
Lexington Insurance Co., et al vs. Cleveland Electric, et al	2007	Research	Pending
Hopewell vs. Hong Kong Planning Board	2006	Report	Pending
Andrews vs Green Thumb et al	2006	Research	Pending
West Virginia Flood Litigation	2006	Research	Pending
Mitchem v. Columbia Forest Products et al	2006	Review	Pending
Alderman v. Asplundh et al	2006	Testimony	Trial
WECI vs Davey Tree et al	2005	Deposition	Settled
Engle v Nilasoni et al	2005	Research	Settled
Miyamoto v. Hawaiian Electric Company et al	2004	Deposition	Settled
Hemphill v. Florida Power and Light et al	2003	Deposition	Settled
Rameriz v. Hawaiian Electric Company et al	2002	Deposition	Settled
Illinois Power Company ICCC Petition	2002	Testimony	Settled
Hunt v. USA; Civil No. 99-00420	2001	Testimony	Settled
ALLTEL et al. v. West Penn Power Company	2000	Testimony	Adj. Hearing
Mizushima v. Hawaiian Electric Co, Inc.	2000	Research	Settled
Cesar v. Hawaiian Electric Co, Inc.	1998	Deposition	Settled
Plouffe v. Hawaiian Electric Co, Inc. et al.	1998	Deposition	Settled
Nofoa v. USA et al.	1996	Review	Settled
Tau v. Hawaiian Electric Co, Inc. et al.	1996	Review	Settled
Milner v. Hawaiian Electric Co, Inc.	1994	Testimony	Trial

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APPOINTMENTS

Industrial Activities:

2002-present President, Global Energy market Solutions (GEMS), Inc.

GEMS, Inc. is a consulting company in the business of analyzing, modeling, and providing innovative solutions to the competitive electricity markets. GEMS, Inc. was established in 2002 for offering a complete range of consulting services to the energy industry. List of GEMS' products and software consulting projects include:
Short term and long term electricity market simulation
ISO simulation and market settlements
Market monitoring techniques
AC transmission congestion management
Bidding strategies for FTR auction
Competitive bidding strategies for energy and ancillary services
Arbitrage and portfolio optimization
Electricity price forecasting and volatility analysis
Electricity load forecasting
Asset valuation and risk analysis
Reliability-centered generation and transmission maintenance scheduling

1983-present Technical consultant for the following firms and organizations: American Transmission Company, New England ISO, Nexant, OM Technologies, KEMA Consulting, Siemens, Amoco, C.E. Neihoff Electric, Commonwealth Edison Company, Exelon, IIT Research Institute, Open Access Technologies, Davis Control Corporation, United Nations

Academic Appointment at Illinois Institute of Technology:

Academic Positions in the Electrical and Computer Engineering Department:

2005-present Carl Bodine Distinguished Professor

1991-2005 Professor

1986-1991 Associate Professor

1983-1986 Assistant Professor

Administrative Positions at Illinois Institute of Technology:

2005-present	Chairman, ECE Department
2001-2005	Director, Electric Power and Power Electronics Center
1999-2000	Associate VP for Research and Dean of the Graduate College
1994-1999	Dean of the Graduate College
1993-1994	Associate Dean of Engineering for Research and Graduate Studies
1985-1991	Associate Chairman, Electrical and Computer Engineering Department
1985-1986	Director of Graduate Studies, Electrical and Computer Engineering Department

Other Appointments:

1981-1983	Assistant Professor, Electrical Engineering Department, University of Michigan, Dearborn
1977-1979	Research Fellow, Energy Organization of Iran

TEACHING AND RESEARCH INTERESTS

Research Interests: control and optimization of electric power systems, financial markets and electricity restructuring, computational intelligence, decentralized control, large scale optimization and modeling, decision analysis

Publications: 300 technical articles and 5 books; 200 presentations, invited lectures, and conference chairmanship

Research Supervision and Activities: 30 doctoral dissertations, 19 post-doctoral fellows, and 22 Master's thesis students

Technical Courses Taught: Operation and Control of Power Systems, Optimization Theory and Applications, Communication and Control in Power Systems, Advanced Topics in Electric Power Systems, Deregulated Power Systems, Power Systems Planning, Maintenance Scheduling in Power Systems, Control and Stability of Power Systems, Fault Tolerant Power Systems, Power System Reliability, Computational Methods in Power Systems, Market Operations in Power Systems, Power System Analysis, Design and Operation of Electric Machinery, Linear Control Systems, Electromagnetic Theory, Electric Circuits

EDUCATION

Ph.D.	Electrical Engineering Department, University of Missouri, Columbia, 1981
M.S.	Electrical Engineering Department, University of Missouri, Columbia, 1978
B.S.	Electrical Engineering Department, Sharif University of Technology, Iran, 1977 (High Honors)

HONORARY APPOINTMENTS

2006-present Honorary Professor, Sharif University of Technology, Iran

2002-present Honorary Professor, North China Electric Power University, Beijing

HONORS AND AWARDS

2007 IEEE/PES T. Burke Hayes Faculty Recognition Award in Electric Power Engineering

2007 IEEE/PES Award for Chairing the Working-Group on Again Power Systems

2006 IEEE/PES Award for Chairing the Working-Group on Power Asset Management

2005 IEEE/PES Transactions Prize Paper Award

2004 IEEE/PSO Transactions Prize Paper Award

2003 IEEE Distinguished Lecturer (has made 40 presentations in 25 countries)

2003 Sigma Xi Outstanding Senior Research Faculty Award

2001 Fellow of IEEE (for contributions to power system operation)

2000 National President of HKN (Board President for the EE Honor Society)

2000 Outstanding IEEE/PES Subcommittee Award

2000 Who's Who in America

1999 Technical Paper Award, North American Power Symposium

1995 Outstanding IEEE/PES Working Group Award

1994 Distinguished Service Award, American Power Conference

1993 Listed as one of the 50 R&D Stars to Watch, *Industry Week*

1993 Edison Electric Institute's Power Engineering Educator Award

1990 C. Holmes MacDonald Outstanding Young Electrical Engineering Professor Award

1990 Excellence in Teaching Award at IIT

1988 Outstanding HKN Chapter Advisor Award

1982 Distinguished Faculty Award, University of Michigan-Dearborn

EDITORIAL BOARD MEMBERSHIP

Editor and Guest Editorship:

1995-2007	Editor, IEEE Transactions on Power Systems
2008	Guest Editor, IEEE Power and Energy Magazine (Energy Efficiency)
2007	Guest Editor, IEEE Power and Energy Magazine (Transmission System Planning)
2006	Guest Editor, IEEE Power and Energy Magazine(Aging Electricity Infrastructure)
2005	Guest Editor, IEEE Power and Energy Magazine (Asset Management)
2004	Guest Editor, IEEE Power and Energy Magazine (Electricity Market)
2003	Guest Editor, Special Section in IEEE Transaction on Power Systems
2000-2002	Editor, Marcel Dekker Book Series in Power Systems

Member of Editorial Boards:

2004-present	Member of the Editorial Board, KIEE Journal of Power Engineering (Korea)
2004-present	Member of the Editorial Board, International Journal of Emerging Electric Power
2003-present	Member of the Editorial Board of the IEEE Power and Energy Magazine
2000-2002	Member of the Editorial Board of the HKN Bridge Magazine
1998-2002	Member of the Editorial Board of the IEEE CAP Journal
1997-2000	Member of the Editorial Board of the IEEE Transactions on Systems, Man and Cybernetics
1997-present	Member of the Editorial Board of the Journal of Electric Power Systems Research
1997-present	Member of the Editorial Board of the IEEE Power Engineering Letters
1996-2000	Member of the Editorial Board of the Journal of Electric Machines and Power Systems

BOOKS

1. M. **Shahidehpour** and M. Marwali, Maintenance Scheduling in Restructured Power Systems, Kluwer Publishers, May 2000

2. M. **Shahidehpour** and M. Alomoush, Restructured Electrical Power Systems, Marcel Dekker Publishers, June 2001

3. M. **Shahidehpour**, H. Yamin and Z. Li, Market Operations in Electric Power Systems, John Wiley and Sons, March 2002

4. M. **Shahidehpour** and Y. Wang, Communication and Control of Electric Power Systems, John Wiley and Sons, June 2003

5. M. **Shahidehpour** and Z. Li, Power System Control and Operation, John Wiley and Sons, October 2007

TECHNICAL PUBLICATIONS

Invited Articles:

1. J. Roh, M. **Shahidehpour**, and Y. Fu, "Market-based Coordination of Transmission and Generation Capacity Planning," IEEE Transaction on Power Systems, To appear in 2007

2. M. **Shahidehpour**, "Our Aging Power Systems," IEEE Power and Energy Magazine, Vol. 4, No. 3, pp. 22-23, May 2006

3. M. **Shahidehpour**, "Impact of Electricity Markets on Electric Power Systems," 4th International Conference on Electrical and Electronics Engineering, Turkey, December 2005

4. M. **Shahidehpour**, W. Tinney, and Y. Fu, "Impact of Security on Power System Operation," IEEE Proceedings, Vol. 93, No. 11, pp. 2013 – 2025, Nov. 2005

5. M. **Shahidehpour**, "A Delicate Balance: The business and Science of Asset Management," IEEE Power and Energy Magazine, Vol. 3, No. 3, pp. 32 - 38, May 2005

6. M. **Shahidehpour** and R. Ferrero, "Chronological Strategies in Power Systems Asset Management," IEEE Power and Energy Magazine, Vol. 3, No. 3, pp. 32 - 38 2005, May 2005

7. M. **Shahidehpour**, Y. Fu, and T. Wiedman, "Impact of Natural Gas Infrastructure on Electric Power Systems," IEEE Proceedings, Vol. 93, No. 5, pp. 1042 – 1056, May 2005

8. B. Lu and M. **Shahidehpour**, "Impact of Phase Shifters on Locational Prices," Special Issue, ASCE Journal of Energy Engineering, Vol. 131, No. 1, pp. 52-71, April 2005

9. M. **Shahidehpour**, "Cool Currents: Evolution of Superconductors in Electric Power Systems," IEEE Power and Energy Magazine, Vol. 3, No. 2, pp. 17-19, March 2005

10. M. **Shahidehpour** and Yong Fu, "Benders Decomposition," IEEE Power and Energy Magazine, Vol. 3, No. 2, pp. 20-21, March 2005

11. Y. Fu and M. **Shahidehpour**, "Profit-based Generation Resource Planning," IMA Journal of Management Mathematics, (Oxford University Press), Vol. 15, No. 4, pp. 273-289, 2004

12. T. Li and M. **Shahidehpour**, "Market Power Analysis in Electricity Markets using Supply Function Equilibrium Model," IMA Journal of Management Mathematics (Oxford University Press), Vol. 15, No. 4, pp. 339-354, 2004

13. E. Vaahedi and M. **Shahidehpour**, "Tools for Managing Restructured Energy Systems," Special Section, IEEE Transaction on Power Systems, Vol. 19, No. 4, pp. 1999-2005, Nov. 2004

14. M. **Shahidehpour**, "The Business of Power," Guest Editorial, IEEE Power and Energy Magazine, Vol. 2, No. 4, pp. 26-28, July 2004

15. M. Marwali and M. **Shahidehpour**, "Role of Fuzzy Sets in Power System State Estimation," International Journal of Emerging Electric Power Systems, Vol. 1, May 2004

16. M. **Shahidehpour**, F. Schwatrz, "Don't Let the Sun Go Down on PV," IEEE Power and Energy Magazine, pp. 40-48, May 2004

17. M. **Shahidehpour**, "Investing in Expansion: The Many Issues that Cloud Electricity Planning," IEEE Power and Energy Magazine, pp. 14-18, Jan 2004

18. E. Rezania and M. **Shahidehpour**, "Available Transfer Capacity Calculation by Interior Point," IEEE/PICA Tutorial on Applications of Interior Point Method to Power System Operation, 1999

19. M. **Shahidehpour** and H. Yamin, "Risk Management using Game Theory in Transmission Constrained Unit Commitment within a Deregulated Power Market," chapter in IEEE/PES Tutorial on Applications of Gaming Methods to Power System Operation, 1999

20. M. **Shahidehpour** and R. Ferrero, "Electricity Supply Industry," chapter in Wiley Encyclopedia of Electrical and Electronics Engineers, 1999

21. M. **Shahidehpour** and M. Marwali, "Power Transmission Network," chapter in Wiley Encyclopedia of Electrical and Electronics Engineers, 1999

22. M. **Shahidehpour** and M. Alomoush, "Decision Making in a Deregulated Power Environment Based on Fuzzy Sets," book chapter in AI Applications to Power Systems, Kluwer Publishers, 1999

23. M. **Shahidehpour** and R. Ferrero, "Fuzzy Systems Approach to Short-Term Power Purchases Considering Uncertain Prices," book chapter in Electric Power Applications of Fuzzy Systems, IEEE Press, pp. 321-338, 1998

24. M. **Shahidehpour** and VC Ramesh, "Nonlinear Programming Algorithms and Decomposition Strategies for OPF," chapter in IEEE/PES Tutorial on Optimal Power Flow, 1996

25. M. **Shahidehpour** and C. Wang, "Applications of Artificial Neural Networks in Multi-Area Generation Scheduling with Fuzzy Data," EPRI Publication TR-104219, July 1994

26. M. **Shahidehpour**, "Enhancing Traditional Power System Computing Using AI Techniques," chapter in IEEE/PES Tutorial on Knowledge-Based System Techniques with Applications to Power Systems, 1993

Journal Publications:

27. Y. Fu and **M. Shahidehpour**, "Fast SCUC for Large Scale Power Systems," IEEE Transaction on Power Systems, To appear in 2007

28. T. Li and **M. Shahidehpour**, "Risk-Constrained Generation Asset Arbitrage in Power Systems," IEEE Transaction on Power Systems, To appear in 2007

29. Y. Fu, **M. Shahidehpour**, and Z. Li, "Security-Constrained Optimal Coordination of Generation and Transmission Maintenance Outage Scheduling," IEEE Transaction on Power Systems, To appear in 2007

30. J. Roh, **M. Shahidehpour**, and Y. Fu, "Security-Constrained Resource Planning in Electricity Markets," IEEE Transaction on Power Systems, To appear in 2007

31. T. Li and **M. Shahidehpour**, "Dynamic Ramping in Unit Commitment," IEEE Transaction on Power Systems, To appear in 2007

32. L. Wu, **M. Shahidehpour**, and T. Li, "Stochastic Security-Constrained Unit Commitment," IEEE Transaction on Power Systems, To appear in 2007

33. T. Li, M. **Shahidehpour**, and Z. Li, "Risk-Constrained Bidding Strategy with Stochastic Unit Commitment," IEEE Transaction on Power Systems, Vol. 22, No. 1, pp. 449-458, Feb. 2007

34. H. Yamin, Q. El-Dwairi, and **M. Shahidehpour**, "A New Approach for GenCos Profit Based Unit Commitment in Day-Ahead Competitive Electricity Markets Considering Reserve Uncertainty," International Journal of Electrical Power and Energy Systems, 2007

35. O. Tor and M. **Shahidehpour**, "Transmission Management in the Aftermath of Electricity Restructuring in Turkey," The Electricity Journal, Vol.19, No. 7, pp. 38-46, Sept. 2006

36. Y. Fu, M. **Shahidehpour**, and Z. Li, "AC Contingency Dispatch based on Security-Constrained Unit Commitment," IEEE Transaction on Power Systems, Vol. 21, No. 2, pp. 897-908, May 2006

37. M. Oloomi, H. Shanechi, G. Balzer, M. **Shahidehpour**, N. Pariz, "Network Planning in Unbundled Power Systems," IEEE Transaction on Power Systems, Vol. 21, No. 3, pp. 1379-1387, Aug. 2006

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39. Y. Fu, M. **Shahidehpour**, and Z. Li, "Long-Term Security-Constrained Unit Commitment: Hybrid Dantzig-Wolfe Decomposition and Subgradient Approach," IEEE Transaction on Power Systems, Vol. 20, No. 4, pp. 2093-2106, Nov. 2005

40. T. Li, M. **Shahidehpour**, and Z. Li, "Price-Based Unit Commitment: A Case of Lagrangian Relaxation Versus Mixed Integer Programming," IEEE Transaction on Power Systems, Vol. 20, No. 4, pp. 2015-2025, Nov. 2005

41. Y. Fu, M. **Shahidehpour**, and Z. Li, "Security-Constrained Unit Commitment with AC Constraints," IEEE Transaction on Power Systems, Vol. 20, No. 3, pp. 1538-1550, Aug. 2005

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43. T. Li and M. Shahidehpour, "Bidding Strategy for FTR Obligations in Transmission Markets," IEE Proceedings, Vol. 152, No. 3, pp. 422-428, May 2005

44. B. Lu and M. **Shahidehpour**, "Short-term Scheduling of Battery in Grid-Connected PV/ Battery System," IEEE Transaction on Power Systems, Vol. 20, No. 2, pp. 1053 – 1061, May 2005

45. Z. Li and M. **Shahidehpour**, "Security-Constrained Unit Commitment for Simultaneous Clearing of Energy and Ancillary Services Markets," IEEE Transaction on Power Systems, Vol. 20, No. 2, pp. 1079-1088, May 2005

46. B. Lu and M. **Shahidehpour**, "Unit Commitment with Flexible Generating Units," IEEE Transaction on Power Systems, Vol. 20, No. 2, pp. 1022-1034, May 2005

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48. M. **Shahidehpour** and H.Y. Yamin, "A Technique for the Standing Phase-Angle Reduction in Power System Restoration," Electric Power Components and Systems, Vol. 33. No. 3, pp. 277-286, Mar. 2005

49. T. Li and M. **Shahidehpour**, "Strategic Bidding of Transmission-Constrained GENCOs with Incomplete Information," IEEE Transaction on Power Systems, Vol. 20, No. 1, pp. 437 – 447, Feb. 2005

50. H.Y. Yamin and M. **Shahidehpour**, "Risk and Profit in Self-Scheduling for GenCos," IEEE Transaction on Power Systems, Vol. 19, No. 4, pp. 2104-2105, Nov. 2004

51. M.O. Buygi, G. Balzer, H. Shanechi, M. **Shahidehpour**, "Market-based Transmission Expansion Planning," IEEE Transaction on Power Systems, Vol. 19, No. 4, pp. 2060-2067, Nov. 2004

52. J. Wang and **M. Shahidehpour**, "Electricity Transaction Tagging Management in American Electricity Market," Automation of Electric Power Systems, Vol. 28, No. 2, pp. 8-12, Aug. 2004

53. B. Lu and M. **Shahidehpour**, "Short-term Scheduling of Combined Cycle Units," IEEE Transaction on Power Systems, Vol. 19, No. 3, pp. 1616-1625, Aug. 2004

54. H. Yamin, S. Al-Agtash, and M. **Shahidehpour**, "Security-Constrained Optimal Generation Scheduling for GENCOs" IEEE Transaction on Power Systems, Vol. 19, No. 3, pp. 1365-1372, Aug. 2004

55. J. Wang and M. **Shahidehpour**, "Electricity Transaction Tagging Management in American Electricity Market," Automation of Electric Power Systems (in Chinese), Vol. 28, No. 2, pp. 8-12, may 2004

56. Z. Li and M. **Shahidehpour**, "Generation Scheduling with Thermal Stress Constraints," IEEE Transaction on Power Systems, Vol. 18, No. 4, pp. 1402-1409, Nov. 2003

57. H. Yamin, K. Al-Tallaq, and M. **Shahidehpour**, "A Novel Approach for Optimal Power Flow using Benders Decomposition in A Deregulated Power Market," Journal of Electric Power Components & Systems, Vol. 31, No. 12, Dec. 2003

58. H. Yamin, K. Al-Tallaq, M. **Shahidehpour**, "New Approach for Dynamic Optimal Power Flow using Benders Decomposition in a Deregulated Power Market," Journal of Electric Power Systems Research, No. 65, pp. 101-107, May 2003

59. A. Srivastava and M. **Shahidehpour**, "Restructuring Choices for the Indian Power Sector," IEEE Power Engineering Review, Vol. 22, No. 11, pp. 25-29, Nov. 2002

60. M. Oloomi Buygi, H. Modir Shanechi, and **M. Shahidehpour**, "Transmission Planning in Deregulated Environments," International Journal of Engineering, Vol. 15, No. 3, pp. 249-256, Oct. 2002

61. E. Rezania and M. **Shahidehpour**, "Real Power Loss Minimization Using Interior Point," Electric Power and Energy Systems, Vol. 23, pp. 45-56, 2001

62. M. Alomoush and M. **Shahidehpour**, "Contingency Constrained Congestion Management with a Minimum Number of Adjustments in Preferred Schedules," Electric Power and Energy Systems, Vol. 22, pp. 277-290, 2000

63. M. Alomoush and M. **Shahidehpour**, "Generalized Model for Fixed Transmission Rights Auction," Electric Power Systems Research, Vol. 29, pp. 207-220, 2000

64. M. Alomoush and M. **Shahidehpour**, "Fixed Transmission Rights for Inter-Zonal and Intra-Zonal Congestion Management," IEE Proc., Vol. 146, No. 5, pp. 471-476, Sept. 2000

65. M. Marwali and M. **Shahidehpour**, "Coordination Between Long-term and Short-term Generation Scheduling with Network Constraints," IEEE Transactions on Power Systems, Vol. 15, No. 3, pp. 1161-1167, Aug. 2000

66. M. Marwali and M. **Shahidehpour**, "Short-term Transmission Line Maintenance Scheduling in a Deregulated System," IEEE Transactions on Power Systems, Vol. 15, No. 3, pp. 1117-1124, Aug. 2000

67. J. Kavicky and M. **Shahidehpour**, "A Subarea-Level Transaction Simulation Framework Supporting Parallel Paths and Energy Tagging," IEEE Transactions on Power Systems, Vol. 15, No. 2, pp. 873-878, May 2000

68. M. Marwali and M. **Shahidehpour**, "A Probabilistic Approach to Generation Maintenance Scheduler with Network Constraints," Electric Power and Energy Systems, Vol. 21, pp. 533-545, Nov. 1999

69. M. Marwali and M. **Shahidehpour**, "Long-Term Transmission and Generation Maintenance Scheduling with Network, Fuel and Emission Constraints," IEEE Transactions on Power Systems, Vol. 14, No. 3, pp. 1160-1165, Aug. 1999

70. M. **Shahidehpour**, et. al., "The IEEE Reliability Test System," IEEE Transactions on Power Systems, Vol. 14, No. 3, pp. 1010-1020, Aug. 1999

71. H. Ma and M. **Shahidehpour**, "Unit Commitment with Transmission Security and Voltage Constraints," IEEE Transactions on Power Systems, Vol. 14, No. 2, May 1999

72. E. Rezania and M. **Shahidehpour**, "Calculation of Transfer Capability of Power Systems using an Efficient Predictor-Corrector Primal-Dual Interior-Point Algorithm," Electric Machines and Power Systems, Vol. 27, No. 1, pp. 25-38, Jan. 1999

73. M. Marwali and M. **Shahidehpour**, "A Deterministic Approach to Generation and Transmission Maintenance Scheduling with Network Constraints," Electric Power Systems Research, Vol. 47, No. 2, pp. 101-114, Oct. 1998

74. M. Marwali and M. **Shahidehpour**, "Short Term Generation Scheduling in Photovoltaic-Utility Grid with Battery Storage," IEEE Transactions on Power Systems, Vol. 13, No. 3, pp. 1057-1062, Aug. 1998

75. M. Marwali and M. **Shahidehpour**, "Integrated Generation and Transmission Maintenance Scheduling with Network Constraints," IEEE Transactions on Power Systems, Vol. 13, No. 3, pp. 1063-1068, Aug. 1998

76. R. Ferrero, J. Rivera and M. **Shahidehpour**, "A Dynamic programming Two Stage Algorithm for Long-Term Hydrothermal Scheduling of Multireservoir Systems," IEEE Transactions on Power Systems, Vol. 13, No. 4, pp. 1534-1540, Nov. 1998

77. H. Ma and M. **Shahidehpour**, "Transmission Constrained Unit Commitment Based on Benders Decomposition," Electric Power and Energy Systems, Vol. 20, No. 4, pp. 287-294, April. 1998

78. R. Ferrero, J. Rivera and M. **Shahidehpour**, "Application of Games with Incomplete Information for Pricing Electricity in Deregulated Power Pools," IEEE Transactions on Power Systems, Vol. 13, No. 1, pp. 184-189, Feb. 1998

79. M. Marwali and M. **Shahidehpour**, "Coordination of Short-term and Long-term Transmission Maintenance Scheduling in a Deregulated Systems," IEEE Power Engineering Letters, Vol. 1, No. 1, pp. 46-48, Feb. 1998

80. H. Ma and M. **Shahidehpour**, "Unit Commitment with Voltage Constraints," International Journal of Energy Research, Vol. 21, pp. 1385-1398, Nov. 1997

81. R. Ferrero and M. **Shahidehpour**, "Short-term Power Purchases Considering Uncertain Prices," IEE Proc., Vol. 144, No. 5, pp. 423-428, Sept. 1997

82. J. Kavicky and M. **Shahidehpour**, "Determination of Generator Siting and Contractor Options Based on Interutility Tie Line Flows," IEEE Transactions on Power Systems, Vol. 12, No. 4, pp. 1649-1653, Nov. 1997

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84. R. Ferrero and M. **Shahidehpour** and V. Ramesh, "Transaction Analysis in Deregulate Power Systems using Game Theory," IEEE Transactions on Power Systems, Vol. 12, No. 3, pp. 1340-1347, August 1997

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92. J. Kavicky and M. **Shahidehpour**, "Parallel Path Aspects of Transmission Modeling," IEEE Transactions on Power Systems, Vol. 11, No. 3, pp. 1180-1190, 1996

93. X. Bai and M. **Shahidehpour**, "Hydro-thermal Scheduling by Tabu Search and Decomposition Method," IEEE Transactions on Power Systems, Vol. 11, No. 2, pp. 968-975, May 1996

94. R. Ferrero and M. **Shahidehpour**, "Energy Interchange in Deregulated Power Systems," Electrical Power and Energy Systems, Vol. 18, No. 4, pp. 251-258, May 1996

95. K. Abdul-Rahman and M. **Shahidehpour**, "A Practical Power Systems Resource Scheduling with OPF Constraints," IEEE Transactions on Power Systems, Vol. 11, No. 1, pp. 254 - 259, Feb. 1996

96. S. Wang and M. **Shahidehpour**, "Power Systems Marginal Cost Curve and Its Applications," IEEE Transactions on Power Systems, Vol. 10, No. 3, pp. 1321-1328, Aug. 1995

97. S. Wang and M. **Shahidehpour**, "Short-term Generation Scheduling with Transmission and Environmental Constraints Using an Augmented Lagrangian Relaxation," IEEE Transactions on Power Systems, Vol. 10, No. 3, pp. 1294-1301, Aug. 1995

98. K. Abdul-Rahman, M. **Shahidehpour** and N. Deeb, "Effect of EMF on Minimum Cost Power Transmission," IEEE Transactions on Power Systems, Vol. 10, No. 1, pp. 347-355, Feb. 1995

99. K. Abdul-Rahman and M. **Shahidehpour**, "Static Security in Power System Operation with Fuzzy Real Load Conditions," IEEE Transactions on Power Systems, Vol. 10, No. 1, pp. 77-87, Feb. 1995

100. C. Wang and M. **Shahidehpour**, "Optimal Generation Scheduling with Ramping Costs," IEEE Transactions on Power Systems, Vol. 10, No. 1, pp. 60-67, Feb. 1995

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108. N. Deeb and M. **Shahidehpour**, "Cross Decomposition for Multi-Area Optimal Reactive Power Planning," IEEE Transactions on Power Systems, Vol. 8, No. 3, pp. 1539-1544, Nov. 1993

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114. S. Li and M. **Shahidehpour**, "An Object Oriented Power System Graphics Package for Personal Computer Environment," IEEE Transactions on Power Systems, Vol. 8, No. 3, pp. 1054-1060, Aug. 1993

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270. C. Wang and M. **Shahidehpour**, "Application of Neural Networks in Generation Scheduling with Fuzzy Data," in Proceedings of 1991 American Power Conference, Chicago, IL, Apr. 1991

271. C. Nwankpa and M. **Shahidehpour**, "A New Approach to the Indication of Voltage Collapse in Electric Power Systems," in Proceedings of 1990 Power Systems Computation Conference, Graz, Austria, Aug. 1990

272. C. Nwankpa and M. **Shahidehpour**, "Effect of Small Load Fluctuations on Power System Voltage Stability Studies," in Proceedings of the 1990 American Control Conference, pp. 2106-2110, San Diego, CA, May 1990

273. C. Nwankpa and M. **Shahidehpour**, "A Class of Power Network Reliability Problems Via Colored Noise Modeling," in Proceedings of the 1990 IEEE International Symposium on Circuits and Systems, pp. 164-167, New Orleans, LA, May 1990

274. Z. Ouyang and M. **Shahidehpour**, "Generation Scheduling Decision Supported by Neural Networks," in Proceedings of the 1990 EPRI Conference on Decision Support Methods for the Electric Power Industry, Cambridge, MA, May 1990

275. C. Wang and M. **Shahidehpour**, "Unit Commitment by Neural Networks," in Proceedings of 1990 American Power Conference, Vol. 52, pp. 245-250, Chicago, IL, Apr. 1990

276. M. **Shahidehpour**, "Multi-Stage Unit Commitment by Artificial Neural Networks," in Proceedings of the NSF Workshop on Artificial Neural Networks, pp. 66-70, Clemson, SC, Apr. 1990

277. Z. Ouyang and M. **Shahidehpour**, "Power Generation Scheduling Using an Expert System," in Proceedings of the Sixth IASTED Conference on Expert Systems, pp. 134-137, Los Angeles, CA, Dec. 1989

278. C. Nwankpa and M. **Shahidehpour**, "A Probabilistic Approach to Bulk Power Transmission Reliability," in Proceedings of the 1989 North American Power Symposium, pp. 88-94, Rolla, MO, Oct. 1989

279. A. Behera and M. **Shahidehpour**, "Dynamics of Power Systems in Reliability Studies," in Proceedings of 32nd Midwest Symposium on Circuits and Systems, pp. 268-272, Urbana, IL, Aug. 1989

280. M. **Shahidehpour**, "Power System Restoration-An Expert System Approach," Presented at the 1989 IEEE Power Engineering Society Summer Power Meeting, Long Beach, CA, July 1989

281. C. Nwankpa and M. **Shahidehpour**, "Inclusion of Small Random Perturbations in a Structure Preserving Model for Power System Reliability Studies," in Proceedings of the 1989 IASTED International Conference on Power, pp. 471-475, Valencia, Spain, July 1989

282. N. Deeb and M. **Shahidehpour**, "Modeling of Protection System in Composite Power Systems Reliability Evaluation," in Proceedings of the 16th International RAM Conference for the Electric Power Industry, pp. 415-421, Monterey, CA, June 1989

283. S. Shah and M. **Shahidehpour**, "A Rule Based Load Shedding Strategy in Electric Power Systems," in Proceedings of the EPRI Conference on Expert Systems in Power, Orlando, FL, June 1989

284. S. Tong and M. **Shahidehpour**, "An Innovative Approach to Generation Scheduling in Large- Scale Power Systems with Fuel Constrained Units," in Proceedings of the 1989 IEEE Power Industry Computer Applications Conference, pp. 188-196, Seattle, WA, June 1989

285. N. Deeb and M. **Shahidehpour**, "Calibration of Measurement Sets in an Electric Power System Using an Updated Broyden Method," in Proceedings of the 1989 American Power Conference, Chicago, IL, Apr. 1989

286. N. Deeb and M. **Shahidehpour**, "Economic Allocation of Reactive Power Supply in an Electric Power Network," in Proceedings of the 1989 IEEE International Symposium on Circuits and Systems, pp. 1859-1862, Portland, OR, May 1989

287. M. **Shahidehpour**, "Utilities' Concern for the Design of a Power System Security Analyzer," Presented at the 1988 Annual Meeting of the American Association for Artificial Intelligence, Minneapolis, MN, Aug. 1988

288. S. Shah and M. **Shahidehpour**, "Application of Expert System in the Design of Power System Security Analyzer," in Proceedings of the 1988 IASTED International Conference on Expert System Theory and Applications, pp. 14-18, Geneva, Switzerland, June 1988

289. J. Qiu and M. **Shahidehpour**, "Application of Singular Perturbation in Modeling Load Disturbances and Its Effect on Power Systems Reliability Evaluation," Presented at the 1988 SIAM Annual Meeting, Minneapolis, MN, May 1988

290. S. Shah and M. **Shahidehpour**, "Automated Reasoning: A New Concept in Power System Security Analysis," in Proceedings of the IEEE International Workshop on Artificial Intelligence for Industrial Applications, pp. 58-63, Hitachi City, Japan, May 1988

291. N. Abbasy and M. **Shahidehpour**, "An Overview of Power Systems Static State Estimation," in Proceedings of the 4-th International Conference on Advanced Science and Technology, pp. 286-296, Chicago, IL, March 1988

292. N. Abbasy and M. **Shahidehpour**, "Power System State Estimation: A Mathematical Programming Approach," in Proceedings of the 1988 IASTED International Conference on High Tech in Power Industry, pp. 56-61, Tempe, AZ, Feb. 1988

293. S. Shah and M. **Shahidehpour**, "Application of Expert Systems to Power System Security Analysis," in Proceedings of the 49th Annual Meeting of the American Power Conference, pp. 780-788, Chicago, IL, Apr. 1987

294. G. Kraft and M. **Shahidehpour**, "Application of Artificial Intelligence to Distributed Processing in a Power System Environment," in Proceedings of the 6th Power Plant Dynamics, Control and Testing Conference, Knoxville, TN, June 1986

295. J. Banda and M. **Shahidehpour**, "Underground Distribution Surge Protection," in Proceedings of the 48-th Annual Meeting of the American Power Conference, pp. 657-664, Chicago, IL, Apr. 1986

296. G. Kraft and M. **Shahidehpour**, "Recovery Techniques in a Distributed Power Environment," in Proceedings of the 1985 Power Plant Digital Control and Fault-Tolerant Microcomputers Conference, (Electric Power Research Institute), Phoenix, AZ, Sept. 1985

297. M. **Shahidehpour**, "Benefits of Interconnection in Three-Area Power Systems, in Proceedings of the 1985 Midwest Power Symposium, Houghton, MI, Oct. 1985

298. F. Samouhi and M. **Shahidehpour**, "Effect of Forced Oscillation on Transient Stability of Power Systems by Direct Method of Liapunov," in Proceedings of the 1984 Midwest Power Symposium, Philadelphia, PA, Oct. 1984

299. M. **Shahidehpour**, J. Tudor and C. Harbourt, "Multi-Area Power Reliability Evaluation," in Proceedings of 1the 1982 Reliability and Maintainability Symposium, pp. 132-137, Los Angeles, CA, Dec. 1982

300. M. **Shahidehpour** and J. Tudor, "Determination of LOLP and the Effect of Tie Capacity on Area Reserve Requirements," in Proceedings of the 1980 Midwest Power Symposium, West Lafayette, IN, Oct. 1980

GRADUATE STUDENTS AND VISITING SCHOLARS

Ph.D. Students: (Date of graduation is given in parenthesis)

1. C. Liu (ongoing): Power System Operation in Restructured Power Systems
2. A. Lotfju (ongoing): Power System Communication and Control
3. M. Urbina (ongoing): Renewable Energy Applications
4. L. Wu (ongoing): Stochastic Security-Constrained Unit Commitment
5. L. Abreu (ongoing): Wind Energy Coordination and Control
6. J. Roh (ongoing): Power System Planning in Restructured Power Systems
7. J. Wang (2007): Market Design Tools In Restructured Power Systems
8. H. Daneshi (2006): Market Simulation in Electric Power Systems
9. Y. Fu (2006): Security-Constrained Operational Planning in Power Systems
10. T. Li (2006): Competition and Risk Management in Power Markets
11. B. Lu (2004): Security-Constrained Unit Commitment with Flexible Operating Conditions
12. Z. Li (2002): Asset Valuation and Risk Analysis in Electric Power Systems
13. H. Yamin (2001): Options for Pricing Ancillary Services in a Deregulated System
14. M. Alomoush (1999): Auctionable Fixed Transmission Rights for Congestion Management
15. E. Rezania (1998): Contingency Constrained Available Transfer Capability with Real and Reactive Power Limits using an Interior Point Method
16. J. Kavicky (1997): Application of Parallel Path in Transmission Open Access
17. M. Marwali (1997): Transmission and Generation Maintenance Scheduling with Different Time Scales
18. H. Ma (1997): Applications of Decomposition Techniques to Unit Commitment with Transmission Flow and Voltage Constraints
19. R. Ferrero (1997): Application of Game Theory with Incomplete Information to Deregulated Power Systems
20. K. Abdul-Rahman (1994): Applications of Fuzzy Sets to Power Systems Operation and Planning

21. C. Wang (1992): Fuzzy Artificial Intelligence Approach to Optimal Generation Scheduling of Large-Scale Hydro-Thermal Power Systems with Uncertain Data

22. C. Nwankpa (1990): Stochastic Models for Power System Dynamic Stability Analysis

23. Z. Ouyang (1990): Application of Artificial Intelligence Techniques to Short Term Electric Power Generation Scheduling

24. N. Deeb (1989): Decomposition Approach to Optimal Reactive Power Dispatch in Large Scale Power Systems

25. S. Tong (1989): Generation Scheduling in Large Scale Hydro Thermal Power Systems with Fuel Constrained Units

26. N. Abbasy (1988): Optimal Set of Measurements for Estimation of System States

27. S. Shah (1988): Expert Systems Application to Power Network Security Analysis

28. J. Qiu (1987): Effect of Random Perturbations on Power Systems Reliability Evaluation

29. X. Shu (1986, with Professor Semyon Meerkov): Vibrational Control in Lumped and Distributed Parameter Systems: Theory and Applications

30. J. Banda (1985): Evaluation of Surge Protection in Underground Distribution Systems Using Zinc Oxide Surge Arresters

Post-doctoral Visiting Scholars

31. Professor Jaeseok Choi, Gyeongsang National University, Korea (2007-2009): Power System Planning

32. Professor Jose Roberto Sanches Mantovani, Sao Paulo State University, Brazil (2006-2007): Power System Operation

33. Dr. Yong Fu, GEMS Corporation, (2006-2007): Outage Management in Electricity Markets

34. Dr. Tao Li, GEMS Corporation, (2006-2007): Strategic Bidding in Electricity Markets

35. Mr. Osman Tor, Middle East Technical University, (2004-2005), Restructuring Models for Turkey

36. Dr. H. Kim, Pusan University, Korea, (2004-2006): Platform for the Simultaneous Auction of Energy and Transmission Systems

37. Dr. Z. Li, GEMS Corporation, (2002-2003): Probabilistic Transmission Risk Analysis

38. Dr. Y. Wang, Tianjin University, PRC, (1999-2003): Distributed Energy Management Systems

39. Dr. H. Shanechi, Ferdowsi University, Iran, (2001): Distributed Generation Technologies

40. Dr. M. Alomoush, University of Jordan, (1999-2000): A Comprehensive Approach for the Supervisory Control of a Deregulated Power System

41. Dr. M. Marwali, Agency for the Assessment and Application of Technology, Indonesia, (1998): Reliability-Centered Maintenance Scheduling in Deregulated Power Systems

42. Dr. X. Wang, Electrical and Computer Engineering Department, Harbin Institute of Technology, PRC (1995-1996): Power Systems Voltage Stability

43. Dr. R. Ferrero, Electrical Engineering Department, University of San Juan, Argentina (1994-1996): Game Theory and Applications to Power Systems

44. Prof. S. Zhu, Electrical and Computer Engineering, Tsinghua University, PRC (1994-1995): Power Plants Control and Operation

45. Dr. X. Bai, Electric Power Research Institute, Beijing, PRC (1994-1995): Regional Power Transfer and Hydro-thermal Power Systems Deregulation

46. Dr. K. Abdul-Rahman, Siemens Corporation (1993-1994): Optimal Generation Scheduling by Augmented Relaxation Method

47. Dr. I. Roytelman, Kiev Research and Design Institute, Kiev, USSR (1992-1993): Power Distribution Automation Techniques

48. Prof. M. Pourkermani, Electrical Engineering Department, Technical University of Stuttgart, Germany (1991-1992): Special Purpose Synchronous Machines

49. Dr. S. Li, Research Institute of Electric Light Source Material, Nanjing, PRC (1990-1991): Objected Oriented Graphics in Power Systems

50. Prof. S. Sun, Electrical Engineering Department, Tsinghua University, PRC (1986-1989): Power Systems Planning Techniques in China

M.S. Thesis Students: (Date of graduation is given in parenthesis)

51. S. Duggirala (2006): Transmission Planning in Restructured Power Systems

52. A. Khan (2006): Wind Speed Forecasting using Wavelets

53. V. Ellia (2005): Agents in Electric Power System Operation

54. D. Patil (2005): Design of Batteries for Electric Cars

55. J. Bui (2005): Hydrogen Economy

56. M. Phadke (2004): Equivalent Energy Function Approach to Photovoltaic-Utility Systems

57. A. Koshi (2004): Superconductors in Electric Power Systems

58. N. Sriram (2004): Biomass in Electric Power Systems

59. A. Joseph (2004): Battery and Storage in Electric Power Systems

60. S. Kullanthasamy (2004): Asset Management in Power Systems

61. S. Sood, (2004): Power Generation at Brownfields

62. S. Sheth (2004): Geothermal Energy in Power Systems

63. R. Pegallapati (2004): Small Hydro as Green Power

64. P. Ganesan (2003): Transmission Management in Restructured Power Systems

65. G. Ponnuvel (2003): Impact of Losses on Transmission Pricing

66. A. Eybalin (2002): Restructuring Models for European Countries S. Sood, (2004): Power Generation at Brownfields

67. M. Albaijat (1999): Optimal Power Flow Calculation with Evolutionary Programming

68. N. Maricar (1998): An Object Oriented Programming Approach to Power System Visualization

69. D. Mardijino (1998): Application of Artificial Neural Networks to Short-Term Load Forecasting

70. M. Marwali (1994): Fuzzy Least Median Square Estimator in Power Systems

71. M. Yesioglo (1993): Adaptive Control of Nonlinear Dynamical Systems by Artificial Neural Networks

72. K. Labudda (1992): Fuzzy Linear Programming Approach to Power System State Estimation

73. J. Qiu (1985): A New Approach to Power Loss Minimization

RESEARCH AND DEVELOPMENT GRANTS AND CONTRCTS

- Power Engineering Research and Education, $5000,000, Grainger Foundation, 2007-2012
- Electrical Engineering Laboratory Development, $80,000, Elite Electronics, 2006
- Wind Energy Technology Development in Illinois, $50,000Invenergy Corp, 2006
- Technical and Market Integration of Small Hydro Development, $50,000, Ornco Corp. 2006
- Electrical Engineering Laboratory Development, $400,000, Cherry Electronics, 2006
- Electrical Engineering Laboratory Development, $500,000, Zebra Technology, 2005-2006
- Security Constrained Maintenance Scheduling, $1,000,000, Siemens Corporation, 2006-2007
- Unit Commitment with AC Constraints, $700,000, Nexant Corporation, 2004-2005
- Power Engineering Research, $500,000, Grainger Foundation, 2004
- A Novel Approach for Improving Power Electronics and Electric Drives Curriculum, $400,000, NSF, 2003
- Leader Follower for Power Market Operations, $150,000, NSF, 2003
- PV-Battery System for Transmission Management, $120,000, DOE, 2003
- Probabilistic Risk Evaluation of Transmission Systems, $70,000, ComEd, 2002
- Virtual Counseling in Illinois High Schools, $50,000, Illinois Board of Higher Ed, 2001
- Power Engineering Innovations, $500,000, Grainger Foundation, (was matched by IIT for a total of $1,000,000), 2000-2001
- Distributed Control of Power Systems, $250,000, ONR, 1999
- Illinois State Matching Grant Program, $43,000, Illinois Board of Higher Education, 1999
- Power Engineering Laboratory Research, $200,000, ComEd, 1998
- Interactive Risk-Based Planning for Dynamic Contingencies, $150,000, EPRI, 1998
- A Multi-Agent Approach to Feeder Reconfiguration, $50,000, NSF, 1998
- Grainger Power Engineering Laboratory at IIT, $200,000, Grainger Foundation, 1997
- Derivatives and Generation Business Opportunities, $32,000, EPRI, 1997
- A WWW ALN for the Utility Industry, $30,000, Sloan Foundation, 1997

- Knowbots for Internet-Based Combat Training, $125,892, ARO, 1996
- Application of Game Theory to Power Systems, $43,500, Siemens Corporation, 1996
- Real-Time Control and Operation of Electric Power Systems, $155,000, DOE, 1995
- A Massively Parallel Population-Based Approach to Operations Scheduling, $72,687, NSF, 1995
- Application of Fuzzy Set Theory to Security Constrained Optimal Reactive Power Control in a Multi-Area, $49,000, NSF, 1994
- Railroad Transportation Curriculum Development for Enhancing the U.S. Infrastructure, $180,000, NSF, 1993
- Resource Scheduling and Commitment, $25,000, Commonwealth Edison Company, 1993
- Special Machine Design, $20,000, C.E. Neihoff Corporation, 1991
- Electric Power Distribution Innovation, $20,000, Commonwealth Edison Company, 1991
- Application of Fuzzy Logic to Power Plant Scheduling, $7,500, TCC, 1991
- Application of Artificial Neural Networks in Multi-Area Generation Scheduling with Fuzzy Data, $60,400, EPRI, 1990
- Scheduling of Power Interchange Between Interconnected Utilities, $9,600, TCC, 1990
- Application of Expert Systems to Generation Control and Scheduling in Large Power Plants, $24,000, TCC, 1989
- Expert System for Operational Scheduling and Generation Control, $49,200, EPRI, 1988
- Application of Expert Systems to Operational Reliability Analysis in a Large Plant, $10,000, ERIF, 1987
- Surge Protection of Underground Distribution Systems, $22,500, Commonwealth Edison Company, 1986

PROFESSIONAL ACTIVITIES

Technical Committee Activities:

2007-	Chair, IEEE/PES Power System Operations Committee
2005-2007	Vice-chair, IEEE/PES Power System Operations Committee
2003-2005	Secretary, IEEE/PES Power System Operations Committee
2004-present	Chairman, Transactions Committee, IEEE Technical Activities Board
2003-present	Member, IEEE Fellows Committee
2002-present	Chairman, IEEE/PES Prize Paper Awards Committee
1996-1998	Chairman of the Operation Methods Subcommittee of the IEEE/PES
1992-1993	Chairman of the Chicago Chapter of IEEE Systems, Man & Cybernetics Society
1992-1993	Chairman of the IEEE Region 4 Student Paper Contest
1992-1993	Member of the IEEE Admissions and Advancement Committee (Reviewed nominations for the IEEE Senior membership)
1987-1993	Chairman of the IEEE/PES Task Force on Power System Protection Reliability
1986-1987	Seminar Chairman of the Chicago Chapter of the IEEE/PES
1985-1986	Program Chairman of the Chicago Chapter of the IEEE/PES
1985-1987	Member of the IEEE Task Forces on Bibliography and Bulk Transmission Reliability
1984-1989	Secretary of the IEEE/PES Subcommittee on Applications of Probability Methods
1987-1997	Member of IEEE/PES Subcommittees on Power Systems Control, Power Systems Operation, Power System Economics, Applications of Probability Methods (activities include reviewing journal and conference papers, chairing technical sessions, organizing various task forces)
1983-present	Chaired /organized 50 technical sessions in various professional society conferences
1983-present	Presented 96 technical papers and seminars at technical conferences

Conference Activities:

2007	Member of the Advisory Committee of the DRPT 2007, China
2007	Member of the Technical Committee of the ELECO 2007, Turkey
2006	Member of the Technical Committee of IEEE SMC, Taiwan
2005	Member of the Technical Committee of the ELECO 2005, Turkey
2005	Member of the Technical Program Committee of JIEEEC05, Jordan
2003	Member of the Technical Program Committee of LASCOPE03, Canada

2003	Member of the Technical Committee of the ELECO 2003, Turkey
2003	Member of the Technical Committee of the IEEE SMC Conference
1994-2002	Member of the Technical Committee of the IEEE Power Industry Computer Applications (PICA) Conference
1993-1994	Member of the Executive Committee of the IEEE T&D Conference
1991-1992	Vice-Chairman of the IEEE Systems, Man and Cybernetics Conference
1984-1991	Associate Director of the American Power Conference;
1991-2000	Member of the Advisory Board of the American Power Conference

EE National Honor Society (HKN):

2007-present	Chair, Distinguished Service Award Committee
1995-2000	Member of the HKN's Outstanding Professor Award Committee
1993-2000	Member of the HKN's National Board of Directors
1992-1994	President and vice-president of the IIT's Sigma Xi Society

External Examiner of PhD Programs:

2003	Member of the PhD Board of Examiners, Indian Institute of Technology, Kanpur, Indian Institute of Technology (Bombay), University of Waterloo, San Juan University (Argentina)
2003	External Reviewer, American University of Beirut Graduate Degree program in Computer and Communication Engineering
1999	External Reviewer of Research Programs at the Kuwait University
1998-present	External Reviewer of Research Programs at the University of Petroleum and Minerals in Saudi Arabia
1983-present	External Reviewer for Promotion and Tenure Cases at University of Manchester-Institute of Science and Technology, Yarmouk University, Jordan American University of Beirut, University of Wisconsin, University of Nebraska, University of Missouri, Drexel University, Michigan Technological University, Texas A&M University, Southern Illinois University,

San-Juan University, Argentina,
Sultan Qaboos University, Oman
Tulane University,
Michigan State University,
New Mexico Tech,
Clemson University,
Petra University, Malaysia
Nanyang Technical University, Singapore

Technical Review Activities:

1983-present Technical reviewer (reviewed 700 papers) for IEEE Transactions on Power Systems, IEEE Transactions on Power Delivery, IEEE Transactions on Circuits and Systems, IEEE Transactions on Systems, Man and Cybernetics, IEE Proceedings, Journal of Optimization Theory and Applications, Canadian Electrical and Computer Engineering Journal, International Journal of Electrical Power and Energy Systems, Journal of Optimal Control Applications, Journal of Intelligence Systems Review, Kluwer Publishers, Academic Press Publishing Company, Journal of Electric Machines and Power Systems IFAC Symposium, International Conference on Systems, Man and Cybernetics, Power Industry Computer Applications Conference, International Symposium on Circuits and Systems, American Control Conference, Power System Computation Conference, Journal of Electric Power Systems Research

1983-present Technical Reviewer for John Wiley & Sons, Inc.

1983-present Technical reviewer for EPRI, DOE, AFOSR, NSF and ONR (reviewed 52 proposals)

1983-present Participant and speaker in several NSF workshops and review panels

PRESENTATIONS AT EDUCATIONAL INSTITUTIONS AND INDUSTRY

These presentations were financially supported by the sponsor:

1. Regulatory Authority for Energy, Athens, Greece, (2007)
2. American Transmission Company, Wisconsin (2007)
3. Electricity Engineers Association of New Zealand, Auckland (2007)
4. University of Aukland, New Zealand (2007)
5. Transpower New Zealand, Ltd, Wellington, New Zealand (2007)
6. Citadel Group, Illinois (2007)
7. American Transmission Company, Wisconsin (2006)
8. University of Waterloo, Canada (2006)
9. Sharif University of Technology, Iran, (2006)
10. Korea Power Exchange, Seoul (2006)
11. IEEE India Power Conference, Delhi (2006)
12. IEEE Qatar Section (2006)
13. IEEE Dhahran Section, Saudi Arabia (2006)
14. King Fahd University of Petroleum and Minerals, Saudi Arabia (2006)
15. IEEE Iran Section, Polytechnic University of Tehran (2006)
16. Grid Management Corporation, Iran (2006)
17. Istanbul Technical University, Turkey (2005)
18. Mohandes Society, Toronto, Canada (2005)
19. University of Ireland (2005)
20. University of London (2005)
21. Technical University of Bucharest (2005)
22. IEEE Chicago Section of PES (2005)
23. IEEE Fox Valley Section, Illinois (2004)
24. University of Engineering and Technology, Lahore, Pakistan (2004)
25. Central Electricity Authority (CEA) HQ, Delhi, India (2004)
26. Indian Institute of Technology (IIT) Madras, India (2004)
27. Federation of Andhra Pradesh Chambers of Commerce, Hyderabad, India (2004)
28. Jadavpur University, Calcutta, India (2004)
29. National Power Engineering Conference (keynote Speaker), Malaysia (2003)
30. American University of Beirut, Lebanon (2003)
31. Nexant Corporation, Arizona (2003)
32. OM Corporation, California (2003)
33. California ISO, Sacramento (2003)
34. American Transmission Company, Wisconsin (2003)
35. Sargent and Lundy Corporation, Illinois (2003)
36. Pars Corporation, California (2003)
37. North China Electric Power University, Beijing (2003)
38. Kolej Universiti Teknikal Kebangsaan Maleka, Malaysia (2003)
39. Exelon Corporation, Illinois (2002)
40. Yarmouk University, Jordan (2002)
41. Energy Transmission Company, Jordan (2002)
42. North China Electric Power University (2002)
43. Tsinghua University, China (2002)

44. Electric Power Research Institute, China (2002)
45. Tehran University, Tehran, Iran (2002)
46. Energy Research Center, Ministry of Energy, Iran (2001)
47. Sharif University, Tehran, Iran (2001)
48. Ferdowsi University, Iran (2000)
49. Michigan Technological University (2000)
50. Southern Illinois University (2000)
51. OATI Corporation, Minnesota (1999)
52. Argonne National Laboratory, Illinois (1998)
53. University of Missouri-Rolla (1997)
54. San Juan University, Argentina (1996)
55. Commonwealth Edison Company, Illinois (1995)
56. Marquette University, Wisconsin (1994)

TECHNICAL SESSIONS ORGANIZED AT NATIONAL MEETINGS

1. Load Management: 1984 American Power Conference, Chicago, IL
2. Environment: 1985 American Power Conference, Chicago, IL
3. System Reliability Evaluation: 1985 IEEE/PES Summer Meeting, Vancouver, Canada
4. Transmission System Reliability: 1986 IEEE/PES Summer Meeting, Mexico City
5. Electrical Transmission: 1986 American Power Conference, Chicago, IL
6. Expert Systems in Power Systems: 1988 International Conference on Expert Systems, Switzerland
7. Production Costing: 1990 IEEE/PES Winter Meeting, Atlanta, GA
8. Power System Operations Topics: 1990 IEEE/PES Winter Meeting, Atlanta, GA
9. Real and Reactive Power Dispatch: 1991 IEEE/PES Summer Meeting, Minneapolis, MN
10. Neural Networks: 1991 American Power Conference, Chicago, IL
11. Bulk Power System Reliability: 1991 IEEE/PES Summer Meeting, San Diego, CA
12. Power Electronics Applications: 1991 North American Power Symposium, Carbondale, IL
13. Real Time Pricing and Optimal Scheduling: 1992 IEEE/PES Winter Meeting, New York, NY
14. System Operations Topics: 1992 IEEE/PES Winter Meeting, New York, NY
15. Advances in Reliability Computation: 1992 IEEE/PES Winter Meeting, New York, NY
16. Power System Economic Evaluation: 1992 IEEE/PES Summer Meeting, Seattle, WA
17. Power Systems Dynamics: 1992 IEEE International Conference on SMC, Chicago, IL
18. Poster Panel Session: 1992 American Power Conference, Chicago, IL
19. Fuzzy Systems: 1993 Conference on Expert Systems Applications to Power Systems, Australia
20. Poster Panel Session: 1993 American Power Conference, Chicago, IL
21. System Operations Topics: 1993 IEEE/PES Summer Meeting, Vancouver, Canada
22. System Operations: 1994 IEEE/PES Winter Meeting, New York, NY
23. Power System Stability: 1994 American Power Conference, Chicago, IL
24. Operations Support-ANN Topics: 1994 IEEE/PES Winter Meeting, New York, NY
25. Hydro Scheduling: 1995 PICA, Salt Lake City, UT
26. Economic Generation Dispatch: 1996 IEEE/PES Summer Meeting, Denver, CO
27. Risk Management in Deregulated Systems: 1996 IEEE/PES Summer Meeting, Denver, CO
28. Unit Commitment: 1997 PICA, Columbus, Ohio
29. State Estimation: 1998 Large Engineering Systems Conference, Halifax, Canada
30. Operation Methods: 1999 IEEE/PES Winter Meeting, New York, NY
31. Hydro Applications: 1999 PICA, Santa Clara, CA
32. Analytical Methods: 1999 PICA, Santa Clara, CA
33. Tools for Restructured Power Systems: 2003 IEEE/PES Annual Meeting, Toronto, Canada