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## **Industrial Advisory Board Meeting**

### **Power Systems Engineering Research Center: A National Science Foundation Industry/University Cooperative Research Center**

November 30 and December 1, 2000  
Denver, Colorado

PSERC is a National Science Foundation Industry/University Cooperative Research Center addressing challenges in the new electric power industry as it restructures to a competitive business environment. Its Industrial Advisory Board serves as a central point of contact between university researchers and industry. It meets twice annually to conduct Center business and to engage in productive discussions about the Center's research and education activities. This is a stimulating meeting with presentations on research, discussions of research ideas, and conversations on current news from industry and academia. We hope that you will join us.

#### **Objectives**

The objectives of the IAB meeting are:

- Learn about the status of current PSERC research projects and education activities
- Develop recommendations for new PSERC projects
- Discuss ways to expand the collaboration between industry and universities
- Address business items of the IAB and PSERC

#### **Attendees**

The IAB meeting is attended by university researchers (including Center Management from the eleven universities and project leaders), industrial members of PSERC, and invited guests.

#### **Agenda**

The detailed agenda is attached. Highlights of the agenda include:

- Presentations and informal discussions in a poster session on current and proposed research
- Closed session of the IAB in which recommendations for funding of future research will be developed
- Open discussions with feedback from IAB members to university researchers on PSERC activities
- Tutorials on current issues in market design and on power quality

Speakers include university researchers and educators in engineering, economics and operations research who have wide-ranging experience and are involved nationally on important issues in the power industry. Principal speakers include:

- Robert J. Thomas, Professor and PSERC Director, Cornell University
- Fernando Alvarado, Professor, University of Wisconsin - Madison
- Gerry Heydt, Professor and Site Director, Arizona State University
- Mladen Kezunovic, Professor and Site Director, Texas A&M
- Timothy Mount, Professor, Cornell University
- Shmuel Oren, Professor and Site Director, University of California at Berkeley

# Industrial Advisory Board (IAB) Meeting Agenda

November 30 and December 1, 2000  
Denver, Colorado

## Wednesday, November 29, 2000 - Radisson Hotel, 83 East 120th Avenue, 303-451-1002

7:00 - 9:00 p.m. Informal reception - Please ask for the location at the front desk.

## Thursday - November 30, 2000 - Tri-State G&T - 1100 W. 116<sup>th</sup> Avenue

8:00 - 8:30 a.m. Registration and Continental Breakfast

8:30 - 8:40 a.m. Introductions - Bob Thomas

8:40 - 8:50 a.m. Welcome - Frank Knutson, CEO, Tri-State G&T Association, Inc.

8:50 - 9:15 a.m. Research Program Overview: Research Roadmap, Research Stem Descriptions, Current Project Status, and New Project Process – Bob Thomas

### Selected Project Presentations from each Research Stem (Introductions by Stem Leaders)

9:15 - 9:35 a.m. Markets Stem Project Presentation: Market Experiments - Tim Mount

9:35 - 9:55 a.m. T&D Technology Stem Project Presentation: Data Needs for the Fault Location and Wireless Communication Projects - Mladen Kezunovic

9:50 - 10:15 a.m. Systems Stem Project Presentation: Impact of Protection Systems on Reliability - Jim Thorp

### Current Research Activities and Project Status

10:15 - 12:00 a.m. Poster Session for Review and Discussion of Current and Proposed PSERC Projects

12:00 - 12:45 p.m. Lunch with Continuing Discussions on Projects and Stem Areas

### Research Needs and New Project Proposals

12:45 - 2:45 p.m. New Project Presentations and Research Need Discussions

2:45 - 3:00 p.m. Break

### Industry and University PSERC Member Meetings

3:00 - 5:00 p.m. Closed Industrial Advisory Board Meeting

3:00 - 5:00 p.m. University Researcher Meeting

### Evening Activity

5:30 - 8:00 p.m. Reception and Dinner, CB & Potts - 1257 W. 120th Avenue (5:30 - 6:30 cash bar, 6:30 - 8:00 dinner). For a little background on the restaurant go to <http://www.theram.com/company/history.html>.

**Friday, December 1, 2000 - Tri-State G&T - 1100 W. 116<sup>th</sup> Avenue**

- 7:30 - 8:00 a.m. Continental Breakfast
- 8:00 - 8:45 a.m. Open discussion on expanding industry/university collaboration including review of activities (member visits, membership, database development, website, IAB Newsletter, etc.) – Steve DeMarco, Phil McCrory and Dennis Ray
- 8:45 - 10:00 a.m. Open industry feedback to and discussion with university researchers on current and proposed projects
- 10:00 - 10:30 a.m. Break – Walk-through tour of the Tri-State Control Room
- 10:30 - 11:15 a.m. Tutorial: **Flow-Based versus Locational Marginal Price or Fixed Transmission Right Approaches to Congestion Management and Forward Transmission Markets** (abstract below) presented by Fernando Alvarado and Shmuel Oren
- 11:15 - 12:00 a.m. Tutorial: **Contemporary Topics in Electric Power Quality** (abstract below) presented by G.T. Heydt
- 12:00 - 12:45 p.m. Lunch
- 12:45 - 3:30 p.m. Optional Tours of WAPA Engineering Training Facilities (an impressive facility that trains power professionals from all over the US and overseas) and of the Engineering labs at the Colorado School of Mines. Please indicate your participation on the registration form.

## Tutorial Descriptions

### Flow-Based versus Locational Marginal Price or Fixed Transmission Right Approaches to Congestion Management and Forward Transmission Markets

Fernando Alvarado  
University of Wisconsin

Shmuel Oren  
UC Berkeley

One of the most hotly debated issues in the context of RTO's market design concerns the definition, allocation and settlement of rights to the transmission system. The two contending approaches are the locational marginal price or fixed transmission right (LMP/FTR) approach that has been adopted by the eastern power pools (that is, PJM, NYPP, and NE) versus the flow-based approach being proposed in the California reformed system, and the Midwest ISO (MISO), DESERT STAR and the ERCOT ISO. Advocates of the flow-based approach contend that it is more amenable to decentralized forward trading of transmission capacity rights and consequently leads to more liquid forward energy markets. Opponents claim that the justification of the flow-based approach relies on unrealistic assumptions and that the simplified commercial models proposed by the flow-based proponents will result in socialization of unanticipated congestion costs and distortion of market signals.

The purpose of this tutorial is to introduce the basic philosophies underlying these two approaches and to identify the main arguments both for and against the two approaches. A compromise that combines the strength of these two market design philosophies (being considered by MISO) will be outlined.

### Contemporary Topics in Electric Power Quality

Gerald T. Heydt  
Arizona State University

**Objectives:** To present the most recent concerns in power quality, and potential solutions. Also, to indicate future research topics on power quality.

**Topics:**

1. Power quality indices, advantages, disadvantages, pitfalls, advanced concepts, three phase formulation. "Interharmonics" and other non-harmonic signals.
2. The power acceptability curves. Basic formulation, energy formulation, disturbances, calculation of sags, impact of sags on loads, needs of the semiconductor industry. The CBEMA and ITIC curves, three phase considerations, short disturbances. Bus voltage sag mitigation technology: a comparison of techniques.
3. Series voltage boost hardware. The DVR and its limitations. Controls and protection.
4. Sag vulnerability testing.
5. Analysis and simulation of power quality transient events. Symmetrical components and Clarke components. PSpice techniques.
6. The vulnerability of AC/DC converters to transient disturbances. Uncontrolled and controlled rectifiers. Energy flow in a rectifier. Loss of load for power electronic loads. ASD loads.