# Transmission Reliability Program Peer Review

October 19-20, 2010
Alexandria, VA

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# TRANSMISSION RELIABILITY PROGRAM OVERVIEW

One of the essential components of the electric grid is a robust and responsive transmission system that connects load centers to affordable sources of generation and connects different regions for enhanced reliability and economic efficiency.

**Research Area Elements**

- Situational awareness tools to improve response time to system disturbances
- Advanced sensing and measurement technologies to help operate the grid more reliably and efficiently

However, large sections of the nation’s transmission system are being operated in a way that strains the electric infrastructure. An increasingly dynamic electrical load from modern power demands and the integration of intermittent renewable resources present challenges for operating the grid reliably.

As the grid exists in its present form, operators would benefit from wide-area visibility and situational awareness of their infrastructure. For example, if grid operators could see dynamic conditions in the transmission system, it would enable faster responses to system changes, such as power oscillations and the rate of change in frequency and phase angles, and market conditions, which is paramount for ensuring reliable and efficient grid operations under high penetration of variable generation. However, these dynamic conditions are not visible with today's monitoring technology, which currently can only take a snapshot of grid conditions once every four seconds. Phasor measurement technology allows sampling at 30 times per second. New analysis applications using this technology will provide operators with a more accurate picture so they can verify that their systems are, in fact, operating safely and securely. Furthermore, existing situational awareness capabilities are not fast enough to respond to many transmission disturbances, which makes it difficult to reduce the number and spread of outages. Having this information available in near real time will allow the transmission system to operate closer to its loading limits and reduce operating margins.

The Transmission Reliability research area focuses on two key areas: 1) Real-Time Grid Reliability Management and 2) Reliability and Markets. The first area develops monitoring and analysis tools that process synchrophasor data to enable real-time assessment of grid status and stability margins, with the goal of improving power system reliability and visibility through wide-area measurement and control. It is developing advanced technologies and tools to help create a resilient electric transmission system that can better detect disturbances, accommodate a variety of generation sources, and automatically reconfigure the grid to prevent widespread outages and/or rebalance the system. The second area focuses on developing a comprehensive set of integrated market and engineering design principles, tools, and technologies to support efficient, competitive electricity markets. These activities include modeling and simulating market rules, developing new computational methods, and performing real-time analysis of market behavior and its impact on market performance.

## Long-Term Goal and Milestones

| **LONG TERM GOAL:** *Develop technologies and market-based options to support a resilient, reliable and efficient National transmission grid, which includes generation sources, including renewables, demand response and significant electrification of the transportation system* | | | | |
|---|---|---|---|---|
| **MILESTONES** | | | | |
| **2012** | **2013** | **2014** | **2015** | **2016** |
| Demonstrate distributed dynamic state estimator at 2 utilities | Demonstrate (through simulation studies) adaptive islanding in an interconnection to improve protection from wide-area blackouts | Demonstrate a prototype real-time phase-angle-based alarming tool in a region of the grid | Demonstrate the inter-area exchange of synchrophasor data utilizing NASPINet concepts | Demonstrate adaptive protective relaying at a utility |

## Key Technical Challenges and Needs

Key barriers to achieving the goal include the following:

- **Slow situational awareness capabilities.**
  Existing situational awareness capabilities are not fast enough to respond to many transmission disturbances, which makes it difficult to reduce the number and spread of outages.
- **Inadequate modeling and data analysis capabilities.**
  Current modeling and data analysis capabilities are insufficient for in-depth power systems planning, operation, and investment.

Transmission system needs exist in two areas in which OE performs work:

***Real-Time Grid Reliability Management:*** Recent advances in information and visualization technologies, high-speed telecommunications, and advanced sensors and electronics offer unique opportunities to modernize electric power grid management and respond to the needs of competitive electricity markets. Key needs include the following:

- **Assess current tools.**
  Identify current operational requirements and assess the suitability of current operational tools and security schemes for wide control areas operated in market-driven conditions.

- **Develop, test, and evaluate new real-time tools and techniques.**
  Develop, test, and evaluate new real-time performance monitoring, reliability adequacy, and security analysis schemes, tools, and operational procedures, along with corresponding real-time control technologies based on advanced measurements.
- **Demonstrate new tools and techniques.**
  Demonstrate the above tools, schemes, and controls utilizing ISOs, RTOs, and utilities as test beds.
- **Improve information visualization systems.**
  Improve information visualization systems and increase their availability so that operators can quickly understand and react to developing system problems in new market-based operational environments.
- **Develop performance metrics.**
  Develop performance metrics to measure and monitor grid reliability for transmission and distribution systems.
- **Implement a deployment strategy.**
  Pursue a dissemination strategy to accelerate the introduction of the operational tools and processes by making them readily available to industry.

***Reliability and Markets:*** Reliability can only be maintained in a competitive market if appropriate mechanisms and incentives are in place to ensure adequate investment in, and safe operation of, the interconnected power system. The reliability and markets research area will develop software tools and implementation approaches to achieve this end. It will take a science-based approach to analyzing evolving institutions to ensure the market's efficacy in maintaining reliability. Key needs include the following:

- **Enable customer participation.**
  Technologies to enable customer participation in providing reliability resources
- **Develop simulation tools.**
  Market simulation tools to guide decision making by system operators

**Transmission Reliability Success Story:**

**North American SynchroPhasor Initiative (NASPI)**
The synchrophasor initiative was formed as the Eastern Interconnection Phasor Project in 2003, leveraging prior experience in the Western Interconnection to connect existing phasor measurement units (PMUs) in the Eastern Interconnection into a network. In 2008, the leadership of NASPI was transitioned from DOE to the North American Electric Reliability Corporation (NERC). NERC, working with the electricity industry, is now leading NASPI in addressing the business issues associated with the deployment of PMUs across the North American grid, while DOE is focusing on the development of longer-range research to develop advanced applications and analysis tools that use the high-speed synchrophasor data. DOE is also managing 10 projects through the American Recovery and Reinvestment Act (ARRA) Smart Grid Investment Grants (SGIG) awards that will install over 800 PMUs on the U.S. transmission system over the next three years. This six-fold expansion of the phasor network will increase wide-area situational awareness, resulting in greater system efficiency and flexibility and a greater ability to identify and address problems in real time before they cascade into widespread outages. See www.naspi.org.

- **Assess emerging market mechanisms.**
  Assessment of the effectiveness of emerging market mechanisms to meet reliability needs

## Implementation Strategy

A key part of the strategy for accomplishing this R&D is continued coordination with NERC to provide technical support to the NASPI Work Group and its five Task Teams (see side bar on page 3). The Transmission Reliability research area will also facilitate the NASPI forum as a venue for progress reports on the ARRA SGIG projects related to the synchrophasor network build-out and implementation of analysis applications. This will enable the exchange of information and lessons learned among the SGIG awardees, assist DOE and NERC in gaining maximum value from the projects, and inform other organizations and grid operators on how to install and benefit from this technology. This research area also supports and collaborates with organizations such as NIST, IEEE, and IEA to develop and maintain national and international standards that insure the compatibility and interoperability of synchrophasor measurement and communications equipment.

OE has maintained a productive federal/state partnership with the transmission research program in the Public Interest Energy Research (PIER) program at the California Energy Commission (CEC). Both OE and the CEC have been long-time supporters of the Consortium for Electric Reliability Technology Solutions (CERTS), which performs research and develops and disseminates new methods, tools, and techniques to protect and enhance the reliability of the U.S. electric power system and the efficiency of competitive electricity markets. CERTS, whose program office is based at the Lawrence Berkeley National Laboratory, is composed of leading researchers from four national laboratories (Lawrence Berkeley National Laboratory, Oak Ridge National Laboratory, Pacific Northwest National Laboratory and Sandia National Laboratories), universities, and an industry partner. The universities comprise the Power Systems Engineering Research Center (PSERC), an NSF Industry /University Cooperative Research Center that draws on multidisciplinary university capabilities to address the challenges facing the electric power industry.

The Transmission Reliability research area will also coordinate research, development, and demonstration activities with regional agencies such independent system operators, regional transmission groups, and multistate, vertically integrated power companies; the Federal Energy Regulatory Commission; the Electric Power Research Institute; equipment manufacturers; and trade groups.

# The Peer Review

A peer review is a documented, critical evaluation performed by technical experts – the peer review panel – who are independent of the work being reviewed. The peer review process is an important tool for assessing the U.S. Department of Energy's portfolio of projects by evaluating its goals, objectives, strategy, productivity, and leadership. In addition, it affords an opportunity for industry, national laboratories, and the academic community to network, share best practices, and seek areas of synergy.

The peer review provides program managers with high-quality technical input that can be used to make decisions, set priorities, and allocate resources. It also improves project management and productivity. The peer review process provides:

- The project team with an expert, unbiased assessment of strengths, weaknesses, and specific changes that would improve the project
- Public accountability for use of public funds
- A forum for interested parties to learn about the program's status and plans
- A forum for program participants to learn aspects of other participants' work that is not otherwise available
- A basis for identifying the most outstanding projects for potential recognition
- A basis for identifying the weakest projects so they can be improved or ended before the completion of the R&D cycle

The Transmission Reliability Program Peer Review was held October 19-20, 2010 in Alexandria, VA. Sixty-seven participants from industry, national laboratories, federal government, and universities attended the event. The agenda can be found in Appendix A or on the Peer Review website (http://events.energetics.com/TRPeerReview/agenda.html). The website agenda includes links to downloadable PDF versions of both the project summary and actual presentation for each project. The list of attendees is located in Appendix B.

## 2010 Transmission Reliability Program Peer Review Panel

The Transmission Reliability Program peer review panel was chosen from a list of stakeholder candidates with a variety of backgrounds and expertise. Particular attention was given to constructing a diverse panel by balancing representatives from industry, government and academia. Occasionally, reviewers had to recuse themselves from reviewing a particular project due to a potential or perceived conflict of interest. When recused from a project, the reviewer may listen to the presentation and may ask questions of the presenter, but the reviewer does not score that particular project. The peer review panel for the Transmission Reliability Program is listed below:

| Transmission Reliability Program Peer Review Panel | |
|---|---|
| **Joe Bowring** | Monitoring Analytics, LLC |
| **Bob Cummings** | North American Electric Reliability Corporation (NERC) |
| **Ben Hobbs** | Johns Hopkins University |
| **Dmitry Kosterev** | Bonneville Power Administration (BPA) |
| **Mike Razanousky** | New York State Energy Research and Development Authority (NYSERDA) |
| **Alison Silverstein** | Consultant |

## Peer Review Format

The peer review panel was charged with providing an evaluation of each of the projects being presented as well as an evaluation of the Transmission Reliability Program itself. The reviews are based on an established set of review criteria.

To facilitate review of the individual projects, the principal investigators submitted a project summary prior to the event. The summary provided background information about the project's accomplishments, program management, and collaborations. During the peer review, each principal investigator (or their designated representative) was given a pre-established time limit to present their project details and engage in a question and answer session to allow the reviewers an opportunity to ask clarifying questions about the project. If time remained after the reviewers' questions were satisfied, additional questions were taken from the audience.

## Project Evaluation Process

The reviewers evaluated each project based on the presentations and the follow up discussion using the project evaluation form included in Appendix C. The form requires the reviewers to rate the projects numerically and it also provides space for written comments. The evaluation form was broken down into four different criteria which were weighted as shown:

Relevance – 5%
Approach and Project Management – 25%
Technical Accomplishments, Quality and Productivity – 50%
Technology Transfer, Collaborations and Partnerships – 20%

The scale for the numeric scoring of each criterion is provided in the table below:

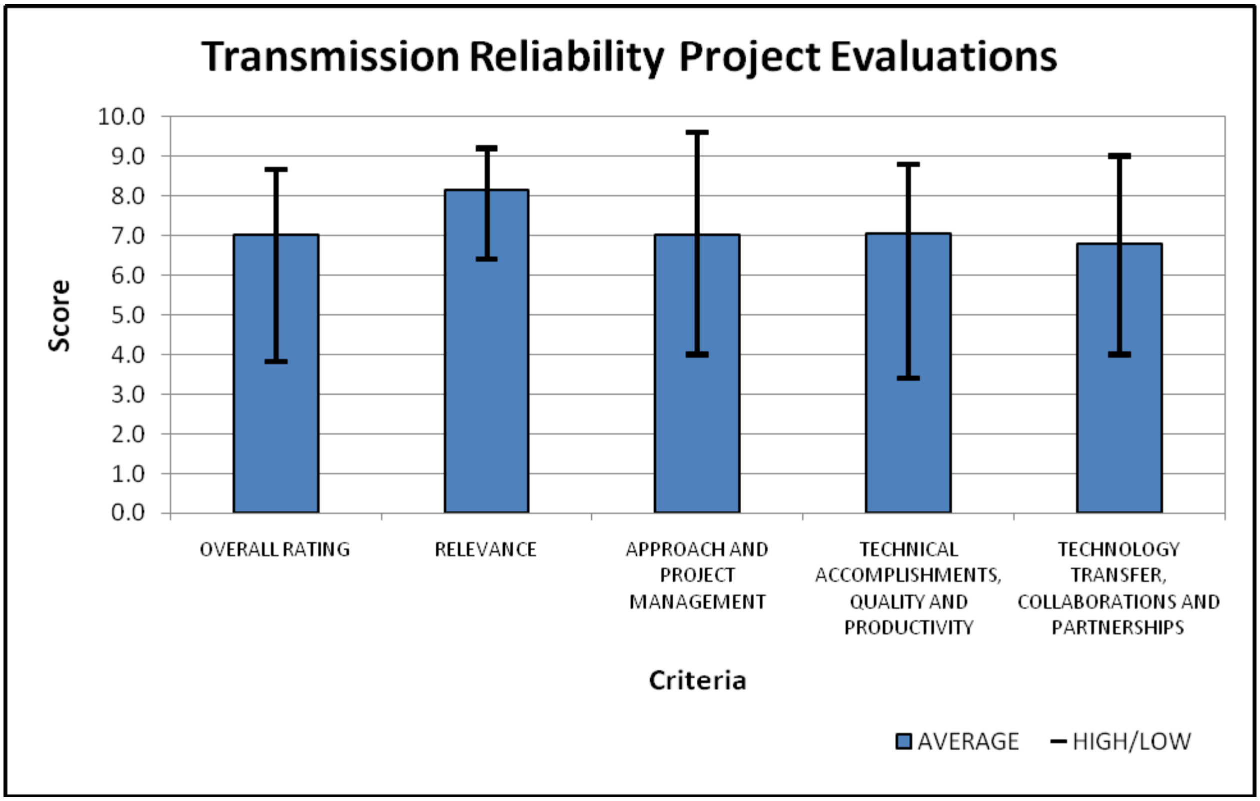
| | |
|---|---|
| 9-10 | Major strengths; no significant weaknesses |
| 7-8 | Strengths outweigh weaknesses |
| 4-6 | Mix of strengths and weaknesses |
| 2-3 | Weaknesses outweigh strengths |
| 0-1 | Major weaknesses |

No effort was made to develop consensus among the reviewers in terms of their scoring or comments. The comments from all the reviewer evaluations were compiled for each project so that the DOE program manager can use them as a tool in their decision making process when determining whether to continue, modify, or redirect individual projects.

Subsequent to the review, the projects' principal investigators received direct feedback regarding all comments and scores related to their project for consideration in improving the research; however, the authors of the individual reviewer comments are kept anonymous. The principal investigators can use the summary evaluation comments, as appropriate, in their upcoming activities.

## Summary of Project Evaluation Scores

The average score for each of the four criteria, along with an average overall score based on the weighting described above, was calculated for each project. The average overall scores and the average score for each criterion are represented by the bars in the chart below, with lines indicating the high and low scores for each category:




## Program Evaluation Process

In addition to completing evaluation forms for individual projects, reviewers evaluated the Transmission Reliability Program as a whole using the form in Appendix D. The program evaluations provide assistance in assessing the overall program performance and productivity. Reviewers assessed the program based on six criteria, in addition to providing an overall program rating on a 10 point scale:

- Program Strategy
- Implementation
- Are there other areas of Research, Development, and Demonstration (RD&D) in which the program should be investing?
- What are the overall strengths of the program?
- What are the overall weaknesses of the program?

- Other Comments or Recommendations

## Summary of Comments and Suggestions from the Program Evaluations

Summaries of reviewer comments for each category are provided below. The overall average program score was 8.25.

### Program Strategy

Reviews of the program strategy were positive and indicated that the Transmission Reliability program supports the mission of the Office of Electricity Delivery and Energy Reliability. Several reviewers encouraged the DOE to make more information about the program available, including a statement of goals. While reviewers believe the program is working on several high-value projects, one reviewer noted that the opportunity costs of choosing one project over another can be significant and a clear explanation of why projects were chosen and why other types of projects were not would be helpful during the evaluation process.

> "The Transmission and Visualization R&D program is working on a number of very high-value projects to improve grid operations and reliability….Most of the projects I saw fit squarely within my view of industry needs and priorities."

The importance of industry collaboration was also emphasized. While projects selected by the program seem to fit squarely within one reviewers view of the industry needs and priorities, wider utility involvement would be beneficial and one reviewer suggested that a vehicle (such as a think tank) be set up to provide more input from industry and stakeholders on their needs. The portion of the program on transmission-constrained systems operations, planning, and policy was described by one reviewer as "innovative and important."

### Program Structure and Management

Two reviewers suggested that materials be developed to show how individual projects tie together and align with program goals and priorities. Another reviewer proposed a Technical Advisory Committee consisting of utility members to help define program goals, to set targets for different categories of projects, and to establish appropriate performance metrics. To increase confidence that the costs and benefits are properly balanced and that the risks are appropriately considered, one reviewer felt special attention should be given to the management of individual research efforts.

## Implementation

Reviewers praised the coordination of the program, with one stating that the program is "using resources very effectively." Researchers and program managers were praised for productivity: "the quality of these projects is quite good, and the researchers are booking through them at a remarkably peppy pace producing generally interesting, useful, high-quality results. That suggests that DOE is doing a very good job finding quality researchers and setting up a system and a culture of accountability." At the same time, however, reviewers stressed the importance of improving technology transfer mechanisms and getting more utility involvement. One reviewer expressed concern that some projects were not "spreading the word effectively." Several reviewers recommended bringing more individuals and organizations into the program, and one reviewer suggested looking into whether it was economical to run so many projects through the national labs. While several projects are ready for implementation, one reviewer expressed the need for exploring additional avenues for moving results into the industry for commercial use.

## Areas of Research, Development & Demonstration (RD&D) in which the Program should be Investing

Reviewers had a number of suggestions for additional RD&D, some of which are listed below. One reviewer said that having more information on other requests for funding and the rationale for the current direction of the program would be helpful for making additional suggestions.

Reviewer RD&D suggestions:

- Possible integration of more power electronics and DC into the existing system
- Analyze whether and how to design and build the grid to break apart into smaller, self-contained islands, possibly using DC links
- Perform more work on the Eastern Interconnection frequency decay and new approaches to address it (including a better explanation for whether it's a problem)
- Perform some basic science work to look for a synthetic way to create inertia or inertia-like effects on the grid to counteract the increase of inertia-free renewable and the retirement of fossil fuel generation
- Evaluate the communication networks being installed by the synchrophasor SGIG awardees to determine what works and doesn't work in those implementations; look ahead 10 years to the suite of production-grade phasor data applications we want to be using and design an IT-communications-centric (rather than utility-centric) communications network architecture to serve those future application needs (son-of-NASPINet); chart a path for whether and how we can get there from the SGIG-based here
- Support demonstration projects with utility sponsorship on power system model validation (one of the top applications under WISP) and phasor-based stability controls
- R&D projects: reliability impacts of changing characteristics of electrical loads and their solutions; distributed generation impact on voltage stability in load centers
- Support basic research projects on powerflow/energy storage/thermal storage/distributed generation and demand response for congestion management
- Coordinate with FERC's initiative on "The Next Generation of Planning Models" would be useful, as this is also a DOE initiative that could set the R&D agenda for transmission over the next few years

## Overall Strengths

Several reviewers praised the diversity of subjects covered by the various projects and their relevance to industry needs. Reviewer comments on the quality of researchers and the program management were also positive. One reviewer specifically cited NASPI efforts as a program strength. Another reviewer praised the program for focusing on a field that is "underfunded relative to other technology areas of national importance."

> "The diversity of the subjects covered by the program is very impressive."

## Overall Weaknesses

> "The program can further benefit from closer collaboration with the utility industries, particularly for better defining the implementation and commercialization paths."

As with other evaluation categories, reviewers emphasized the importance of increased industry involvement and outreach, with one reviewer suggesting that the program sponsor panels that will highlight project results at professional meetings. Another reviewer suggested an expansion of the pool of researchers and a reevaluation of projects that are not progressing as hoped: "are we bringing in new ideas, talent and perspectives? Are we working on fresh issues and taking new technology risks? Are we reevaluating projects that are disappointing to us? Let's get braver and meaner." One reviewer noted the need for prioritization and control of software development tools and how they fit into program needs.

# APPENDIX A – AGENDA

## TRANSMISSION RELIABILITY PEER REVIEW AGENDA

October 19-20, 2010
The Westin Alexandria
400 Courthouse Square, Alexandria VA, 22314

*PDF versions of project summaries and presentations are posted at*
*http://events.energetics.com/TRPeerReview/agenda.html*

### TUESDAY, October 19 – DAY ONE

| Time | Activity | Host/Presenter |
|---|---|---|
| 7:00 am – 8:00 am | Registration/Continental Breakfast | |
| 8:00 am – 8:15 am | Welcome | Hank Kenchington<br>Deputy Assistant Secretary for R&D,<br>U.S. Department of Energy, Office of Electricity Delivery and Energy Reliability |
| 8:15 am – 8:30m | Program Overview | Phil Overholt<br>U.S. DOE, Office of Electricity Delivery and Energy Reliability |
| 8:30 am – 9:00 am | **North American SynchroPhasor Initiative (NASPI) (20+10)** | Jeff Dagle<br>Pacific Northwest National Laboratory (PNNL) |
| 9:00 am – 9:30 am | **NIST Synchrometrology Lab (20+10)** | Jerry Stenbakken<br>National Institute of Standards and Technology (NIST) |
| 9:30 am – 10:00 am | Break | |
| 10:00 am – 10:30 am | **Eastern and Western Interconnection Baselining – Part 1 (20+10)** | Bharat Bhargava<br>Electric Power Group (EPG) |
| 10:30 am – 11:00 am | **Eastern and Western Interconnection Baselining – Part 2 (20+10)** | Tom Ferryman<br>Pacific Northwest National Laboratory (PNNL) |
| 11:00 am – 11:30 am | **Real Time Dynamic Monitoring System (RTDMS) (20+10)** | Abhijeet Agarwal<br>Electric Power Group (EPG) |
| 11:30 am – 12:00 pm | **IEC and IEEE Synchrophasor-related Standards Harmonization (20+10)** | Ken Martin<br>Electric Power Group (EPG) |
| 12:00 pm – 1:00 pm | **Lunch** | |
| 1:00 pm – 1:30 pm | **Measurement Based Stability Assessment (20+10)** | Dan Trudnowski<br>Montana Technical University |

| Time | Activity | Host/Presenter |
|---|---|---|
| 1:30 pm – 2:00 pm | **Mode-Meter Development (20+10)** | Ning Zhou<br>Pacific Northwest National Laboratory (PNNL) |
| 2:00 pm – 2:30 pm | **Modal Analysis for Grid Operations (MANGO) (20+10)** | Ning Zhou<br>Pacific Northwest National Laboratory (PNNL) |
| 2:30 pm – 3:00 pm | Break | |
| 3:00 pm – 3:30 pm | **Synchrophasor-based Situational Awareness System (20+10)** | Kai Sun<br>Electric Power Research Institute |
| 3:30 pm – 4:00 pm | **Adaptive Islanding Demonstration (20+10)** | Vijay Vittal<br>Arizona State University |
| 4:00 pm – 4:30 pm | **Risk-Based Security Assessment (20+10)** | Jim McCalley<br>Iowa State University |
| 4:30 pm – 5:00 pm | **Characteristic Ellipsoid Method for Wide-Area Dynamic Monitoring (20+10)** | Yuri Makarov<br>Pacific Northwest National Laboratory (PNNL) |
| 5:00 pm | Adjourn for the Day | |
| 5:15 pm – 6:45 pm | Reception<br>(light appetizers and cash bar) | |

## WEDNESDAY, October 20 – DAY TWO

| Time | Activity | Host/Presenter |
|---|---|---|
| 7:30 am – 8:00 am | Continental Breakfast | |
| 8:00 am – 8:30 am | **Evaluating System and Financial Adequacy of Portfolios (20+10)** | Tim Mount<br>Cornell University |
| 8:30 am – 9:00 am | **Impact of New Energy and Environmental Regulations (20+10)** | Bill Schulze<br>Cornell University |
| 9:00 am – 9:30 am | **Development and Testing of New Tools (20+10)** | Ray Zimmerman<br>Cornell University |
| 9:30 am – 10:00 am | Break | |
| 10:00 am – 10:30 am | **Interaction of Multiple Market-based Energy and Environmental Policies (20+10)** | Shmuel Oren<br>University of California, Berkeley |
| 10:30 am – 11:00 am | **Commercialization of Market Power Monitoring Metrics and Visualization (20+10)** | Bernie Lesieutre<br>University of Wisconsin |
| 11:00 am – 11:30 am | **Reliability Compliance and Monitoring Tools (20+10)** | Gil Tam<br>Electric Power Group (EPG) |
| 11:30 am – 12:00 pm | **Automated Reliability Reports and Implementation: On the Use of Phasor Measurements for Model-Less Grid Reliability Assessment (20+10)** | Alejandro Dominguez-Garcia<br>University of Illinois Urbana-Champaign |
| 12:00 pm – 1:00 pm | **Lunch** | |
| 1:00 pm – 1:30 pm | **Spinning Reserve Demonstrations (20+10)** | John Kueck<br>Oak Ridge National Lab (ORNL) |
| 1:30 pm – 2:00 pm | **Utilizing Small Loads for Frequency Responsive Reserves in a Large System Model (20+10)** | Jeff Dagle<br>Pacific Northwest National Lab (PNNL) |
| 2:00 pm – 2:30 pm | **Frequency Responsive Demand (20+10)** | Jim Nutaro and Isabelle Snyder<br>Oak Ridge National Lab (ORNL) |
| 2:30 pm – 3:00 pm | **Break** | |
| 3:00 pm – 3:30 pm | **Three-phase State Estimation (20+10)** | A.G. Phadke<br>Virginia Tech |
| 3:30 pm – 4:00 pm | **Distributed Dynamic State Estimator (20+10)** | Sakis Meliopoulos<br>Georgia Tech |
| 4:00 pm – 4:30 pm | **Advanced Wide-Area Early Warning System (20+10)** | Lloyd Cibulka<br>California Institute for Energy and Environment |
| 4:30 pm – 5:00 pm | **Real-time Simulation of Power Grid Operation and Control (20+10)** | Anjan Bose<br>Washington State University |
| 5:00 pm | **Adjourn** | |

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# APPENDIX C – SAMPLE PROJECT EVALUATION FORM

## TRANSMISSION RELIABILITY PROGRAM PEER REVIEW 2010
## PROJECT EVALUATION FORM

| | |
|---|---|
| **Reviewer Name:** | |
| **Project Title:** | |
| **Presenter:** | |
| **Project Number:** | |

Using the following criteria, rate the work presented in the context of program objectives and provide specific, concise comments in support of your score. Use whole numbers for the score.

| 9-10 | 7-8 | 5-6 | 3-4 | 1-2 |
|---|---|---|---|---|
| Outstanding/ Excellent | Very Good/Few areas to improve | Good/Modest/ Some areas to improve | Fair/Significant weaknesses | Poor/Not Adequate |

### 1. Relevance

Relevance to the OE mission and the Transmission Reliability Program goals to develop technologies to modernize the electric grid, enhance security and reliability of the energy infrastructure, and facilitate recovery from disruptions to energy supply. Degree to which the project addresses a specific and existing problem, interest, or need.

**Rating:** ☐ 5%

**Comments:**

### 2. Approach and Project Management

Quality of project management, including research plan, program execution, and research team. The degree to which technical or market barriers are, or have been, addressed, the quality of the project design, and technical feasibility. Degree to which the project approach is free of major flaws that would limit the project's effectiveness or efficiency. If this project is continuing, the degree to which the project has effectively planned its future, defined milestones, identified risks, considered contingencies to mitigate/manage risks, built in optional paths, etc.

**Rating:** ☐ 25%

**Comments:**

## 3. Technical Accomplishments, Quality, and Productivity

Degree to which technical accomplishments are being achieved and progress is being made toward overall project goals and milestones. The degree to which progress compares to performance indicators in terms of effectiveness, efficiency, cost, and benefits.

**Rating:** [ ] 50%

**Comments:**

## 4. Technology Transfer, Collaborations, and Partnerships

The degree to which collaboration with the electricity industry, universities, government laboratories, states, and/or end-users is being, or has been, accomplished. The effectiveness of technology transfer or dissemination of results. The degree to which the project has successfully leveraged other resources or opportunities.

**Rating:** [ ] 20%

**Comments:**

## 5. Overall Impressions

Comments on overall strengths and weaknesses, aspects of the project that could be expanded or deleted, new areas or directions that could be added, and changes that may have occurred in research context (markets, policy, competing technologies, etc.) that might alter planned targets or goals.

**Strengths**:

**Weaknesses:**

**Recommendations:**

# APPENDIX D – SAMPLE PROGRAM EVALUATION FORM

## TRANSMISSION RELIABILITY PROGRAM PEER REVIEW 2010
## PROGRAM EVALUATION FORM

**OVERALL RATING:** **(Provide numeric score)** ___________

| 9-10 | 7-8 | 5-6 | 3-4 | 1-2 |
|---|---|---|---|---|
| Excellent | Very Good | Good | Fair | Not Adequate |

***Please provide feedback under the following bullets to support your overall rating of the program.***

1. **Program Strategy:** Do the mission, goals, and priorities of the program appropriately support the Office of Electricity Delivery and Energy Reliability R&D Program mission? Do the goals and priorities properly reflect the needs of industry and other stakeholders? How could they be improved?

2. **Program Structure and Management:** How well do the program activities support the overall program goals and priorities? Given the resources available, is the relative emphasis placed on the various program elements appropriate?

3. **Implementation:** Is the program effectively leveraging its resources? Is the coordination with other related DOE, federal and state activities adequate? Are the mechanisms for technology transfer appropriate? How would you assess the productivity of the program? Are the accomplishments and results commensurate with the investment being made?

4. **Are there other areas of Research, Development, and Demonstration (RD&D) in which the program should be investing?**

5. **What are the overall strengths of the program?**

6. **What are the overall weaknesses of the program?**

7. **Other Comments or Recommendations:**