

2005 Transmission Reliability Program Peer Review Report

October 11-12, 2005
Washington Marriott Hotel
Washington, D.C.

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TRANSMISSION RELIABILITY PROGRAM OVERVIEW

The Transmission Reliability Program was reestablished by Congress in 1999 to conduct research on the reliability of the Nation's electricity infrastructure during the transition to competitive markets under restructuring. This Program is in the DOE Office of Electricity Delivery and Energy Reliability. The Transmission Reliability Program develops advanced real time control systems and evaluates electricity market/system reliability interactions to enable full technical and economic integration of all electric supply technologies into the transmission and distribution system. Transmission Reliability activities will provide the necessary system controls and analyses to support the large-scale participation of loads in electricity markets as an ancillary service such as spinning reserves and provide market competition down to the individual customer level.

Federal Role in Transmission Reliability:

- Perform reliability technology research and development in the absence of market-based incentives for the power sector to perform this R&D.
- Conduct third-party evaluations of electricity market designs and develop technology-based electricity policy options.

The Program's approach for improving the electricity delivery infrastructure is to develop and apply advanced computing, sensing, power electronics, communications, and control technologies to provide real time system control for reliable, efficient operation of the nation's electric power system under both normal and emergency operating conditions.

The Transmission Reliability Program performs analyses and develops technologies in four program areas: Real Time Grid Reliability Management, Load as a Resource, Reliability and Markets, and Reliability Technology Issues and Needs Assessment.

▪ ***Real Time Grid Reliability Management (RTGRM)***

Objective: Develop and apply a new generation of methods and technologies for optimizing the utilization of the North American power grid under restructuring while maintaining system reliability. RTGRM develops technologies leading to automated system reliability assessment and control, based upon real time system measurements. High-speed communications and distributed intelligent controllers will adjust power electronic network management devices, and actively suppress disturbances with only limited human supervision. Information from RTGRM will enable reliable operation of the electric grid, and efficient operation of competitive power markets. Near term, this activity is developing data collection and visualization tools that will provide system operators with a real time view of grid conditions, and longer term allow assessment of operator compliance with grid reliability standards.

▪ ***Load as a Resource***

Objective: Improved reliability and system efficiency through responsive demand. This activity assesses the capabilities of load to participate in electricity markets as a reliability resource. This activity will demonstrate the value of load as a resource through field evaluation where load responds to price signals or as an ancillary service such as spinning reserves.

▪ ***Reliability and Markets***

Objective: Reliability and markets evaluates options to strike the appropriate balance between ideal economic market mechanisms and traditional utility operating practices that will provide inexpensive and reliable electric services for consumers. This activity engages in interdisciplinary research involving power system engineering and market economics, and responds to the need for a strong Federal role to provide unbiased, third-party policy options on restructuring for Federal and State decision- makers. This activity is conducting market auction behavioral experiments that indicate how generators and demand response will react to alternative electricity market designs. These experiments are an accurate and low-cost method for analyzing proposed market designs before they are implemented. A near term priority in this activity will examine how loads can participate in energy and reliability services markets.

▪ ***Reliability Technology Issues and Needs Assessment***

Objective: Identify the R&D needs for a reliable electricity delivery infrastructure consistent with the requirements of competitive electric markets. This area identifies emerging critical issues for electric reliability, analyzes these issues to identify gaps in reliability R&D, and prioritizes and initiates planning for needed Federal research and technology development. This activity is working with industry stakeholders to develop a framework for grid reliability performance and reliability indicators.

The Transmission Reliability Program budget history is as follows:

FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006
2.5	2.4	4.9	4.7	5.2	4.4	4.7	4.0

(Dollars in Millions)

The Transmission Reliability Program is implemented through a DOE National Laboratory/industry/university partnership called the Consortium for Electric Reliability Technology Solutions (CERTS). CERTS was formed to develop and commercialize new methods, tools, and technologies to protect and enhance the reliability of the U.S. electric power system under the emerging competitive electricity market structure.

Members of CERTS include:

- Lawrence Berkeley National Laboratory
- Electric Power Group
- Oak Ridge National Laboratory
- Power Systems Engineering Research Center (PSERC)
- Sandia National Laboratories
- Pacific Northwest National Laboratory

For additional information on CERTS, see <http://certs.lbl.gov>

For information on the Transmission Reliability Program, see: <http://electricity.doe.gov> under Electric Power Systems R&D Division.

THE PEER REVIEW

The U.S. Department of Energy's Transmission Reliability Program conducted an independent peer review of its projects on October 11-12, 2005, at the Washington Marriott Hotel in Washington DC. The results of the review are an important element of management's plans to continually adjust and improve the Department's Transmission Reliability program, and to provide valuable feedback to researchers.

The review was structured into 4 areas:

- Real Time Grid Reliability Management
- Load as a Resource
- Reliability and Markets
- Reliability Technology Issues and Needs Assessment

THE PANEL

The review covered 18 presentations as shown in the Agenda at Appendix A. Participation as a reviewer required that there be no financial relationship with DOE or the presenting research organizations, or conflict of interest with same. The names and affiliations of the review panel are listed below:

Reviewer Affiliations:

Navin Bhatt - American Electric Power

Merwin Brown - California Institute for Energy and Environment

Hamid Elahi, Ph.D - General Electric Company

David Hawkins - California Independent Systems Operator

REVIEW CRITERIA

The reviewers evaluated each project on the basis on the principal investigator's oral presentation, written documentation provided prior to the review, and a question and answer period following the investigator's presentation. Each reviewer was provided a workbook prior to the review that included an evaluation form for each project, hard copies of each presentation, and a one-page summary and budget history for each project. The evaluation form was organized using the following review criteria:

- 1) Value in relation to programmatic goals?*
- 2) What is the technical merit of the work?*
- 3) Does the project place the correct emphasis on transfer of technology to stakeholders?*
- 4) What is the overall performance of this project?*

The completed evaluation form for each project is the reviewer's official record of evaluation, both quantitative and qualitative. A numerical score for each of the four criteria was selected from the rating tables on a scale of 1-10. The rating scale is:

Excellent: 9 – 10

Good: 6 – 8

Marginal: 3 – 5

Unsatisfactory: 1 – 2

Space for written comments was provided on the evaluation form. Specific comments on the strengths and weaknesses of a project and recommendations to improve a project were strongly encouraged.

GUIDELINES

Oral Presentations: The principal investigator for each project was urged to prepare his oral presentation in the order of the evaluation criteria to assist reviewers in scoring. Each presenter was allotted 30 minutes for his presentation, and an additional 10 minutes for questions from the review panel or the general audience.

COMMENTS & RESULTS

Completed evaluation forms were given to the peer review monitor, who calculated quantitative scores and transcribed written comments verbatim. Panelist's comments and scores for each presentation were then consolidated and provided to the Transmission Reliability Program manager for evaluation and feedback to project investigators. Following are general comments from the peer reviewers, and a summary of the scores resulting from the review.

- This is a very important project and the researchers are doing some ground breaking work. New thinking and new approach to what we could do to improve reliability of the power grid. Continue work in this area.
- This is fundamental research, on the medium to long time frame horizon. The wide-area voltage control concepts may be applicable to all the North American Interconnections, whereas the SPS piece would appear difficult to coordinate and implement within the Eastern Interconnection.
- Need to continue the development of concepts based on “response based controls” such as grid damping ratios versus event driven controls.
- A critical issue is the size of the communication pipeline that is required to bring back this information, the cost of this pipeline, and from a security standpoint whether bringing all station IED data into the EMS is the right thing to do.
- Essential work in preparation of full scale implementation of an open and non-discriminatory grid.
- Refocus on Reliability following the 2003 blackout. Markets and Operations must be integrated to ensure grid reliability. Goal is by 2009 to have a valid RTO market design validated with simulation. Developing a Super OPF for use in the simulation testing. Funded Resource Adequacy project this year.
- Concepts are a challenge for most regulators to understand and to set rules that allow load serving entities to enter into long term contracts. If the independent power producers are to get long term contracts, the regulators must reduce the risk of signing long term contracts.
- Market Design is a very important issue. As proven in California, if done poorly, it can lead to disastrous reliability results. The East and Midwest markets today are struggling with what the proper structure and design should be for their markets in order to foster competition, encourage appropriate investment and maintain reliability. This research is very important to the industry and future reliability of the grid as it supports the making of good public policy decisions.
- Good personnel on the project.
- Excellent innovative progress in an area with a great deal opportunities to enhance grid loading.

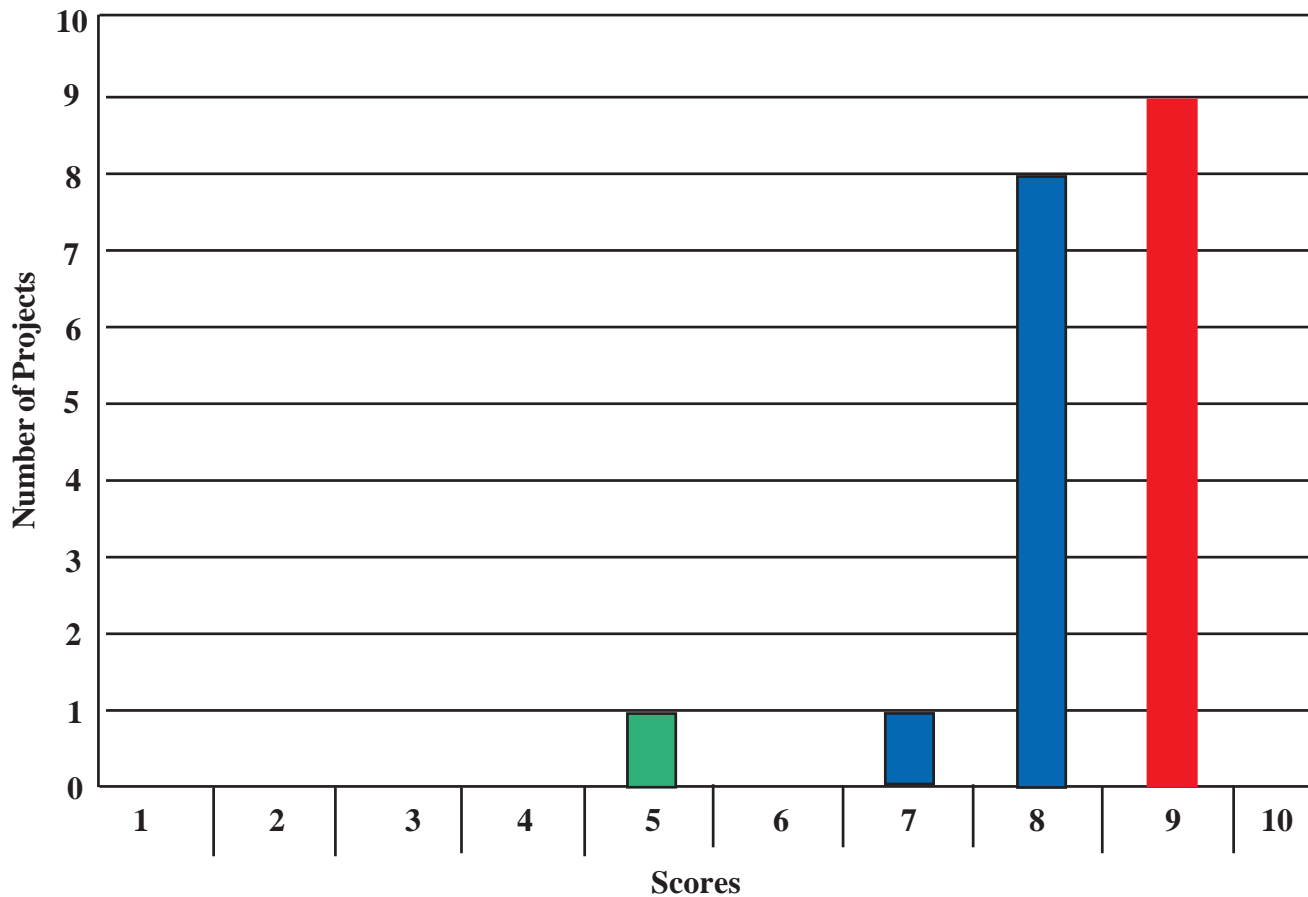
SCORES

Criteria 1- “ Project in Relation to Programmatic Goals ”

The average for all projects -- **8.6**.

The number of projects and relevant percentage by rating category are:

Excellent (9-10):	9 projects (50%)
Good (6-8):	8 projects (44%)
Marginal (3-5):	1 project (6%)
Unsatisfactory (0-2):	none

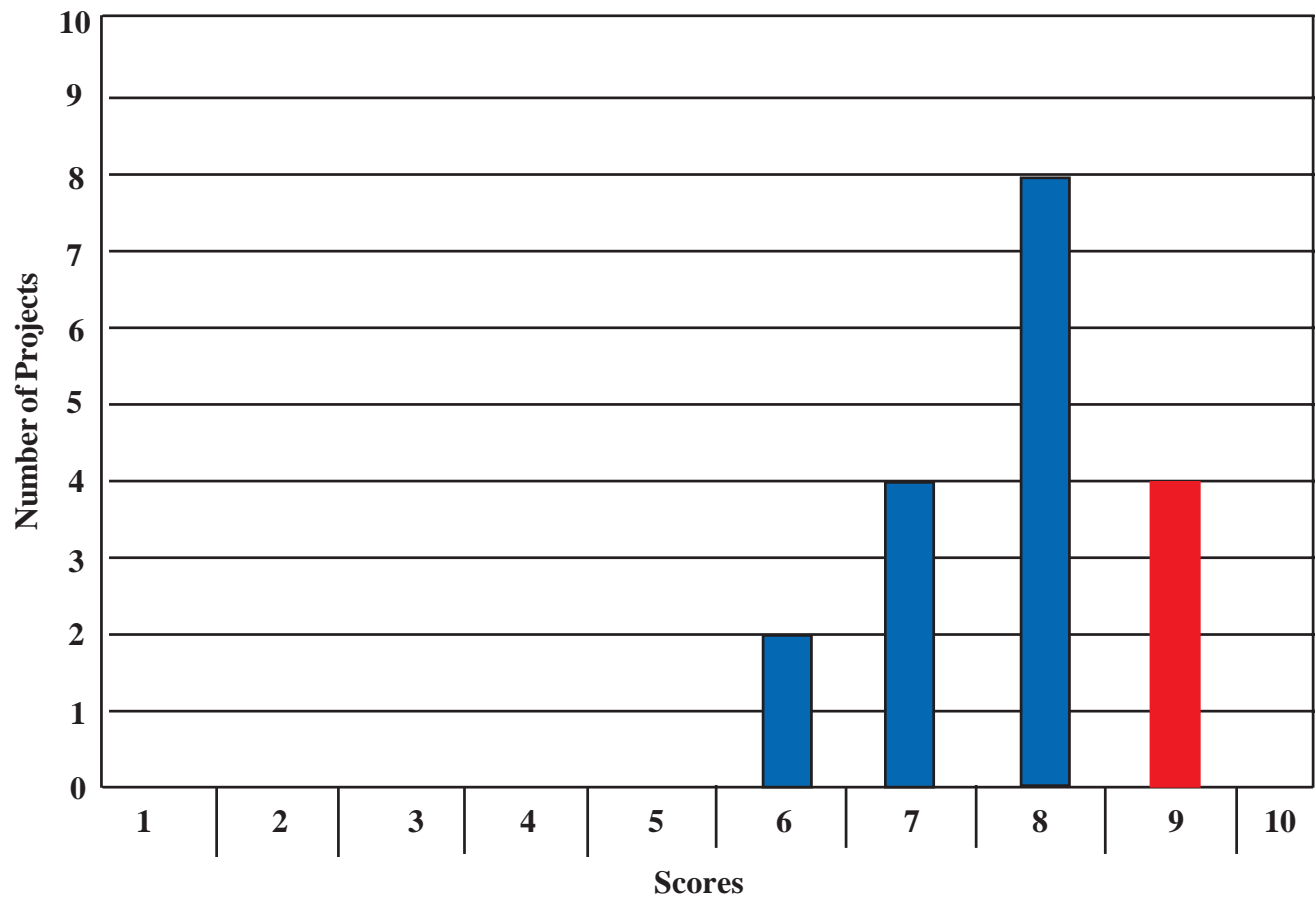


Criteria 2- “ Technical Merit of the Work”

The average for the all projects -- **8.1**.

The number of projects and relevant percentage by rating category are:

■	Excellent (9-10):	4 projects (22%)
■	Good (6-8):	14 projects (78%)
■	Marginal (3-5):	none
■	Unsatisfactory (0-2):	none

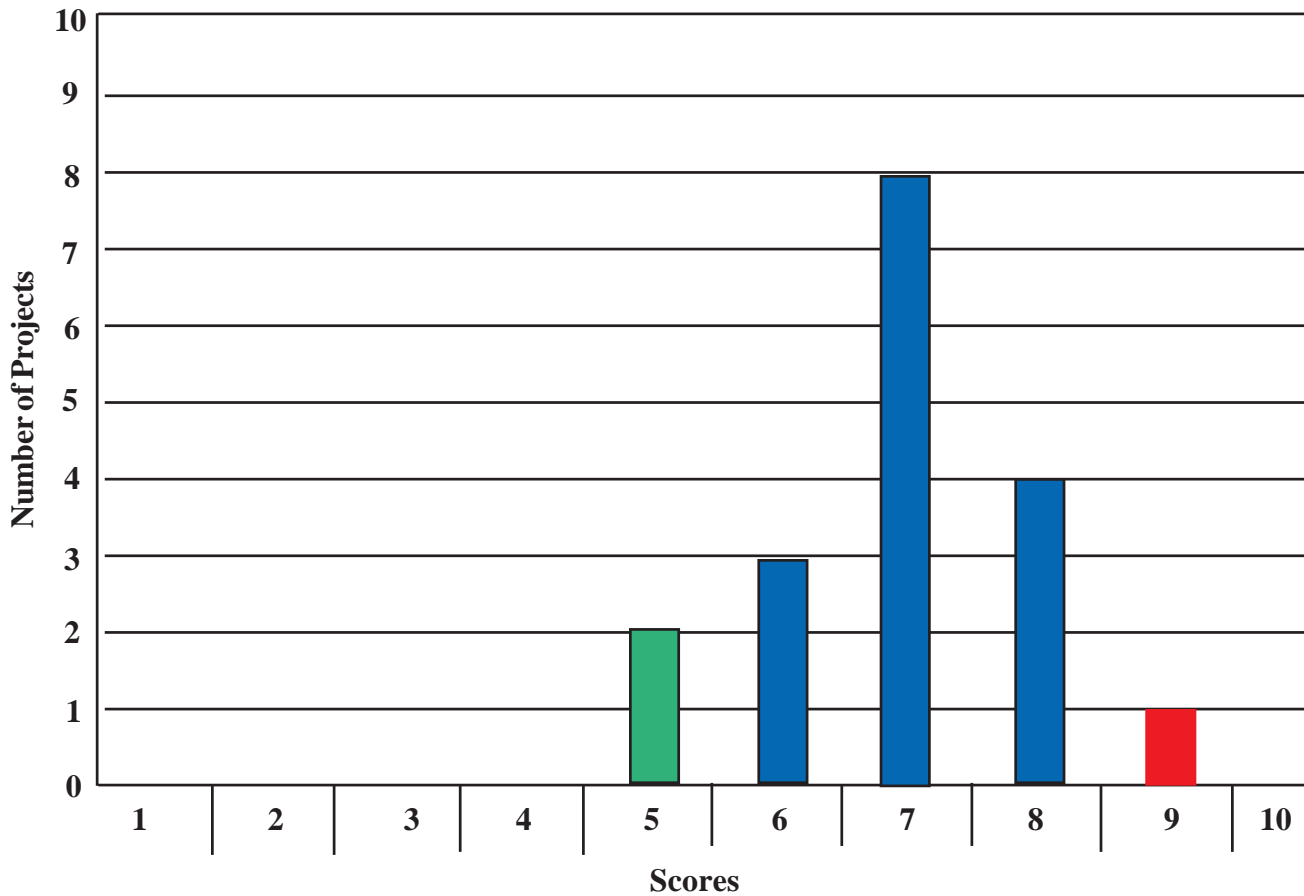


Criteria 3- “ Project in Terms of its Technical Transfer”

The average for all projects -- **7.2**.

The number of projects and relevant percentage by rating category are:

■	Excellent (9-10):	1 projects (11%)
■	Good (6-8):	15 projects (82%)
■	Marginal (3-5):	2 projects (11%)
■	Unsatisfactory (0-2):	none

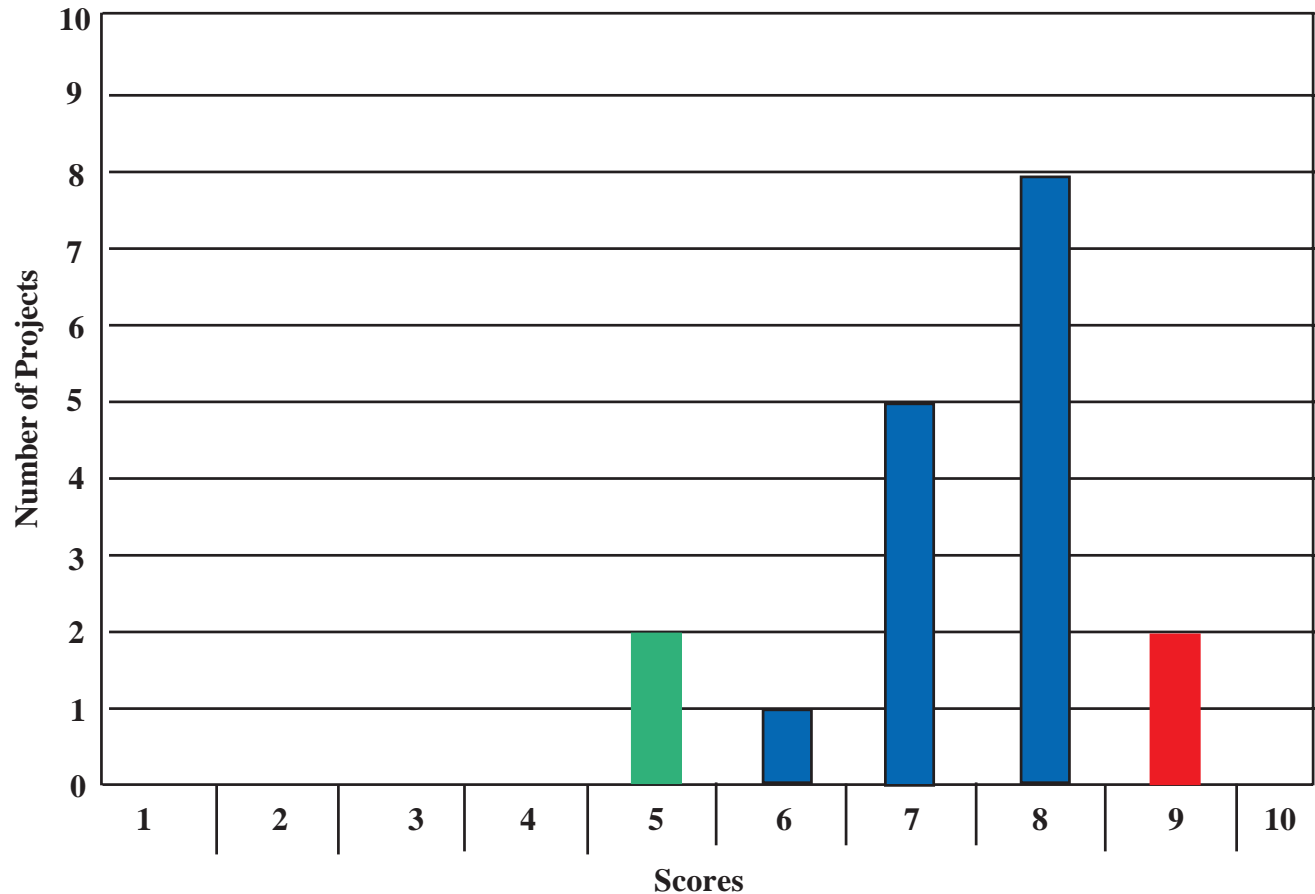


Criteria 4- “ Overall Performance of Projects”

The average for all projects -- **7.7**.

The number of projects and relevant percentage by rating category are:

■	Excellent (9-10):	2 projects (11%)
■	Good (6-8):	14 projects (78%)
■	Marginal (3-5):	2 projects (11%)
■	Unsatisfactory (0-2):	none



APPENDIX A

Agenda

U.S. Department of Energy
Transmission Reliability Program Peer Review
Washington Marriott Hotel
October 11-12, 2005

Agenda

DAY 1 - OCTOBER 11

8:30 – 9:00 am	Continental Breakfast
9:00 – 9:10 am	Welcome - Phil Overholt, Manager, DOE Transmission Reliability Program
9:10 – 9:20 am	DOE Perspectives – Kevin Kolevar, Director, Office of Electricity Delivery and Energy Reliability
9:20 – 9:30 am	NERC Perspectives – Bob Cummings, Director, Reliability Performance and Engineering Support

Time	REAL TIME GRID RELIABILITY MANAGEMENT
9:30-9:45 am	Overview of Real Time Grid Reliability Management – Carl Imhoff, PNNL
9:45-10:15 am	Eastern Interconnection Phasor Project – Matt Donnelly, PNNL
10:25-10:40 am	Break
10:40-11:10 am	Reliability Adequacy Tools – NERC ACE/AIE – Carlos Martinez, EPG
11:20-11:50 am	Real Time Control – Anjan Bose, PSERC/WSU
12:00-1:00 pm	Lunch (on your own)
1:00-1:30 pm	Adaptive Islanding – Vijay Vittal, PSERC/ASU
1:40-2:10 pm	Role of Substation Information – Mladen Kezunovic, PSERC/TAMU
2:20-2:40 pm	Break

Time	RELIABILITY AND MARKETS
2:50-3:00 pm	Overview of Reliability and Markets– Bob Thomas, PSERC/Cornell
3:00-3:30 pm	Experiments with Multidimensional Markets – Tim Mount, PSERC/Cornell
3:40-4:10 pm	Market Power Monitoring - Bernard Lesieutre, LBNL
4:20-4:50 pm	Public Goods Aspects of Reliability – Bill Schulze, PSERC/Cornell
	Adjourn

DAY 2 – October 12

8:30-9:00 am	Continental Breakfast
Time	LOAD AS A RESOURCE
9:00-9:10 pm	Overview of Load as a Resource – Joe Eto, LBNL
9:10-9:40 pm	Load Participation in Reserves Markets: Experiences in U.S. and Internatioanally – Brendan Kirby, ORNL
9:50-10:20 pm	Spinning Reserve from Large Load Trial with XCEL Energy Cabin Creek Pumped Storage Unit– John Kueck, ORNL
10:30-10:45 am	BREAK
	Reliability Technology Issues and Needs Assessment
10:45-11:15 am	Examination of Centralized Dispatch in the Midwest – Bernie Lesieutre, LBNL
11:25–11:55 am	Grid Metrics – Joe Eto, LBNL
12:05-1:00 pm	Lunch (on your own)
1:00-1:30 pm	Transmission Test Facility – John Stovall, ORNL
1:40-2:10 pm	Advanced Composite Conductor Field Demonstration – Colin McCullough, 3M
2:20-2:45 pm	Break
2:45-3:15 pm	PowerGrid Simulator Project – Chika Nwankpa, Drexel University
3:25-3:55 pm	
	ADJOURN

APPENDIX B

Attendee List

Attendees

Adibi, M. M.
IRD Corp
P. O. Box 34901
Bethesda, MD 20827
301 299 8397
madibird@aol.com

Badin, Joseph
Energetics
7164 Columbia Gateway Dr.
Columbia, MD 21046
410-953-6252
jbadin@energetics.com

Baran, Mesut
NC State University
1250 Partners I
Raleigh, NC 27695-7571
919-515-5081
baran@ncsu.edu

Barber, David
FirstEnergy
PO Box 16001
Reading, PA 19612-6001
610-921-6542
debarber@gpu.com

Barklind, Sharla
Genscape, Inc.
Vice President
211 North Union St., Suite 100
Alexandria, VA 22314
703-684-4895
sharla.barklind@genscape.com

Barney, Diane
Department of Public Service
3 Empire State Plaza
Albany, NY 12223
518-486-2943
diane_barney@dps.state.ny.us

Beard, Lisa
Tennessee Valley Authority
4200 Greenway Drive
Knoxville, Tennessee 37918
865-673-2327
lmbeard@tva.gov

Bhargava, Bharat
Southern California Edison Co.
Consulting Engineer
2131 Walnut Grove Avenue
Rosemead, California 91770
626-302-8684
Bharat.Bhargava@sce.com

Bhatt, Navin
AEP
Manager
700 Morrison Road
Gahanna, Ohio 43230
614-552-1660
nbbhatt@aep.com

Bindewald, Gil
U.S. DOE
1000 Independence Ave., SW
Washington, DC 20585
202-586-0635
gilbert.bindewald@hq.doe.gov

Boezio, Daniel
AEP
1 Riverside Plaza
Columbus, Ohio 43215
614-716-6630
drboezio@aep.com

Bond, Meesha
Federal Energy Regulatory
Commission
888 First Street, NW
Washington, DC 20426
202-502-8414
meesha.bond@ferc.gov

Borbely-Bartis, Anne-Marie
PNNL
901 D Street, SW Suite 900
Washington, DC 20034
202-646-5240
am.borbely@pnl.gov

Bose, Anjan
Washington State University
College of Engineering & Architecture
Pullman, WA 99164-2714
509-335-5593
bose@wsu.edu

Brown, Merwin
CIEE
901 P Street, Suite 142A
Sacramento, CA 95814
916 551-1871
merwin.brown@ucop.edu

Cain, Mary
Federal Energy Regulatory Commission
Electrical Engineer
888 1st St NE, Room 91-31
Washington, DC 20426
202-502-6337
mary.cain@ferc.gov

Carroll, James R
TVA
System Architect
1101 Market St.
Chattanooga, TN 37402-2801
423-751-2827
jrcarrol@tva.gov

Caskey, John
NEMA
Industry Director
1300 North 17th Street
Rosslyn, VA 22209
703-841-3233
joh_caskey@nema.org

Chhabra, Harbans
U.S. Department of Energy
1000 Independence Ave., SW.
Washington, DC 20585
2025867471
harbans.chhabra@hq.doe.gov

Cummings, Bob
Princeton Forrestal Village, 116-390 Village
Boulevard
Princeton, New Jersey 08540
609-452-8060

Dale, Steinar
CAPS-Florida State University
Director
2000 Levy Avenue
Tallahassee, FL 32310
850-645-1183
dale@caps.fsu.edu

Davis, Euniesha
Communications Specialist
McNeil Technologies, Inc.
6564 Loisdale Court Ste. 900
Springfield, VA 22150
703-600-1463
edavis@mcneiltech.com

DeBlasio, Richard
NREL
Technology Manager
1617 Cole Boulevard
Golden, CO 80401
303-275-4333
dick_deblasio@nrel.gov

DeGroat, Kevin
Director, Energy and Environmental
Services Operation
McNeil Technologies, Inc.
6564 Loisdale Court, Ste 900
Springfield, VA 22150
703-921-1632
kdegroat@mcneiltech.com

Donnelly, Matthew K
P.O. Box 999 / K5-20
Richland, WA 99352
Matthew.Donnelly@pnl.gov

Duggan, Patrick M.
Con Edison of NY, Inc.
Rm 2615-S
New York, NY 10003
212-460-4020
dugganp@coned.com

Eto, Joe
Lawrence Berkeley National Lab
1 Cyclotron Road Mail Stop
90R4000
Berkeley, CA 94720
510-486-7284
JHEto@lbl.gov

Fargo, Dennis
Project Manager
McNeil Technologies, Inc.
6564 Loisdale Court Fl. 900
Springfield, VA 22150
703-921-1600
dfargo@mcneiltech.com

Fedora, Philip
NPCC
1515 Broadway 43rd FL
New York, NY 10036
212 840-4909
pfedora@npcc.org

Friedman, Kenneth
U.S. DOE OE-30
1000 Independence Avenue
Washington, District of Columbia
20878
202-586-0379
kenneth.friedman@hq.doe.gov

Galvan, Floyd
Entergy Corporation
Sr. Project Manager R&D
639 Loyola
New Orleans, LA 70113
504-310-5719
fgalvan@entergy.com

Garson, Jerry
Missionwood Consulting, Inc.
8308 Raymond Lane
Potomac, MD 20854-3729
301-765-9470
garson@comcast.net

Ghasemi, Meghdad
Semnan University
Engineer
Tehran-narmak-helaleahmar(sq)-
nobari(alley)-no31
Tehran, Narmak 16457
+98217725368
meghdad82@yahoo.com

Giri, Jay
AREVA T&D Inc.
11120 NE 33rd PL
Bellevue, WA 98004
425-922-1072
jay.giri@areva-td.com

Gorham, Gary
Alabama Power Company
600 North 18th Street
Birmingham, Alabama 35291
205-257-3792
gmgorham@southernco.com

Gray, Edward
NEMA
1300 N. 17th. St. Ste 1847
Rosslyn, VA 22209
703-841-3265
edw_gray@nema.org

Gray, Roger
Power Transmission Solutions
CEO
3254 Adeline St. Suite 205
Berkeley, CA 94703
510.910.4695
r.gray@ptransolutions.com

Haught, Debbie
US DOE
Technology Manager
1000 Independence Ave, SW
Washington, DC 20585
202-586-2211
debbie.haught@ee.doe.gov

Hawkins, David
California ISO
151 Blue Ravine Road
Folsom, CA 95630
916-351-4465
dhawkins@caiso.com

Hawkins, James
Energy Technology Solutions
8 Faling Water Court
Reisterstown, MD 21136
410-453-0080
hawkinsjr@att.net

Hawsey, Robert
Oak Ridge National Laboratory
P O Box 2008
Oak Ridge, TN 37831-6195
865-574-8057
hawseyra@ornl.gov

Imhoff, Carl H.
P.O. Box 999 / K1-98
Richland, WA 99352
Carl.Imhoff@pnl.gov

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Kennington, Hank
DOE
1000 Independence Ave SW
Washington , DC 20585
202-586-1878
henry.kennington@hq.doe.gov

Kendrick, Jr., Lumas
Project Manager
McNeil Technologies
6564 Loisdale Court. Ste 900
Springfield, VA 22150
703-921-1706
lkendrick@mcneiltech.com

Kennedy, Tom
PJM Advanced Technology
955 Jefferson Ave.
Norristown , PA 19403
610.666.4749
kennedt@pjm.com

Kezunovic, Mladen
Texas A&M University
Department of Electrical
Engineering
College Station, TX 77843-3128
409-845-7509
kezunov@ee.tamu.edu

Kirby, Brendan
Oak Ridge National Laboratory
Oak Ridge National Lab
Oak Ridge, Tennessee 37831
865-576-1768
kirbybj@ornl.gov

Kobler, Denis
Qualitrol
Bahnhofstrasse 15
Pfäffikon, SZ 8808
+4155 415 75 26
dkobler@qualitrolcorp.com

Kolevar, Kevin
Director, Office of Electricity
Delivery and Energy Reliability
U.S. Department of Energy (OE-1)
1000 Independence Ave, SW
Washington, DC 20585
202-586-1411
kevin.kolevar@hq.doe.gov

Kreczko, Adam
SAIC
8301 Greensboro Dr. M/S E-5-7
McLean, VA 22102
703-676-4132
Adam.Kreczko@SAIC.com

Kueck, John
Oak Ridge National Laboratory
P.O. Box 2008
Oak Ridge, TN 37831
Phone: 865-574-5178
kueckjd@ornl.gov

Lesieutre, Bernard
Lawrence Berkeley National
Laboratory
1 Cyclotron Road Mail Stop 90R4000
Berkeley, CA 94720
Phone: 510-486-6527
BCLesieutre@lbl.gov

Litvinov, Eugene
ISO New England
Director
One Sullivan Road Holyoke, MA
01040
413-535-4183
elitvinov@iso-ne.com

Luo, Xiaochuan
ISO New England
Senior Analyst
One Sullivan Road
Holyoke, MA 01040
413 540 4236
xluo@iso-ne.com

Mahoney, Marc
National Grid
25 Research Dr.
Westboro, MA 01582-0001
508-389-2782
marc.mahoney@us.ngrid.com

Martinez, Carlos
Electric Power Group, LLC
201 South Lake Avenue, Suite 400
Pasadena, CA 91101
Phone: 626-685-2015
Fax: 626-685-2039

McCarthy, Michael
American Superconductor Corporation
Director -Advanced Grid Solutions
Two Technology Drive
Westborough, MA 01581
508-621-4380
michaelmccarthy@amsuper.com

McCullough, Colin
3M
Senior Scientist
3130 Lexington Ave. So.
Eagan, MN 55121
651-737-4127
cmccullough@mmm.com

McGrath, Glenn
Energy Information Administration
General Engineer
950 LEnfant Plaza
Washington, DC 20585
202-287-1745
glenn.mcgrath@eia.doe.gov

Meeker, Rick
FSU Center for Advanced Power Systems
2000 Levy Ave, Bldg. A
Tallahassee, FL 32310
850-645-1711
meeker@caps.fsu.edu

Mehta, Harish
Mehta Tech, Inc.
President/CEO
208 N. 12th Avenue, P.O. Box 350
Eldridge, IA 52748
563-285-9151
harish@mehtatech.com

Mirheydar, Mahmood
FERC
Electrical Engineer
888 1st St. NE
Washington, DC 20426
202-502-8034
mahmood.mirheydar@ferc.gov

Mount, Timothy
Cornell University
215 Warren Hall
Ithaca, NY 14853
Phone: 607.255.4512
tdm2@cornell.edu

Myrda, Paul
Trans-Elect, Inc
Director of Operations
18026 Voss Dr
Orland Park, IL 60467
7084795543
ptmyrda@trans-elect.com

Renz, Bruce
RDS
Principal Consultant
385 Delegate Drive
Columbus, Ohio 43235
614 804 4840
BRENZ@COLUMBUS.RR.COM

Sklar, Scott
The Stella Group, Ltd.
1616 H Street, NW, 10th Fl.
Washington, DC 20006
202-347-2214
solarsklar@aol.com

Ng, Camilla
FERC
Energy Infrastructure Analyst
888 First Street, N.E.
Washington, DC 20426
202-502-8706
camilla.ng@ferc.gov

Rodrigue, Michael
DOE
1000 Independence Ave SW ME-30
4A-201
Washington, DC 20585
202-586-2942
michael.rodrigue@hq.doe.gov

Small, Forrest
Navigant Consulting
Associate Director
77 South Bedford Street, Suite 400
Burlington, MA 01803
781-270-8455
fsmall@navigantconsulting.com

Nwankpa, Chika
Drexel University
3141 Chestnut Street, ECE Dept.
Philadelphia, PA 19104
Phone: 215-895-2218
con22@drexel.edu

Rodriguez, George
Southern Calif. Edison Co.
2131 Walnut Grove Ave.
Rosemead, CA 91791
626-302-8682
rodriggd@sce.com

Smith, Larry
Alabama Power
600 N. 18th St.
Birmingham, Alabama 35291
205-257-3270
lesmith@southernco.com

Overholt, Philip
U.S. Department of Energy, OE-10
1000 Independence Ave, S.W.
Washington, DC 20585
Phone: 202 586-8110
philip.overholt@hq.doe.gov

Schatz, Joe
Southern Company
600 North 18th St.
Birmingham, AL 35291
205-257-5047
jeschatz@southernco.com

Tarler, Howard
Department of Public Service
3 Empire State Plaza
Albany, NY 12223
518-486-2483
howard_tarler@dps.state.ny.us

Paliza, Roberto
Paliza Consulting, LLC.
Consultant
PO Box 347
Westfield, IN 46074
317-818-4588
roberto@palizaconsulting.com
Patel, Mahendra
PJM
955 Jefferson Avenue
Norristown, PA 19403-2497
610-666-8277
patelm3@pjm.com

Schlueter, Robert
Intellicon
1936 Heatherton Dr.
Holt, MI 48842
517-694-1825
Schlueter@Intellicon.biz

Stamos, John
U.S. DOE
1000 Independence Ave SW
Washington, DC 20585
301-903-1196
john.stamos@hq.doe.gov

Schultze, William
Cornell University
301 Warren Hall
Ithaca, N.Y. 14853
Phone: 607.255.9611
wds3@cornell.edu

Stenbakken, Jerry
NIST
100 Bureau Drive, MS 8172
Gaithersburg, MD 20899
301-975-2440
gstenbakken@nist.gov

Ramon, Greg
Tampa Electric Company
702 N. Franklin St
Tampa, FL 33602-4418
813-228-4469
gjramon@tecoenergy.com

Shankar, Mallikarjun
ORNL
1 Bethel Valley Rd., MS-6085
Oak Ridge, Tennessee 37831
865-574-2704
shankarm@ornl.gov

Suryanarayanan, Siddharth
CAPS- Florida State Univ.
2000 Levy Ave, Research Bldg A, #0231
Tallahassee, FL 32301
850-645-2994
sid@caps.fsu.edu

Transmission Reliability Program Peer Review Final Report

Sweetser, Richard
EXERGY Partners Corp.
12020 Meadowville Court
Herndon, VA 20170
703-707-0293
RSweetser@exergypartners.com

Syracuse, Steven
Promethean Devices
President & CTO
9896 Old Charlotte Highway
Fort Mill, SC 29715
803-802-7012
syracuse@prometheandevices.com

Taylor, Carson
Bonneville Power Administration
Principal Engineer
P.O. Box 61409
Vancouver, WA 98666
360 619 6656
cwtaylor@bpa.gov

Taborsky, Craig
MD PSC
6 St. Paul St.
Baltimore, MD 21202
410-767-8051
ctaborsky@psc.state.md.us

Thomas, Bob
Cornell University
428 Phillips Hall
Ithaca, NY 14853
Phone: (607) 255-5083
rjt1@cornell.edu

Thundiyil, Kevin
Federal Energy Regulatory
Commission
Electrical Engineer
888 First Street NE, MT-8.1
Washington, DC 20426
202-502-6490
kevin.thundiyil@ferc.gov

Torres, Juan
Sandia National Laboratories
P.O. Box 5800
Albuquerque, NM 87185
505-844-0809
jjtorre@sandia.gov

Thundiyil, Kevin
Federal Energy Regulatory
Commission
Electrical Engineer
888 First Street NE, MT-8.1
Washington, DC 20426
202-502-6490
kevin.thundiyil@ferc.gov

Torres, Juan
Sandia National Laboratories
P.O. Box 5800
Albuquerque, NM 87185
505-844-0809
jjtorre@sandia.gov

Venayagamoorthy, Ganesh
Real-Time Power and Intelligent
Systems Lab.Univ.
Professor
132 Emerson Electric Co. Hall
Rolla, MO 65409
573-341-6641
ganeshv@umr.edu

Viikinsalo, James
Southern Company Services, Inc.
P.O. Box 2625, PCC-Corp HQ
Birmingham, Alabama 35291-8210
205-257-6823
jwviikin@southernco.com

Vittal, Vijay
Arizona State University
Fulton School of Engineering
ERC 513, Mailcode 5706
Tempe, Arizona 85287
Phone: (480) 965-1879
Vijay.Vittal@asu.edu

Waligorski, Joseph
FirstEnergy Corp.
Manager
76 S. Main Street
Akron, OH 44308
330-384-5743
waligorskij@firstenergycorp.com

Waslo, Stephen
US DOE
9800 S. Cass Ave.
Argonne, IL 60439
630-252-2143
stephen.waslo@ch.doe.gov

Yue, Meng
BNL
Assistant Scientist
Bldg 475C
Upton, NY 11973
631-344-7140
yuemeng@bnl.gov

