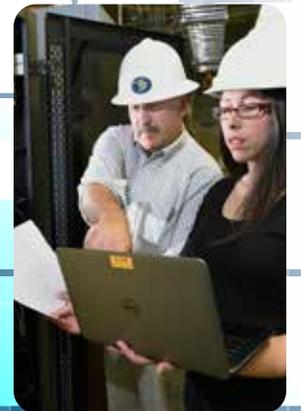
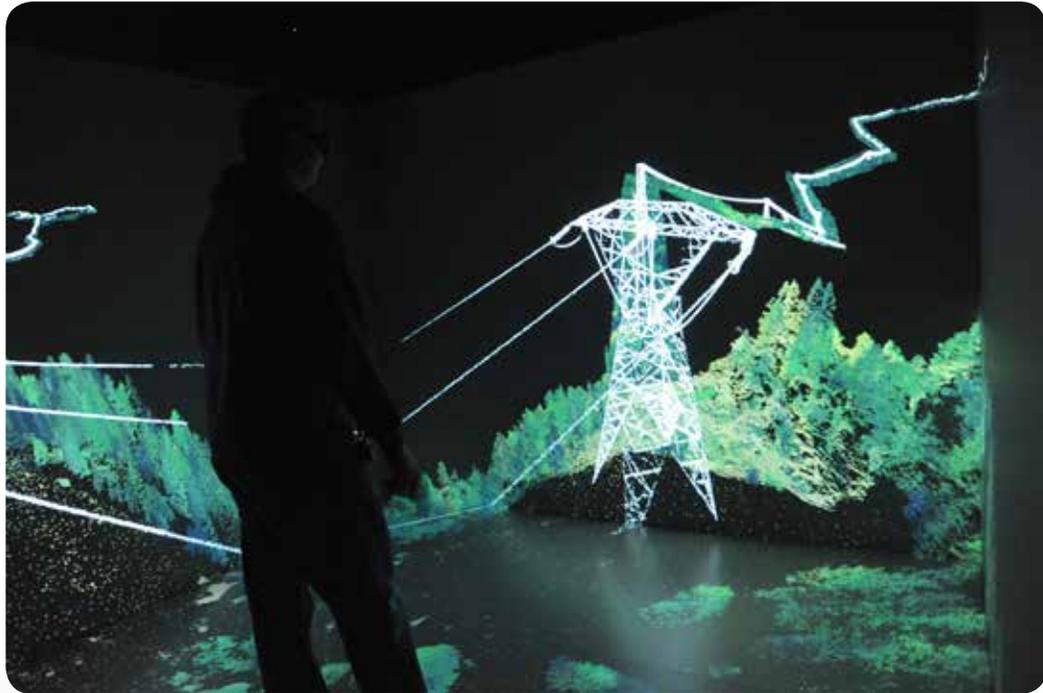


# Geomagnetic Disturbance Workshop



Idaho National Laboratory



## **Geomagnetic Disturbance Workshop**

**INL Meeting Center**

Energy Innovation Laboratory

775 University Blvd, Idaho Falls, Idaho



# Welcome



Welcome to Idaho National Laboratory (INL) and the second annual Geomagnetic Disturbance workshop. The United States faces unprecedented challenges as we strive to protect our electrical infrastructure from the threats posed from geomagnetic disturbances (GMD). The goal of this workshop is to bring industry leaders, lawmakers, and researchers together for active dialogue and collaborative discussions on national recovery challenges and potential risks of mitigation. Opportunities to address resilience and the power needs of the nation, while balancing the effort with a reasonable and affordable path forward, will be addressed during the workshop.

At INL, we take a proactive approach to research, building resilience into power infrastructure, and addressing technology solutions to mitigate potential damage. INL has worked with key stakeholders to support full-scale testing of the GMD phenomena with a realistic power grid, confirming some geomagnetic storm theories and bringing new concerns to light.

I welcome this opportunity for each of you to share your expertise and capabilities to enhance our nation's energy security through a more resilient electrical grid. I also want to personally thank you for attending the workshop and collaborating to improve our understanding of the challenges posed by geomagnetic disturbances.

Brent Stacey

Associate Laboratory Director  
National and Homeland Security  
Idaho National Laboratory

# Agenda

Tuesday, April 7, 2015

**7:30 Registration at INL Meeting Center**

**8:00 Welcome**

Dan Elmore, Director, Critical Infrastructure Protection,  
INL National & Homeland Security (N&HS)

**8:15 Keynote Presentation –  
Space Weather & Solar Cycle 24**

Chris Balch, Lead Forecaster  
NOAA Space Weather Prediction Center

## **Policy & Regulation**

National and state posture for GMD vulnerability mitigation.

**9:00 Maine Response**

The Honorable Andrea Boland,  
former State Representative of Maine

**9:30 Maine & Wisconsin Commonalities**

Gale Nordling, President and CEO  
Fred Faxvog, Senior Program Director  
Emprimus

**10:15 Break**

**10:30 DOE-OE Activities**

John Ostrich, Department of Energy, Office of Electricity Delivery and Energy Reliability

**11:00 EMP SIG/InfraGard**

Chuck Manto, Instant Access Network CEO

**11:30 Power Systems Modeling**

Dr. Tom Overbye, Professor  
University of Illinois

**Tuesday, April 7, 2015**

<b>12:00</b>	<b>Lunch presentation on GMD GIC Monitoring at INL</b>	Shawn West, INL N&HS Research
<b>1:15</b>	<b>Electric Power Grid EMP/GMD/RF Weapon Protection Issues</b>	Dr. George H. Baker, Professor Emeritus, James Madison University
<b>1:45</b>	<b>Solar Shield Focusing System for Predicting GIC</b>	Chigomezyo Ngwira, Catholic University of America
<b>2:15</b>	<b>Harmonics</b>	Dr. Mack Grady, Professor Baylor University
<b>2:45</b>	<b>Auto-Transformer Research</b>	Emanuel Bernabeu, PJM
<b>3:30</b>	<b>Break</b>	
<b>3:45</b>	<b>Panel Discussion: Standards and Research</b>	Andrea Boland, John Ostrich, Gale Nordling, and Fred Faxvog Facilitated by: Andy Bochman
<b>4:45</b>	<b>End of Day Workshop Report</b>	Scott McBride, INL N&HS
<b>5:00</b>	<b>Adjourn</b>	



**Wednesday, April 8, 2014**

**8:00 Meet & Greet with Refreshments**

**8:15 Morning Kick-off**

Andy Bochman, INL N&HS

**8:30 Keynote Presentation – EIS Council  
E-PRO™ Handbook**

Dr. Chris Beck, Vice President, Policy & Strategic Initiatives, The Electric Infrastructure Security (EIS) Council

**Modeling, Analysis, & Harmonics (cont.)**

Status of modeling and simulation of GIC caused by GMD on power grid components

**9:00 The View from the Other Side: Trans-  
former Effects on GIC**

Dr. David Boteler, Natural Resources Canada

**Industry Response**

How industry is responding to research and standards.

**9:45 Space Weather Impacts to the  
Power Grid**

John Kappenman  
Storm Analysis Consultants

**10:15 Managing Top Risks Faced by Critical  
Infrastructure Owners and Operators**

David Batz, Director,  
Cyber & Infrastructure Security  
Edison Electric Institute

**10:45 Break**

**11:00 Lunch Presentation**

Richard Lordan, EPRI

**Wednesday, April 8, 2014**

**Industry Response**

How industry is responding to research and standards

**12:15** ATC's Deployment of the Emprimus/  
ABB GIC blocker

Mike Londo, Transmission Reliability Administrator,  
American Transmission Company (ATC)

**1:00** PJM Response

Frank Koza, Executive Director, Operations Support  
PJM

**1:45** Break

**2:00** Panel Discussion  
Review, identification of research gaps,  
and path forward after Discussion

David Boteler, Emanuel Bernabeu, Frank Koza  
and David Batz  
Facilitated by: Scott McBride

**3:15** End of Workshop Report

Scott McBride INL N&HS

**3:30** Walking Tour of INL's  
Idaho Falls Campus

**5:00** Adjourn

**Thursday, April 9, 2015 – INL Facilities Tour (optional)**

**7:30** Leave Idaho Falls for INL Site

**1:00** Arrive back in Idaho Falls

# Biography's



## **Christopher C. Balch**

Dr. Balch is a Space Scientist at the NOAA Space Weather Prediction Center (SWPC). His work is primarily focused on the development of operational geomagnetic data, services and products, transition of physics-based models to operations, and special support for the electrical power industry.

Dr. Balch research interests cover theories, models, and empirical relationships applied to solar activity and its influence on the terrestrial environment. More particularly, the study of solar flare prediction, coronal mass ejections and their evolution in the solar wind, the acceleration and transport of energetic particles in interplanetary space, the interaction between the solar wind and the magnetosphere, and phenomena associated with geomagnetic storms, with special emphasis on study of geomagnetically induced currents.

Dr. Balch received his Ph. D. at the University of Colorado, Boulder, Astrophysical and Planetary Sciences, in August 1999 under the guidance of Fran Bagenal at C.U., Boulder, and A.J. Hundhausen at NCAR/HAO.



## **Andrea Boland**

Andrea Boland recently completed eight years of service in the Maine legislature. As State Representative, she worked to advance integration of nutritional wellness and prevention into approaches to health care delivery, consumer safety awareness of non-thermal electromagnetic radiation risk from cell phones and smart meters, and safer electric transmission line siting for public

protection from high voltage electromagnetic fields. She introduced the first legislation in the world to call for warning labels for cell phones.

Her work led her to learning about the threat from solar storms (GMD/geomagnetic disturbance) and EMP/manmade electromagnetic pulse, together often referred to as natural and man-made EMP, or simply abbreviated as EMP. She introduced the first legislation passed in the country for protections of the transmission system against GMD and EMP.

Andrea served on the State and Local Government Committee, and on the Government Oversight Committee. She is a strong advocate for government transparency and accountability. She earned the 2011 National Health Freedom Hero Award from the National Health Federation.

She lives in Sanford, Maine, has an MBA from Northeastern University and a BA degree in International Studies from Elmira College, including a year of study at the Sorbonne and L'Institut d'Etudes Politiques in Paris. She works independently as a title examiner and a Reliv distributor. She serves on the policy advisory council of the InfraGard National Electromagnetic Pulse Special Interest Group (EMP-SIG), and is a member of the Task Force on National and Homeland Security..

The Honorable Andrea Boland continues to support initiatives in the areas of her legislative work. She currently spends most of her time supporting efforts to protect the electric grid in Maine and other states from GMD and EMP. She believes the states readily see the opportunity for attracting and keeping businesses and jobs where there is a commitment to ensure the safety of both their people and their electric grid from the devastating threats of GMD and EMP.



### **Thomas J. Overbye**

Thomas J. Overbye is the Fox Family Professor of Electrical and Computer Engineering at the University of Illinois at UrbanaChampaign (UIUC). He received his BS, MS, and Ph.D. degrees in Electrical Engineering from the University of WisconsinMadison. Prior to joining UIUC he was employed with Madison Gas and Electric Company. Dr. Overbye is the original developer of PowerWorld Simulator, a coauthor of the book Power System Analysis and Design, and a member of the US National Academy of Engineering. His areas of research include power system operations, visualization, cyber security and the modeling of the power system impacts of geomagnetic disturbances.



### **George H. Baker**

Dr. Baker is CEO of Baycor, LLC-a consulting company primarily devoted to preparedness for and protection against major electromagnetic threats to critical infrastructure including nuclear EMP, solar storms, and RF weapons. In addition to serving as a Director of the Foundation for Resilient Societies, Baker is Professor Emeritus at James Madison University, where he directed the JMU Institute for Infrastructure and Information Assurance. Previously Dr. Baker led the Defense Nuclear Agency's EMP program, directed the Defense Threat Reduction Agency's assessment ann, and served as a member of the Congressional EMP Commission staff. He continues to advise the Defense Department on hardening systems to survive EMP effects. He holds an M\_S. in Physics from University of Virginia, and a Ph.D in Engineering Physics from the U.S. Air Force Institute of Technology



### **Scott A. McBride**

Mr. Scott A. McBride joined the Idaho National Laboratory in Idaho Falls, Idaho operated by EG&G Inc. for the U.S. Department of Energy (DOE) in 1988 with a BS degree in electrical engineering from the University of Idaho. While at the INL, Mr. McBride supported various DOE and DOD customers in numerous power systems engineering projects. In 1995 Mr. McBride was selected as the Chief Engineer for Idaho Falls Power and served in that capacity for 12 years. In 2007 Mr. McBride returned to the INL, now operated by the Battelle Energy Alliance, in the National and Homeland Security, Infrastructure Protection Department. Mr. McBride is the Infrastructure Protection Department Manager and is a licensed Professional Engineer in the State of Idaho.



### **Andy Bochman**

Andy Bochman is the Senior Cyber and Energy Security Strategist for Idaho National Lab's National and Homeland Security directorate. Prior to joining INL, he was an advisor on energy security matters at the Chertoff Group, and was security lead for IBM's global energy & utilities business. A frequent speaker and adviser on topics at the intersection of grid modernization and national security, Andy is a corporate board member of the Industrial Control Systems - Information Sharing and Analysis Center and a member of GTM's Grid Edge Executive Council.



### **Chris Beck**

Chris Beck is the Vice President for Policy and Strategic Initiatives for the Electric Infrastructure Security (EIS) Council.

Dr. Beck is a technical and policy expert in several homeland security and national defense related areas including critical infrastructure protection, cybersecurity, science and technology development, WMD prevention and protection, and emerging threat identification and mitigation.

Dr. Beck served as the Subcommittee Staff Director for Cybersecurity, Infrastructure Protection, and Science and Technology and was the Senior Advisor for Science and Technology for the House Committee on Homeland Security (CHS), where he worked from May 2005 to May 2011. Prior to CHS, he worked in the office of Congresswoman Loretta Sanchez for three years, beginning as a Congressional Science Fellow and then as a legislative assistant.

Before government service, Dr. Beck was a postdoctoral fellow and adjunct professor at Northeastern University. He holds a PhD in physics from Tufts University (2001) and a B.S. in physics from Montana State University (1994). He served in the Marine Corps Reserve for five years (1987 – 1992).



### **David Boteler**

David Boteler was born in London, UK and has a B.Sc. in Electronic Engineering from the University of Wales, M.Sc in Geophysics from University of British Columbia, Canada and Ph.D. in Physics from Victoria

University of Wellington, New Zealand. He has over 30 years' experience working on interdisciplinary problems including work in the Antarctic and Arctic. Since 1990 he has been a research scientist with Natural Resources Canada specialising in space weather and geomagnetic effects on technological systems.



### **David Batz**

David Batz joined Edison Electric Institute in 2009 with a focus on cyber and infrastructure Security in the association's Energy Delivery group.

Mr. Batz assists EEI member companies with understanding and applying appropriate security solutions to address emerging threats and issues. He has provided professional technology and security solutions and services for over 25 years, the last ten

being focused on Cyber Security issues for utilities and critical infrastructure protection. In addition to working on both cyber and physical security issues on behalf of EEI Member companies with federal agencies including Department of Energy, and the Department of Homeland Security, Batz assists in the development and articulation of policy positions concerning Smart Grid.

Batz also manages the Spare Transformer Equipment Program (STEP) which is operated by EEI. STEP provides a ready mechanism for participating utilities to share assets in the event of catastrophic destruction.

Prior to joining EEI, Batz was a Cyber Security Risk Manager with Alliant Energy, an electric and gas utility serving customers in Iowa and Wisconsin. During his 20-year tenure with Alliant Energy, Batz performed in a variety of roles within the Information Technology and Facility Services departments.

Batz is a member of InfraGard, and serves on the SANS Advisory Board. He has served on the North American Electric Reliability Corporation (NERC) Critical Infrastructure Protection Committee (CIPC) and the CIPC-Executive Committee.

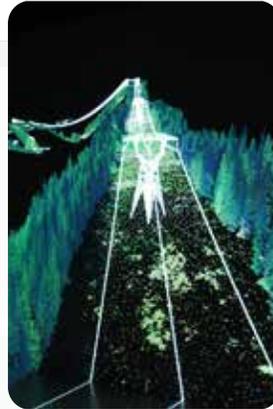
Batz is a Certified Information Systems Security Professional (CISSP), and has multiple security certifications.



### **Frank J. Koza**

I have worked at PJM over 13 years, previously in charge of system operations. Presently, I am Executive Director of Infrastructure Planning and in charge of the technical staff associated with generator interconnection and implementation of transmission enhancements. I am Chair of the NERC Geomagnetic Disturbance Standard Drafting Team and former Chair of the NERC Operating Reliability Subcommittee.

Previously, I worked for 29 years at Exelon/PECO Energy in a variety of assignments including construction of fossil and nuclear generation facilities, construction and maintenance of transmission, system planning, and system operations.



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