TRANSFORMING GRID OPERATION AND PLANNING

Future Power Grid Initiative Newsletter

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FPGI WORKSHOP ADVANCES "COMMUNITY" APPROACH

Committee Will Form to Take on Workshop and Community Planning

The Future Power Grid Initiative's 3rd Workshop on Next-Generation Analytics for the Future Power Grid continued the progress toward creating a community of advocates to advance new tools for the future power grid.

Nearly 80 participants—representing the Bonneville Power Administration, national laboratories, industry and academia—attended this year's workshop, held July 17 and 18 at Washington State University Tri-Cities. They learned about the latest software development activities and identified major data-related grid challenges that need to be addressed in the future.

Workshop speakers included **Gil Bindewald**, who manages the Advanced Grid Modeling Research Program in the Department of Energy's Office of Electricity Delivery & Energy Reliability; **Larry Bekkedahl**, senior vice president of Transmission Services for BPA; and **Jesse Berst**, founding editor and chief analyst for Smart Grid News and chairman of the Smart Cities Council.

The workshop opened on July 17 with nearly 80 participants representing a wide range of power grid interests.

One of the key outcomes from the workshop was the decision to form a multi-entity committee that will assume from the Future Power Grid Initiative the task of organizing future workshops and further defining and establishing the community concept.

As envisioned, the community would consist of Pacific Northwest National Laboratory, other national laboratories, academia, vendors, and power companies. The community would leverage resources and expertise to ensure that FPGI-developed tools, as well as data-related tools developed by other entities, ultimately are available for use and help advance power grid improvements.

Alstom's David Sun (standing) led a workshop breakout session that examined a key grid challenge and potential solutions.

There are a number of questions about forming a community, including its structure and the business model needed to sustain it. This workshop—and previous ones—are helping to answer those questions and create a path forward.

In addition to the main workshop, FPGI sponsored tutorials on three of its products--GridPACK™, the GridOPTICS™ Software System, and the Framework for Network Co-Simulation. Also, following the workshop, FPGI provided a tour of several PNNL facilities.

STAFF, SYNERGY PUT SPARK IN FUTURE POWER GRID INITIATIVE

Initiative draws from multiple research disciplines to create grid innovations

Pacific Northwest National Laboratory is known for marshaling interdisciplinary teams to deliver science and technology solutions. PNNL's Future Power Grid Initiative is a great example of how this approach produces collaboration and positive outcomes.

"When we launched the initiative in 2011, we knew that along with power engineering, we needed capabilities from other PNNL domains, such as computer science, mathematics, statistics, and visualization," says FPGI Lead **Henry Huang**, who works in PNNL's Energy and Environment Directorate (EED). "The diverse expertise represented in the initiative has been vital to achieving FPGI objectives of developing tools to improve the grid."

During the past fiscal year, more than 50 staff at PNNL have worked on the initiative, which is a five-year effort funded through the Laboratory Directed Research and Development program. Based on total hours charged, about 40 percent of staff are from EED. Approximately one-third are associated with the Fundamental and Computational Sciences Directorate (FCSD), and one-fourth with the National Security Directorate.

FPGI leadership also reflects diverse research backgrounds and experience. Henry and Co-Lead **Jeff Dagle** are power engineers from EED who have spent the bulk of their careers at PNNL, while FPGI's Focus Area leads have come to the initiative through other paths:

Bora Akyol, FCSD, oversees FPGI's research in Networking and Data Management, where he has played central roles in key product development. He initiated the powerNET testbed, which provides a realistic testing environment for power system and other technologies. He also led the design of VOLTTRON™, a distributed control and sensing software platform, and currently leads efforts to develop the GridOPTICS™ Software System (GOSS) middleware. Bora holds master's and doctorate degrees in Electrical Engineering in the area of Wireless Networking from Stanford University. He has served as a technical leader at Cisco Systems, is a veteran of three business startups in California, and holds more than 10 patents. Away from work, Bora likes to sleep, ride his bicycles and play with his dog.

Paul Whitney, FCSD, leads FPGI's research in Visualization and Decision Support. As part of his leadership with FPGI, Paul has framed a vision for creating tools that will help power system operators with effective decision-making in their management of grid performance. Paul's research interests are modeling behavior of individuals and organizations; the analysis of data objects associated with Internet content; and algorithm development for a variety of automatic text analyses. Paul earned a bachelor's degree in Mathematics and a doctorate in Statistics. He holds seven patents associated with information analysis. In his spare time, he enjoys endurance bicycling with the Desert River Randonneurs and is looking forward to participating in one of the oldest continuing bicycle events still running: Paris-Brest-Paris.

Staff Members Benefit from Involvement

How do research staff at PNNL assess their work experiences in FPGI?

*Among the contributors from the National Security Directorate is **Luke Gosink**, a scientist in the Applied Statistics and Computational Modeling group with a background in computer science and machine learning.*

"I've enjoyed working on FPGI," Luke says. "The initiative leads are very engaging and supportive of the research we have performed. FPGI has also been one of the best experiences I have had with respect to opportunities for direct client engagement and the ability to transition your research from proof-of-concept to an operationalized state that benefits clients in their environments." He adds that another fascinating aspect of his job has been learning about commercialization. He's actively engaged in technology transfer tasks for two FPGI projects that will carry into next year.

*The FPGI experience also has been enriching for **Angela Dalton**, who is a social scientist in the Fundamental and Computational Sciences Directorate's Computational Mathematics Team. Her background is in expert elicitation and organizational behavior. Angela partnered on a project with colleague Gariann Gelston and other staff that engaged with the power industry to gain an understanding of organizational behavior and change management perspectives. The goal was to provide tools to help power system operators better manage the grid.*

"The industry engagement not only was an educational experience, but inspired us to pursue bold, futuristic ideas," Angela says. She adds that through her work with FPGI, she came to appreciate the remarkable diversity and depth of R&D capabilities at PNNL, "and, from a personal perspective, I made great friends with many colleagues from the initiative."

GOSS, FNCS NOW PUBLICLY AVAILABLE

Two innovations created by the Future Power Grid Initiative are now publicly available.

The GridOPTICS™ Software System (GOSS) code (https://github.com/GridOPTICS/GOSS) became available on GitHub on April 1. The Framework for Network Co-Simulation—FNCS—(https://github.com/GridOPTICS/FNCS) pronounced "phoenix," was released via GitHub in July. GOSS and FNCS are both products within the GridOPTICS™ capabilities suite—or the set of inter-related grid tools FPGI is developing.

GOSS integrates grid applications with sources of data and facilitates easy communication between them, providing a foundation for developing a range of applications that will improve grid management. FNCS is a federated co-simulation platform that merges communication simulators with distribution and transmission simulators, serving as a resource for grid modeling and helping to inform the deployment of smart grid hardware.

Other FPGI-developed tools that have been publicly released are GridPACK™ and VOLTTRON™.

ABOUT FPGI AND GRIDOPTICS™

The **Future Power Grid Initiative** (FPGI) was established in 2011 by Pacific Northwest National Laboratory and is delivering next-generation concepts and tools for grid operation and planning to help ensure a more secure, efficient and reliable future grid. FPGI builds upon PNNL's pre-eminent grid expertise and resources such as the Electricity Infrastructure Operations Center (EIOC), a national electric grid research facility.

When the initiative concludes in 2015, its key product will be the **Grid Operations and Planning Technology Integrated Capabilities Suite (GridOPTICS™)**, a set of tools that will facilitate secure data collection and management in real time, use data to drive modeling and simulation, and convert large volumes of data to actionable information. The result will be the ability to show and analyze grid performance at an unprecedented speed, scale, and resolution, supporting operational and policy decision-making for the grid of the future. A primary emphasis of FPGI is on transitioning GridOPTICS™ tools to open-source status and creating a community of advocates that will promote use and further development.

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