

## FPGI'S VOLTTRON™ REACHES NEW MILESTONE

### Code Release Brings New Tool to Smart Grid/Buildings Efforts

The source code for VOLTTRON™, an innovative distributed control and sensing software platform developed through PNNL's Future Power Grid Initiative, has been released for public use.

"The availability of VOLTTRON™ code means that researchers and others now have access to use this tool to build applications for more efficiently managing energy use among appliances and devices, including heating, ventilation and air conditioning (HVAC) systems, lighting, electric vehicles and others," says Jereme Haack, who is one of the platform's developers.

VOLTTRON™ has been created as an open, language agnostic and non-proprietary framework. It's envisioned that as the platform gains more users, a "community" of supporting entities will coalesce around it and not only use the tool, but add to it and advance it.

VOLTTRON™ creates an environment in which appliances and other devices are represented by "agents" that communicate among each other to prioritize power needs and deliver



*A multi-disciplinary PNNL team, which included staff pictured above, developed VOLTTRON™. In the photo, top row from left, are Nate Tenney, Srinivas Katipamula, Mike Brambley, Bora Akyol and Robert Lutes. Pictured in the bottom row, from left, are Kyle Monson, Siddarth Goyal, Jereme Haack, Brandon Carpenter, Weimin Wang and Lucy Huang.*

electricity accordingly. For instance, in a neighborhood, an agent might temporarily turn off one home's water heater after another agent communicates a higher priority need—that of an electric vehicle charging next door. Once the car is charged, the water heater is turned back on. The end result of this balancing act is that all power needs are met, but in a more efficient manner.

The innovative tool already has established an impressive record of accomplishment. This year it received funding from DOE's Office of Energy Efficiency and Renewable Energy for two projects—one focused on building energy management and automation, the other to create an open source community around VOLTTRON™. Previous accomplishments have included the use of VOLTTRON™ as the integrating platform for a DOE-funded project combining multiple labs and vendors for building energy efficiency, and the platform's deployment into the PNNL Lab Homes test bed to enable the scheduling and control of electric vehicle chargers.

VOLTTRON™ is available via GitHub at <https://github.com/VOLTTRON/volttron>

## EASTERN GRID OPERATOR TESTS FORECASTING TOOL

### FPGI Innovation Could Improve Grid Efficiency, Help Avoid Energy Market Volatilities

Software developed through the Future Power Grid Initiative is showing promise as a tool to help power grid transmission operators improve grid operation efficiency and avoid transactions-based volatilities in the energy market.

Developers Luke Gosink and Ryan Hafen recently installed the software—a forecasting methodology based on Bayesian Model Aggregation (BMA)—in PJM Interconnection's Net Interchange Schedule (NIS) testing environment. PJM operates electric transmission in 13 eastern states and the District of Columbia. PJM's Net Interchange (NI) is the sum of the transactions (in megawatts) between PJM and its neighbors. Effective NI forecasts improve grid operation efficiency and help PJM minimize volatilities in the energy markets due to changes of NI schedules.

“This project with PJM is a great opportunity for PNNL to showcase its capabilities and help deliver a solution to a big challenge,” Luke says. “We’re making good progress and are now beginning to work with PJM to identify follow-on activities.”

PJM became aware of the software and, earlier this year, reached an agreement with PNNL to install the tool in the organization’s testing environment. There, the software accesses live data to generate NIS forecasts. The tool is currently in a testing mode and is aimed for actual decision-making.

This forecast and modeling methodology and the related software are available for licensing to other potential users and software developers. For more information, contact:

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## FPGI TO HOST THIRD WORKSHOP ON NEXT-GENERATION ANALYTICS

### July Meeting Will Advance Community Approach

The 3<sup>rd</sup> Workshop on Next-Generation Analytics for the Future Power Grid is set for July 17-18 at Washington State University’s Tri-Cities campus in Richland, Wash.

The workshop will build on the progress of the past two workshops, where it was concluded that a software infrastructure such as the FPGI-developed GridOPTICS™ should transition to open-source software, with further development entrusted to an open community of users and advocates. In addition to furthering the community approach, the workshop will explore

ways to accelerate deployment of new software to support next-generation power delivery systems.

Workshop information is available at <http://gridoptics.pnnl.gov/fpgws14/> or from FPGI’s David Callahan ([david.callahan@pnnl.gov](mailto:david.callahan@pnnl.gov)). Last year’s workshop report, which summarizes the 2013 meeting and its recommendations, is available at <http://gridoptics.pnnl.gov/fpgws13/>.

## ADVISORS: FPGI ON RIGHT TRACK

### Annual Review Provides Positive Feedback, Suggestions for Transition Effort

The Future Power Grid Initiative started with baby steps, then strides, and now, four years later, is poised to make a major advance toward meeting its goal of delivering next-generation power grid concepts and tools.

During the initiative’s annual review with its advisory committee on May 13-14 at PNNL, the FPGI team highlighted the initiative’s progress, demonstrated tools that have been developed, and outlined plans for the next major step—that of transitioning FPGI from a PNNL-funded internal initiative to a national resource for enhancing the grid.

The advisors were impressed with current projects, were intrigued and excited about tools that have been developed,

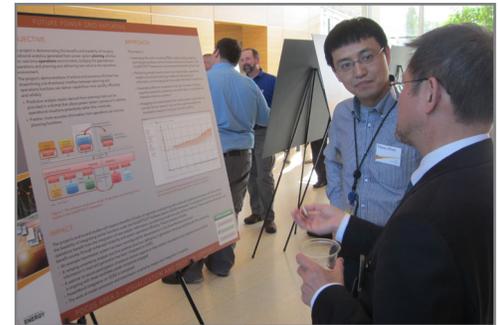


*Advisors and FPGI leadership gather for the annual review’s opening session.*

and praised FPGI for successfully assembling a multi-disciplinary team to carry out initiative objectives. The advisors also provided some specific suggestions to help ensure transition success.



*PNNL staff member Abhishek Somani discusses wholesale-retail market design concepts in one of two demonstrations that showed advisory committee members how FPGI-developed tools can be integrated to enhance power system operations.*



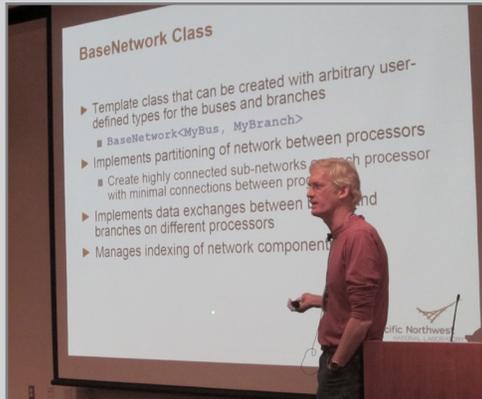
*PNNL’s Yousu Chen (left) discusses his research with advisory committee member Chen-Ching Liu at the annual review’s poster session.*



*During the review, five FPGI advisory committee members participated in a panel discussion on grid-related issues. Advisors from left are Carl Imhoff (PNNL); Scott Moore (American Electric Power); David Sun (Alstom Power); Frank Mueller (North Carolina State University); and Larry Buttress (Bonneville Power Administration). The panel session was moderated by FPGI Co-Lead Jeff Dagle.*

## GridPACK™, FNCS TUTORIALS SUCCESSFUL

### Training Sessions Provide Overview of Innovative Grid Tools



*Tutorials for the FPGI-developed GridPACK™ and Framework for Network Co-Simulation (FNCS) were conducted January 22 at PNNL. The GridPACK™ tutorial was held in the morning, and FNCS in the afternoon. Approximately 40 people participated in each session. GridPACK™ is a software framework and library that facilitates software development on advanced computing platforms for power grid applications. It is open source and can be downloaded at <https://www.gridpack.org>. FNCS is a co-simulation framework that integrates the simulation of power transmission grids, distribution grids, and data communication networks. It can interface with existing simulation tools and supports the studies on network interdependency. It is being made open source and will be available for download soon.*



## HUANG SHARES FPGI STORY AT NIAC DAY

### Event Helps Shape Computing Institute's Research Future

FPGI Lead Henry Huang spoke at NIAC Day@PNNL, a March 18-19 event hosted by NIAC, the Northwest Institute for Advanced Computing. NIAC is a joint PNNL-University of Washington

collaborative center that's designed to maximize computing's impact on scientific discovery.

The event sought to engage PNNL's sector leaders and researchers to help steer NIAC's future research agenda.

Henry provided an FPGI overview and update. "The event was a great opportunity to demonstrate how FPGI has benefitted from advanced computing and our relationship with NIAC," Henry says.

## ABOUT FPGI

The Future Power Grid Initiative (FPGI) will deliver next-generation concepts and tools for grid operation and planning and ensure a more secure, efficient and reliable future grid. Building on the Electricity Infrastructure Operations Center (EIOC), the Pacific Northwest National Laboratory's (PNNL) national electric grid research facility, the FPGI will advance the science and develop the technologies necessary for meeting the nation's expectations for a highly reliable and efficient electric grid, reducing carbon emissions and our dependence on foreign oil.

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### Past Newsletters

For past newsletters, please see our news page here [http://gridoptics.pnnl.gov/articles/i/n/i/Initiative\\_News\\_57ae.html#newsletters](http://gridoptics.pnnl.gov/articles/i/n/i/Initiative_News_57ae.html#newsletters).

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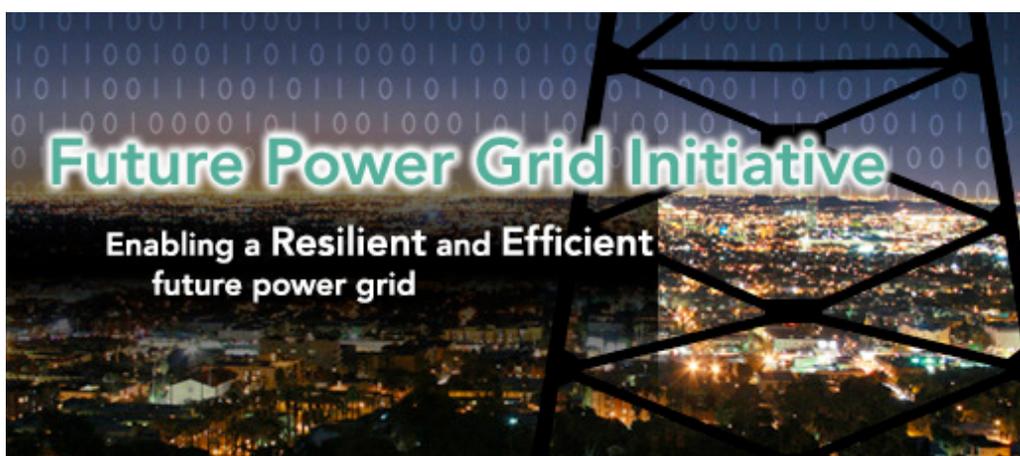
For more information, please visit the FPGI website [gridoptics.pnnl.gov](http://gridoptics.pnnl.gov) or contact Initiative Leads

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