

## Special Issue on High Performance Computing (HPC) Applications for a More Resilient and Efficient Power Grid

Proposed by the IEEE PES CAMS Task Force on High Performance Computing for Grid Analysis and Operation

The power grid has been evolving over the last 120 years but it is likely to see more changes over the next decade than it has seen over the past century. In particular, the widespread deployment of intermittent renewable generation, smart loads and devices, hierarchical and distributed control technologies, phasor measurement units, energy storage, and widespread usage of electric vehicles will require fundamental changes in methods and tools for the operation and planning of the power grid. The resulting new dynamic and stochastic behaviors will demand the inclusion of more complexity in modeling the power grid, while solving complex models in the traditional computing environment will be a major challenge. Along with the increasing complexity of power system models, the increasing complexity of smart grid data further adds to the prevailing challenges. In this environment, the myriad of smart sensors and meters in the power grid increase by multiple orders of magnitude, so do the volume and speed of the data. The information infrastructure will need to drastically change to support the exchange of enormous amounts of data as smart grid applications will need the capability to collect, assimilate, analyze and process the data, to meet real-time grid functions. High performance computing (HPC) holds the promise to enhance these functions, but it is a great resource that has not been fully explored and adopted for the power grid domain.

Computers have evolved significantly over the past decade. Multi-core and many-core computers and computer clusters are ubiquitous today which make every processor to be a parallel computer. The easy gains of the past in which sequential applications simply got faster due to increased performance and clock frequencies on newer processors, are gone. Any performance gains for applications must be realized through the use of parallelism across multi-core processors. It is imperative to adapt or re-develop power grid software tools with explicit parallelization for massive smart grid applications.

In this special issue, we invite original and unpublished submissions discussing the development of HPC for smart grid applications. This includes adapting commercial tools to run on small- or medium-scale parallel computers and massive scenario analysis on tens of thousands of computer cores. Pilot projects, demonstration or field application experiences, and HPC benefit analyses will also be given consideration for publication. Computing aspects should be specifically addressed in the paper to be aligned with the scope of this special issue.

Topics of interest for this Special Issue include, but are not limited to:

- High performance data networking, management, and analytics in smart grid
- Applications of computing platforms (shared memory, distributed memory, cloud computing, etc.) in smart grid
- High performance simulation of smart grid
- Real-time operation and planning of smart systems
- Integrated simulation of power grid & other critical infrastructures in smart cities
- Role of visualization in converting large data to information in smart grid
- Stochastic analysis and optimization in smart networks
- Computing architecture for smart grid applications

Two-page extended abstracts are solicited for the first round of review. Authors of selected abstracts will be invited to submit the full papers in the second round. Authors should refer to the IEEE Transactions on Smart Grid author guidelines at <http://www.ieee-pes.org/publications/information-for-authors> for information about contents and formatting of submissions. Please submit a PDF version of the abstracts including a cover letter with authors' contact information to, Dr. Zhenyu (Henry) Huang via e-mail at: [zhenyu.huang@pnnl.gov](mailto:zhenyu.huang@pnnl.gov), or Prof. Zeb Tate via email at: [zeb.tate@utoronto.ca](mailto:zeb.tate@utoronto.ca).

### Important Dates

February 27, 2015: Deadline for extended abstract submission

April 1, 2015: Completion of first-round of review

August 3, 2015: Deadline for full paper submission

May 1, 2016: Final decision notification

June 1, 2016: Publication materials due

### Guest Editorial Board

Zhenyu (Henry) Huang (Guest Co-Editor-in-Chief), Pacific Northwest National Laboratory, U.S.A.

Zeb Tate (Guest Co-Editor-in-Chief), University of Toronto, Canada

Shri Abhyankar, Argonne National Laboratory, U.S.A.

Zhaoyang Dong, The University of Sydney, Australia

Siddhartha Khaitan, Iowa State University, USA

Liang Min, Lawrence Livermore National Laboratory, USA

Gary Taylor, Brunel University, United Kingdom

Jianhui Wang, Argonne National Laboratory, U.S.A.

### Editor-in-Chief of IEEE Transactions on Smart Grid

Mohammad Shahidepour, Illinois Institute of Technology, USA