

**Energy Efficient High Performance Computing Working Group**  
**8/13/13 Meeting Report**

**INTRODUCTION**

The EE HPC WG held a meeting on 8/13/13. This Working Group is composed of members representing major Federal departments and independent agencies, private sector representatives, and members of the academic community. More information can be found at the working group's website, <http://eehpcwg.lbl.gov>.

Documents from the group can be found at

<https://docs.google.com/leaf?id=0BzyTVVVRdMKpNwVjNTI5YTEtMTIiZi00YTA5LTlkMTYtZmY3ZDIyZjJjZmMy&hl=en>.

***NEXT MEETING: October 8th, 9:00-10:00AM Pacific Time***

**Introductions and Announcements: *Natalie Bates & Dale Sartor, LBNL***

- The Green Computing Report has a lot of great information. You can subscribe to this report at <http://www.greencomputingreport.com/>
- EE HPC WG Membership continues to grow and at last count we were over 370 members.
- Mike Patterson was the webinar speaker for July. He repeated a presentation that he made at ISC in June on TUE, a new metric that proposes to improve PUE. This presentation is posted on the EE HPC WG website on the "Discussions and Webinars" page. This presentation was for a paper that won the Gauss Best Paper Award at ISC.

**Conferences Sub-group Update: *Anna Maria Bailey & Marriann Silveira, LLNL***

- **News on EE HPC WG participation in upcoming Conferences**
- SC13 Supercomputing Conference will be held in Denver from November 17-22.

The SC13 Workshop submission was accepted. We asked for 1.5 days- and got it! This will be on Sunday and 1/2 day Monday. There is a planning team that is working on developing the agenda for the workshop. The general structure is that there will be panel sessions on active sub-teams for the EE HPC WG. These include TUE, Liquid Cooling Commissioning, Procurement Considerations, Power Measurement Methodology, Energy Re-use Effectiveness and Demand Response. There will be a few special talks also; Jack Dongarra will talk about Benchmarks and Energy Efficiency, Dan Reed will talk about What HPC Can Learn from Data Warehouse Sized Computers, John Shalf will give a talk about "System Architecture and Energy Efficiency" and Jim Laros will present his proposal for laying the groundwork for an Application Programming Interface (API) for power consumption.

❖ **Submissions that are planned or in the works.**

- We submitted a paper to the SC13 State of the Practice session, but it was rejected. The paper reviewed the power measurement methodology and described its use in three sites (Argonne, LRZ and Calcul Quebec). We are planning on updating the paper and resubmitting it to the ACM/SPEC International Conference on Performance Engineering in Dublin, Ireland, March 23-26, 2014. The deadline for paper submission is mid-October.
- We made three BoF submissions to SC13 and will know the results of these requests on September 10<sup>th</sup>.
  1. A TUE BoF will provide a forum for reviewing the beta test results and also provide for further community feedback on the new metrics.
  2. A Liquid Cooling Commissioning BoF will present lessons learned from Steve Hammond, NREL, Anna Maria Bailey, LLNL and Detlef Lebrecht, LRZ. The audience will also be asked to provide your lessons learned and review the draft commissioning paper.
  3. A joint BoF with the Green500 will do several things, including provide a forum for highlighting the new power measurement methodology.

**Future Conferences: (more details at <http://eehpcwg.lbl.gov/events-and-links> )**

- ❖ International Conference on Energy Aware High Performance Computing, September 2-3, 2013 Dresden, Germany. Paper submission: 26 April 2013
- ❖ Energy-Efficient High Performance Computing & Communication Workshop, September 17, 2013, Madrid, Spain.
- ❖ SC13, November 17-22, 2013 Denver, Colorado

\*\*The EE HPC WG website Links and Events page lists many upcoming Conferences and Workshops that have an HPC Energy Efficiency Focus\*\*

**Infrastructure Sub-Group Update: *William Tschudi, LBNL & Dave Martinez, SNL***

- **LIQUID COOLED COMMISSIONING TEAM UPDATE:** The Liquid Cooling Commissioning Team has collected and reviewed best practices and lessons learned for commissioning of liquid cooling infrastructure. The ultimate goal is to improve the commissioning process for delivering a liquid cooling infrastructure that works when the HPC system is installed. The Team has finished a draft document that will be distributed to the general membership for review by the end of August. They are now soliciting 'lessons learned' from sites that have deployed- or are in the process of deploying- liquid

cooling infrastructure. If anyone would like to contribute to the lessons learned, let Natalie know.

- **TUE TEAM:** The TUE Team has developed a metric that improves PUE by accounting for infrastructure elements that are a part of the HPC system (like cooling and power distribution). The team has already tested the metric at ORNL and published a paper with the results. (The paper was awarded with “Best Paper” at ISC13.) The TUE Team is soliciting sites to beta test the TUE metric. There are at least five sites that have expressed interest in testing the metric. If you are interested, please contact Natalie.
- **ENERGY REUSE EFFECTIVENESS:** The Energy Re-use Effectiveness Team in collaboration with The Green Grid has developed a standard metric for measuring the contribution of re-using heat generated by HPC systems for other useful purposes. NREL has been identified as an alpha site for evaluating this metric, but results are pending acceptance and use of their new system. There are other SC sites that have been using their waste heat – mostly for heating adjoining office space. This team has been tracking those SC sites and doing outreach to engage them as testers of the Energy Re-use Effectiveness Metric. Please contact Natalie if you are interested.

#### **Compute System Sub-group Update: *Natalie Bates, LBNL***

- **SYSTEM WORKLOAD POWER MEASUREMENT METHODOLOGY TEAM:** The Power Measurement Methodology along with the Green500, Top500 and Green Grid have developed a standard methodology for measuring energy and power while running a workload. The team developed the standard, refined it through both alpha and beta testing and collaborated with the Green500 List to ensure adoption as the Green500 run rules. They are now developing outreach and other tools for broader adoption of the measurement methodology. The ultimate goal is to have broad use of the highest quality energy and power measurement methodology for all of their system workload energy efficiency benchmarking activities.
- **HPC AND GRID INTEGRATION:** The Demand Response Team is investigating how HPC centers have, can and should engage more actively with the Grid electricity providers. They will be collecting information from all DOE HPC sites as well as other large US-based SC sites. This is an investigative activity with the ultimate goal of educating the HPC DOE Facility and Operations Managers about HPC and grid integration opportunities and challenges.
- **PROCUREMENT CONSIDERATIONS:** The RFP Team has drafted a Rev 0.2 whitepaper that recommends procurement document requirements that target more energy efficient HPC systems. The intention is to raise the bar and extend the requirements with a yearly update of the whitepaper. The 2013 focus is on measurement capabilities. This draft whitepaper has been reviewed by the EE HPC WG. We are planning a series of webinars for September with the system integrators and component providers invited to respond to the requirements and talk about their roadmaps. The

ultimate goal is to have vendors respond to the requirements with cost-effective product features.

***PARTICIPANTS INCLUDED***

| <b>Name</b>        | <b>Organization</b>                                  |
|--------------------|--|
| Auvil, Miles       | Schneider Electric                                   |
| Bair, Ray          | ANL  |
| Bates, Natalie     | LBNL   |
| Campbell, Matt     | SDSC   |
| Chung-Hsing, Hsu   | ORNL   |
| Cocilova, Anita    | LLNL   |
| Goodhue, John      | Mass Green HPC Center                                |
| Horga, Marius      | University of Chicago                                |
| Krishnan, Shankar  | Intel  |
| Kubaska, Ted       | Independent Contractor                               |
| Labrenz, Detlef    | LRZ  |
| Malik, Abid        | University of Houston                                |
| Martinez, Dave     | SNL  |
| Moss, David        | DELL   |
| Rodgers, Greg      | Network for Earthquake Engineering Simulation (NEES) |
| Rountree, Barry    | LLNL   |
| Sartor, Dale       | LBNL   |
| Siebold, Larry     | Seibold Systems                                      |
| Silveira, Marriann | LLNL   |
| Tschudi, Bill      | LBNL   |
| Wescott, Ralph     | PNNL   |