

NETL Water-Energy Workshop Summary
Water Management for Fossil Energy Systems
August 20 2014, Baltimore, Maryland

The U.S. Department of Energy Fossil Energy National Energy Technology Laboratory's (NETL) Crosscutting Research Program conducted a half-day workshop, "Water Management for Fossil Energy Systems," in conjunction with the MEGA Symposium at the Marriott Waterfront Hotel in Baltimore, Maryland on Wednesday, August 20, 2014. The MEGA Symposium is co-sponsored by **NETL, EPA, EPRI**, and the *Air and Waste Management Association (AWMA)*. Conducting the workshop at this forum provided the opportunity to bring together knowledgeable stakeholders with insight into critical areas where water-energy research may be needed. The thermal electric power generation sector is being challenged to come up with technology-based solutions for reducing and conserving water thus the need to identify areas of research. The workshop included three facilitated breakout brain-storming sessions to identify areas for future research. The 40 participants in the breakout sessions conducted discussions on topics including: cooling water systems design, water treatment technologies, solid waste disposal issues, and other water-related topics. Utilities, government agencies, research entities, national laboratories, universities and other industry stakeholders were represented in the workshop including Southern Company, Tampa Electric, U.S. EPA, EPRI, Southern Research Institute, Los Alamos National Laboratory, University of Chicago, and West Virginia University, among others. Details of the workshop will be provided on the NETL Website.

The Agenda for the workshop included opening remarks from Regis Conrad, FE-HQ, This was followed by a presentation by Robie Lewis, FE-HQ, describing the issues associated with the Water-Energy Nexus and DOE's efforts to coordinate government research in this area to provide solutions that improve water availability for future power generation and conserving existing resources. Susan Maley, NETL Crosscutting Program Technology Manager, discussed NETL's R&D efforts as a part of the Water-Energy Program and the Water Atlas being planned with the assistance of other federal agencies. There was considerable interest in the Atlas expressed by members of the audience with many asking about the structure and schedule for availability. Steve, Wilson, Southern Company Services provided a perspective on what Southern Company is doing in Water R&D to improve their company's response to water issues, and how they will be sharing this technology with the industry. Patricia Rawls, NETL Crosscutting Program Division Director concluded the formal session with instructions for the Brainstorming Breakout Session. These presentations are attachments to this report.

Following the formal presentations three (3) facilitated breakout sessions were conducted to gain input from the participants on areas where they felt R&D could benefit Water-Energy issues that they face looking into the future. To assist with this effort a package of resource materials was provided at registration, see Attachments E. Prior to each session, the participants were asked to prioritize the topics according to their preference for discussion, so that there would be sufficient time to discuss those areas they believe were most significant. Each of the sessions completed all topic areas identified for discussion.

BRAINSTORMING SESSIONS SUMMARY

Each of the sessions provided a review of areas where R&D funds can best be utilized over the near term. The order of discussion was based on prioritization of the categories to be used by each of the Brainstorming Groups. Each group participant received two red stickers. Participants used these to vote for their area of greatest interest for prioritizing discussion among the categories listed below. This ensured that sufficient time would be available to capture discussion on the areas of greatest interest to that group. In all the sessions, each group was able to cover all the topic areas.

1. **Cooling Systems:**
 - a. *(Wet and Dry)*
 - b. *Incremental & Step Change Improvements*
2. **Water Treatment and Reuse:**
 - a. *Economic Pathways for Zero Liquid Discharge*
3. **Process Efficiency and Heat Utilization:**
 - a. *Pathways for produce more power per unit of water withdrawn, consumed, and treated*
4. **Data, Modeling and Analysis:**
 - a. *Tools to enable regional and plant level decision making*
5. **Other topics**

The following is a summary of areas highlighted in the sessions that were considered worthy of consideration for future R&D. The order is not prioritized.

Highlights of Discussion

- Completion of a Water Atlas
 - Need for better data from a variety of sources
 - Trace mineral data in waters
- Funding of demonstrations for technologies currently in the R&D pipeline
 - Hybrid cooling
 - Alternative packing for cooling towers
 - Recovery of cooling tower condensate
- Funding of technologies that would facilitate the continued use of once-through cooling
- Issues associated with sea water cooling
- Development of advanced materials for water treatment systems
- There are an array of issues when ZLD is required and these need to be considered
 - Solids Disposal
 - Liquid Discharges
 - Materials
 - Recovery of value added byproducts
- Technologies for low level waste heat recovery and use

Technologies for energy storage