



## **CoalFleet for Tomorrow-Future Coal Generation Options (Program 66)**

### ***CoalFleet meets in Germany.***

*Group tours ultrasupercritical test center, IGCC plant.*

Several European power generators and technology suppliers provided briefings on their advanced coal power generation development efforts when EPRI's CoalFleet for Tomorrow program held its first technical meeting outside the U.S. during the week of Oct. 27 in Düsseldorf, Germany. In addition to hearing updates on the ongoing CoalFleet research projects, the more than 60 participants from 15 countries went on site tours of RWE's lignite drying prototype plant near Cologne, E.ON Engineering's ultrasupercritical materials test center in Gelsenkirchen, Germany and Nuon's Buggenum IGCC in the Netherlands.

"From my perspective it was a great success and EPRI deserves major league credit for putting on a great CoalFleet Meeting," wrote Great River Energy's Charlie Bullinger. "The tours, the project updates, the vendor and major electrical utility presentations were all superb. I came home with a wealth of info to circulate in our company."

For more information contact Jeff Phillips ([jphillip@epri.com](mailto:jphillip@epri.com), 704-595-2250).

### **CCS 101.**

*CoalFleet manager talks about the basics.*

"CO<sub>2</sub> Capture and Storage Primer: How Boilermakers Can Help" was the title of Jeff Phillips' presentation at the MOST National Tripartite Alliance's annual conference in Myrtle Beach, SC on Oct. 15. For a copy of the presentation, contact him ([jphillip@epri.com](mailto:jphillip@epri.com), 704-595-2250).

### ***EPRI team leads GUA meeting, tour of Michigan Basin CO<sub>2</sub> Sequestration Demonstration site.***

*Operations updates provided on five IGCC plants.*

Current and future IGCC plants were the topics when the Gasification Users Association (GUA) met Oct. 9 in Washington, DC. The 20 members representing 16 companies from eight different countries heard an operations update summarizing availability statistics, given by GUA members currently operating five different IGCC plants. Members also reported on IGCC projects they are developing and reviewed other gasification projects in development.

The following day, several of the members visited the Michigan Basin CO<sub>2</sub> Sequestration Demonstration site in Gaylord, Michigan, a geologic field test conducted by the Midwest Regional Carbon Sequestration Partnership. The tour began with overview presentations by key project partners Battelle, DTE Energy, and Core Energy and included visits to the DTE Energy Turtle Lake natural gas processing plant, the Core Energy Chester 10 CO<sub>2</sub> dehydration and compression facility, and CO<sub>2</sub> injection and monitoring wells. The tour also included a stop at one of the Niagaran Reef oil fields, where Core Energy uses the captured CO<sub>2</sub> for enhanced oil recovery.

For more information, contact Jose Marasigan ([jmarasigan@epri.com](mailto:jmarasigan@epri.com), 650-855-2939).

### ***Funding and incentives available for CCS research.***

*Deadlines approaching for advanced coal projects.*

Project applications were due in October for the U.S. Department of Energy (DOE) **restructured FutureGen** program. DOE anticipates selections by late December and contract awards by late December 2009. Multiple awards are anticipated in the range of \$100 million to \$600 million. The DOE expects to award approximately \$290 million (through FY 2009) to "incrementally fund" selected projects. An additional \$1.01 billion may become available in subsequent years subject to future appropriations being made.

DOE has issued a third round solicitation funding opportunity announcement (FOA) under the **Clean Coal Power Initiative** (CCPI), focused on CO<sub>2</sub> capture and sequestration and/or its beneficial use. Up to \$340 million may be available. Recipients must provide at least 50% of project funds, and repayment of the government share not required. Project criteria include 90% + capture efficiency; at least 300,000 tpy of CO<sub>2</sub> CCS and/or use; must show progress to goal of < 10% increase in COE without capture; coal must be > 75% of energy input; power must be > 50% of gross energy output. Applications are due to DOE by Jan. 15, 2009, with selection anticipated by July 2009.

In September 2008 a new solicitation was issued which has the potential to provide \$8 billion in additional **Energy Policy Act (EPAAct) loan guarantees**. It includes coal-based power generation and industrial gasification that incorporate carbon capture and sequestration or other beneficial uses of carbon (\$6 billion available) and advanced coal gasification (\$2 billion). The primary goal of the solicitation is to support projects that may employ technologies including IGCC with carbon capture, combined coal/biomass to liquids, ultra-supercritical pulverized coal plants, coal to chemicals, and coal to methane/syngas. Applicants are required to submit Part I of the application to DOE by Dec. 22, 2008 and Part II by March 23, 2009.

The **U.S. Economic Stabilization Act** contains a number of incentives for CCS, including \$1.5 billion in new tax credits; \$1.25 billion for advanced coal with CCS with > 65% capture; \$.25 billion for coal gasification projects with >75% capture, and a \$10/ton credit for CO<sub>2</sub> to enhanced oil recovery (EOR) and a \$20/ton credit for sequestration. Qualifying facilities must sequester or use > 500,000 mtpy of CO<sub>2</sub>.

For more information, contact Neville Holt ([nholt@epri.com](mailto:nholt@epri.com), 650-855-2503).

#### ***Gasification in the news.***

*Hydrogen Energy launches new IGCC project in California.*

A new IGCC project has been launched near Bakersfield, California by Hydrogen Energy, a joint venture formed by BP and Rio Tinto to invest in hydrogen-based power and polygeneration plants. The 250-MW plant is based on three GE Quench gasifiers (900 cubic foot) with a single GE 7 FB gas turbine. The CO<sub>2</sub> will be transported to the Elk Hills oil field operated by Occidental for EOR. A very comprehensive permit application document has been filed.

The first U.S. project in this partnership, a large IGCC polygeneration project at the BP Carson refinery in the Los Angeles area based on petroleum coke, was initiated in 2006; however, the issue of CO<sub>2</sub> pipeline liability through an urban area could not be resolved. A second IGCC + CCS project was planned at the Kwinana refinery in Western Australia using coal, but the offshore site for sequestration did not have a sufficient seal cap.

For more information about emerging IGCC projects, contact Ron Schoff ([rschoff@epri.com](mailto:rschoff@epri.com), 704-595-2054).

#### ***IGCCs focus of EPRI presentations at conference.***

*Recent economic trends highlighted.*

The Oct 5-8 Gasification Technologies Conference in Washington, DC featured two EPRI presentations. Ron Schoff discussed EPRI Industry Technology Demonstration projects, focusing on the IGCC with CCS projects and the Ion Transport Membrane project with DOE/NETL and Air Products. George Booras talked about recent economic trends in the IGCC industry. For more information, contact Schoff ([rschoff@epri.com](mailto:rschoff@epri.com), 704-595-2054) or Booras. The presentations may be downloaded from the GTC website ([www.gasification.org](http://www.gasification.org)).

#### ***EPRI offers white paper on advanced coal with CCS.***

*Report details status of technologies.*

*Advanced Coal Power Systems with CO<sub>2</sub> Capture: EPRI's CoalFleet for Tomorrow Vision* (EPRI Document # 1016877) is a primer on the status of the portfolio of gasification-and combustion-based advanced coal power technologies, and on opportunities for increased power generation efficiency, for state-of-the-art emissions controls and CO<sub>2</sub> capture and storage (CCS). It outlines the issues related to coal generation and CCS, details the current state of its technology, including pulverized coal, fluidized bed, oxy-combustion, and integrated

gasification combined cycle (IGCC), and discusses a plan by EPRI, which leverages the work of the U.S. Department of Energy and other researchers, to develop and demonstrate advanced coal technologies. It includes proposed roadmaps for providing cost-effective and low-carbon advanced coal power for multiple technologies. For more information, contact Jeff Phillips ([jphillip@epri.com](mailto:jphillip@epri.com), 704-595-2250).

## **CO<sub>2</sub> Capture & Storage (Program 165)**

### ***3,000 ton CO<sub>2</sub> injection test completed in Southeast.***

*Preliminary results confirm Lower Tuscaloosa formation is a viable candidate for CO<sub>2</sub> sequestration.*

The Southeast Carbon Sequestration Partnership (SECARB) began injecting CO<sub>2</sub> into the Lower Tuscaloosa Massive Sand unit at Mississippi Power's Plant Daniel pilot test site on Oct. 2 and stopped later that month after successfully injecting 3,000 tons of commercial-grade CO<sub>2</sub> at a depth of 8,500 feet. Preliminary results show the unit was able to sustain high injection rates while maintaining relatively low injection pressures, proving that the Lower Tuscaloosa is a viable candidate for future CO<sub>2</sub> sequestration. For more information, contact Rob Trautz ([rtrautz@epri.com](mailto:rtrautz@epri.com), 650-855-2088).

### ***Permits expected before year's end for drilling and injection in WESTCARB's Arizona project.***

*Public hearing was held Nov. 12.*

The U.S. Environmental Protection Agency and Arizona Department of Environmental Quality, two regulatory agencies responsible for reviewing and approving the environmental permits for CO<sub>2</sub> injection, are expected to issue proposed injection permits in November for the Arizona Utilities CO<sub>2</sub> Storage Pilot program. A second public outreach meeting to review the permitting process and the project's future plans for injection was held in Holbrook, Arizona on Nov. 12, and a 30-day public comment period will ensue before the final permits are issued. For more information, contact Rob Trautz ([rtrautz@epri.com](mailto:rtrautz@epri.com), 650-855-2088).

### ***New research highlighted at Stanford Global Climate and Energy Project's (GCEP) meeting.***

*Sessions included solar energy, biofuels, CO<sub>2</sub> storage, advanced energy transformations and storage.*

Stanford's Sally Benson reviewed work by her team to improve computational models of fluid flow in heterogeneous rocks. She showed how the model predictions correlated to rock cores tested in Stanford's labs in simulated in-situ conditions.

Lynn Orr presented a study of coal bed fires, in which university students recently investigated an active coal fire in Arizona which has been burning for decades. Core samples were used to map the extent of the seam, the active fire front, and the already-burned areas. Their analysis led to conclusions on how the fires start and, more importantly, how new air feeding fissures are formed as the underground fire front advances – vital information for extinguishing these fires, which are a significant and avoidable source of carbon emissions.

A paper from Stanford's Mechanical Engineering Department described a novel process that gasifies coal in an oxygen-blown gasifier and combusts the syngas in the presence of brine extracted from underground that has been raised to supercritical conditions. The resulting heat drives two engine cycles, and all combustion products, including CO<sub>2</sub>, remain with the supercritical water. This mixture subsequently is redissolved with the brine and injected back underground. The overall efficiency of the process, which releases no matter to the atmosphere, is estimated to be 42%. The major challenge with this technology is the development of materials and heat transfer surfaces that can withstand the highly corrosive nature of oxygen and other ions in supercritical water.

For more information, contact Brice Freeman ([bfreeman@epri.com](mailto:bfreeman@epri.com), 650-855-1050).

### ***Second Algae Biomass Summit draws big investor interest.***

*Conference review will be part of December EPRI webcast.*

Peer-reviewed technical presentations at the meeting, held in Seattle on Oct 22-23, provided an up-to-date view into the performance and economics of CO<sub>2</sub> biofixation and biodiesel production to the more than 700 participants. Besides the process developers and their financial backers, attendees and presenters included potential partners (Chevron, BP, etc.) and end users (Air Force, Boeing, Airbus).

The algae energy community is forming an industry trade organization, the Algal Biomass Organization (ABO), and is collectively moving forward with larger demonstrations. In the process, developers are learning more about the key technical and market challenges to advancing the technology. A summary review of the conference will be given to the members of P165 during the December webcast. For more information, contact Brice Freeman ([bfreeman@epri.com](mailto:bfreeman@epri.com), 650-855-1050).

### ***Two CCS conferences held in November.***

*EPRI staff will update P165 members in December.*

The meetings include IEA's 9th International Conference on Greenhouse Gas Control Technologies in Washington, DC, and the 100th Annual Meeting of the American Institute of Chemical Engineers in Philadelphia (where about 250 papers, or one-third of the total, will be on CO<sub>2</sub> separation, thermodynamics, and fixation). EPRI staff attended both conferences (Abhoyjit Bhowan will chair a session on CO<sub>2</sub> separation technologies at the AIChE meeting) and will report back to Program 165 members in December. For more information, contact Bhowan ([abhown@epri.com](mailto:abhown@epri.com), 650-855-2383).

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## **MAJOR COMPONENT RELIABILITY**

### **Steam Turbines, Generators and Balance-Of-Plant (Program 65)**

***EPRI report on hipot testing featured in article.***

High-potential (hipot) withstand testing, which indicates whether the stator winding insulation in a generator is fit for service, is a standard factory acceptance test for new machines. The same test can be used on an existing generator to assess the machine's condition. EPRI surveyed owners of generating facilities about hipot testing on existing machines. The resulting EPRI report 1014908, "Guide for Rotating Machine Hipot Testing: 2007 Update," was published in the October issue of *Hydro Review*. This article answers questions raised during the survey, including when to test, the type of test to perform, and the proper test voltage. For more information, contact Jan Stein ([jstein@epri.com](mailto:jstein@epri.com), 650-855-2390).

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## **OPERATIONS AND MAINTENANCE**

### **I&C and Automation for Improved Plant Operations (Program 68)**

***Fleet-Wide Monitoring Interest Group (FWMIG) sets R&D priorities.***

Integration of tools, boiler modeling, and thermal performance monitoring were ranked as the top three topics during a roundtable discussion at the recent fall meeting in Concord, North Carolina. Utility members, EPRI staff, and invited guests discussed progress in fleet-wide monitoring, shared experiences and lessons learned, and provided feedback on current and future EPRI research activities. For more information, contact Aaron Hussey ([ahussey@epri.com](mailto:ahussey@epri.com), 704-595-2009).

### **Maintenance Management and Technology (Program 69)**

***Peers share info on computerized maintenance, enterprise asset management systems.***

*Success of first meeting leads to plans for more.*

Fifteen participants from 12 companies exchanged view on challenges, issues, successes and lessons-learned in the implementation of computerized maintenance management systems (CMMS) or enterprise asset management systems (EAMS) in a workshop conducted November 5-6 in Charlotte, North Carolina. Program 69 advisors consistently have identified CMMS upgrades as one of the top issues they face as central office maintenance process improvement engineers. This is the first meeting of this type conducted by Program 69, and based on the needs identified and attendee feedback, it is likely that EPRI will plan future meetings on this topic. For more information, contact Steve Hesler ([shesler@epri.com](mailto:shesler@epri.com), 704-595-2183).

### **Report, project help improve outage performance.**

*Improving availability subject of report due in December.*

Program 69 advisors and sector council members said during the fall advisory meeting that they need increased attention on outage performance, in particular reducing unit unavailability in the first thirty days following return to service. EPRI has responded with a new report, "Outage Closeout and Unit Restart Guidelines for Fossil-Fueled Power Plants" (document 1015719), to be released in December. EPRI also has introduced a new supplemental project, "Performance-Based Outage Assessments" (1018136). This project will provide an on-site assessment of the total outage planning, execution, and close-out cycle using a team of EPRI and industry experts. For more information, contact Steve Hesler ([shesler@epri.com](mailto:shesler@epri.com), 704-595-2183).

### **2009 research on continuous improvement.**

Three EPRI research programs for 2009 will address the need for continuous improvement (CI) in the fossil industry – a base project that collaboratively defines an effective CI process; an industry workshop to define all key elements, including corrective action programs (CAP); and definitions of enhancements to EPRI's PlantView decision support software that strengthen CI and CAP. For more information, contact Steve Hesler ([shesler@epri.com](mailto:shesler@epri.com), 704-595-2183).

### **Lessons learned from outage assessments drive R&D.**

*Several EPRI reports help improve performance; projects working to fill gaps.*

EPRI's Maintenance Management & Technology (MM&T) multi-year effort to address fossil generation's performance in outage management has led to the development of a number of products to assist EPRI members in improving in their outage performance. Some address overall needs, while others are focused on specific problem areas. These products include: 1004383 Outage Benchmarking Guideline; 1004830 Outage Metrics; 1012281 Fossil Outage Management Guidelines; 1012288 Work Package Templates; 1014240 Fossil Outage Scope Development; 1014547 Work Package Planning Guidelines, and 1015719 Outage Closeout and Recovery Guidelines.

In addition, a supplemental project is validating the work and helping the industry implement it through performance-based assessments of individual outage programs. EPRI has performed these assessments at several stations worldwide to identify shortcomings and help with improvements. Several patterns have emerged, ranging from missing or inadequate organization and process procedures to insufficient preparation and ineffective management oversight.

EPRI plans to continue these assessments and to either upgrade our guidelines or create more detailed guidelines for special needs. Members can request their own outage program assessment from EPRI by contacting their member services representative and inquiring about Supplemental Project Notice, SPN, 1018136. For more information, contact Steve Hesler ([shesler@epri.com](mailto:shesler@epri.com), 704-595-2183).

## **Fossil Maintenance Applications Center (Program 104)**

### **Members share knowledge about pulverizers.**

*Summer 2009 workshop planned.*

Pulverizer maintenance and performance experiences were the topics when nine EPRI member organizations representing 15 different plant sites joined in an Oct. 16 webcast hosted by EPRI's Program 71.002 "Emerging Combustion Control Technologies" and Program 104. The webcast provided a forum for members of both programs to discuss their current areas of interest, including wear and longevity of materials, pulverizer tuning, and pulverizer efficiency. Plans and a proposed agenda for a joint in-person workshop this summer were presented. For more information contact Jose Sanchez ([josanche@epri.com](mailto:josanche@epri.com), 650-855-2580) for Program 71.002 or Merrill Quintrell ([mquintrell@epri.com](mailto:mquintrell@epri.com), 704-595-2030) for Program 104.

### ***Scrubber Maintenance Guideline helps improve performance.***

*Includes separate sections for subsystems.*

Many coal-fired power plant owners are modifying older flue gas desulphurization (FGD) equipment or installing new, highly efficient scrubbers. The Fossil Maintenance Application Center (FMAC) has been developing maintenance guidance on these expensive new systems. This effort is not designed to displace the original equipment manufacturers (OEM) guidance, but to enhance it to achieve the best reliability and conserve costs while achieving excellence in performance. FMAC is addressing numerous components within the typical state-of-the-art scrubber system; a guideline will be developed for each of the major sub-systems which include a glossary, system application section, technical description, troubleshooting, and guidance on preventive maintenance, PM Basis and condition maintenance.

The guideline is intended to be used for education of the staff via a training organization, for best maintenance practices, operational understanding, and for developing a stronger maintenance basis for the FGD. For more information, contact Ray Chambers ([rchambers@epri.com](mailto:rchambers@epri.com), 704-595-2080).

### ***Cut out low-value maintenance tasks with EPRI PMBD.***

*Host site sought for study of optimized maintenance tool.*

EPRI is updating materials to support powerful new enterprise-wide system interaction features of its PM Basis Database (PMBD) Version 2.0 tool, which has more than 140 component modules developed over a decade, and the wide range of equipment data to help member utilities implement the technology. To demonstrate the effectiveness of PMBD, EPRI's Fossil Maintenance Applications Center (FMAC) is offering to work with a host site to start a collaborative study of the use of the PMBD in optimizing maintenance tasks.

FMAC will match funds from the first utility to support a PMBD Implementation project in addition to available Tailored Collaboration funds on a targeted system. This pilot will be the start of several implementations to help enhance the current Maintenance Basis Optimization (MBO) materials to help EPRI member utilities refocus their resources on the most effective tasks. For more information, download "Preventive Maintenance Database (PMBD) Implementation Experience" (1016920) or contact Justin Thibault ([jthibault@epri.com](mailto:jthibault@epri.com), 704-595-2103).

## **Operations Management and Technology (Program 108)**

### ***Alarm woes lead EPRI member to host management project.***

*Participants can share in lessons learned.*

An EPRI member's plant which recently upgraded to distributed control systems (DCS) has experienced an overconfiguration of alarms, making it more difficult for the operator. A project which applies EPRI's Alarm Management and Annunciator Guidelines (Document 1014316) at that plant kicked off the week of Nov. 10. This project will apply the first four steps of the seven-step process for establishing and maintaining an effective alarm management system.

EPRI expertise will help revise and manage the system so that central control room operators know an alarm represents an abnormal situation that requires action. Lessons learned and best practices gleaned from each application will be compiled and fed back into the RD&D program to update the appropriate EPRI operations guidelines. Other members interested in considering EPRI assistance in alarm management should contact Wayne Crawford ([wcrawford@epri.com](mailto:wcrawford@epri.com), 704-595-2233).

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## **ENVIRONMENTAL CONTROLS**

### ***EPRI information helps address stakeholder concerns about future mercury rules.***

The recent federal court ruling vacating the Environmental Protection Agency's (EPA) cap-and-trade-based Clean Air Mercury Rule left utilities and the public with many unanswered questions about when and how mercury, as well as other air toxics, may be regulated. EPRI has an extensive library of information on emissions, transport and fate of mercury and other toxics, as well as health effects and control technologies.

This information is useful in responding to stakeholder concerns. In addition, EPRI's current information and future research likely will be important resources for the EPA, state regulatory bodies, and other stakeholders as they reexamine technical issues and develop new rules and regulations for mercury or other emissions.

To access EPRI's mercury-related issue briefs, click on this link:  
<http://my.epri.com/portal/server.pt?open=514&mode=2&objID=218874>.

To learn more about EPRI mercury research, click on the following links: [Environmental Controls](#), [Air Toxics Health and Risk Assessment](#), [PISCES – Plant Multimedia Toxics Characterization](#).

## **Combustion Performance and NOx Control (Program 71)**

***Members share knowledge about pulverizers.***

*Summer 2009 workshop planned.*

*(See story on Page 6 under Fossil Maintenance Applications Center (Program 104))*

## **Integrated Environmental Control (Program 75)**

***Bromide addition can drive mercury into the scrubber liquid phase, but not always.***

*Results at three sites varied; causes are being studied.*

A better understanding of mercury partitioning in wet FGDs can lead to measures that prevent re-emissions, eliminate mercury contamination of the gypsum, and minimize soluble mercury in the water effluent stream. One approach to achieve these aims is to add bromide to the FGD liquor. In tests at two sites adding bromide for two weeks, the chemical caused mercury to move from the solid to the liquid phase. Specifically, at the first site, most of the mercury reported to the FGD solids under normal operation. At the end of a two-week test of calcium bromide addition, 85% of the FGD mercury was found in the scrubber liquor. At the second site, baseline operation resulted in less than 1% of the slurry mercury being found in the liquor, while at the end of a two-week continuous addition test, up to 10% of the slurry mercury was found in the liquor. At the third site, however, where the test was conducted on a pilot scrubber, in the baseline condition, the scrubber liquor contained approximately 0.1% of the mercury in the slurry, with the remainder in the solids. Upon calcium bromide addition, the mercury content of the liquor did not increase appreciably, while the concentration in the solids increased by approximately 50%.

The data from these three sites represent three points along a continuum of mercury partitioning behavior. It is unknown why these three sites experienced such different outcomes. Additional laboratory and field investigations are studying this effect. For more information, contact Ramsay Chang ([rchang@epri.com](mailto:rchang@epri.com), 650-855-2535).

***Presque Isle TOXECON™ system continues to operate well.***

*Plant maintains ~90% mercury removal with low activated carbon injection, acceptable bag cleaning frequency.*

The TOXECON™ installation has been in operation, with activated carbon injection, since February 2006. The project combines the flue gas from three PRB-fueled boilers (90MWe each, equipped with hot-side electrostatic precipitators) into a single pulse jet baghouse operating at an air-to-cloth ratio of ~ 5.5 ft/min and fitted with 2.7 denier PPSS fabric filters. Baseline mercury concentrations were ~4 to 5 ug/Nm<sup>3</sup>, with about 90% elemental mercury and <10% native removal. Since the baghouse and ACI operation were optimized, the plant has been able to maintain mercury removals ~90% with 1 to 1.2 lb/MMacf of brominated activated carbon injection. Baghouse operating parameters have been steady – opacity < 5%, baghouse pressure drop about 5.5 inches water, and cleaning frequency of ~0.25 pulse/bag/hr. With modified hopper and ash evacuation operation, the plant has not experienced any repeats of the further hopper fires encountered earlier. In summary, the long term TOXECON operation has been excellent, demonstrating the viability of this approach for high mercury control effectiveness while preserving ash sales. For more information, contact Ramsay Chang ([rchang@epri.com](mailto:rchang@epri.com), 650-855-2535).

### ***Theories on role of iron in partitioning mercury in scrubbers confirmed.***

On the bench-scale study of the kinetics of Hg reactions in wet FGD, recent efforts have focused on the effects of iron on mercury partitioning in FGD slurries. Initial bench-scale static tests (no flue gas flow) tests have confirmed previous theories that iron hydroxide can remove mercury from the liquid phase, presumably via co-precipitation and/or adsorption. Future testing will be conducted with flue gas flow through the bench-scale wet FGD system to determine the relative rates for co-precipitation/adsorption versus re-emission reactions. For more information, contact Richard Rhudy ([rrhudy@epri.com](mailto:rrhudy@epri.com), 650-855-2421).

### ***Novel contactor design may reduce FGD and CO<sub>2</sub> absorber vessel size dramatically.***

*EPRI might lead test of system.*

An EPRI team visited Neumann Systems Group (NSG), Colorado Springs, CO to receive an in-depth briefing on its liquid-gas contactor that uses multiple, extremely thin sheets of liquid to produce very high mass transfers. NSG believes it can reduce the absorber volume by a factor of 15 relative to a conventional FGD scrubber. The team also saw a 2-MW pilot unit at Colorado Springs Utilities' Martin Drake station. NSG is also designing a solvent-based CO<sub>2</sub> capture around this contactor. EPRI is discussing the conduct of an independent test of the 2-MW FGD unit with NSG. For more information, contact Chuck Dene ([cdene@epri.com](mailto:cdene@epri.com), 650-855-2425).

### ***Beta version of FGDLIQEQ available for testing.***

EPRI seeks interested parties to test its updated liquid equilibrium and mass balance computer model for FGD systems, which will enable FGD operators to assess the condition of their scrubber and validate the measurements made by the chemical laboratory. To obtain the beta version for testing, contact Chuck Dene ([cdene@epri.com](mailto:cdene@epri.com), 650-855-2425) or download it directly from the Program 75 website.

## **Particulate & Opacity Control (Program 76)**

### ***New interest in reliability of alkali sorbent injection systems for SO<sub>3</sub> or SO<sub>2</sub> control.***

*EPRI offers to coordinate R&D by individual power companies, starting with a telecon/webcast.*

A number of power producers have installed systems to inject sodium or calcium compounds to capture SO<sub>3</sub> at their plants, and virtually all the systems have reduced emissions to an acceptable level. However, many of the systems have maintenance issues with the reagent handling, storage and injection systems. The injection systems have been particularly troublesome. Members have started, or are planning to start, studies to find solutions to the problems, and EPRI is leading an effort to identify and coordinate these research efforts.

The first priority will be plugging of hydrated lime injection systems. If you are willing to share your knowledge and participate in brainstorming to identify the root causes, please contact Ralph Altman ([raltman@epri.com](mailto:raltman@epri.com), at 423-899-0072) or George Offen ([goffen@epri.com](mailto:goffen@epri.com), 650-855-8942).

## **Continuous Emissions Monitors (Program 77)**

### ***Progress on two fronts in developing mercury calibration standards.***

*"NIST Prime" calibrator is stable over time; two potential fixes to unsteady nitrogen flow.*

The National Institute of Standards and Technology (NIST) said in a meeting at its headquarters in early October that it has resolved the procedural issues in evaluating the "NIST Prime" calibrator and determined that the stability over time was very good. It has established an expanded uncertainty of 1%, which increases to 2-3% when the mercury concentration is < 2µg/m<sup>3</sup>. NIST plans to use sorbent traps and ID-ICP-MS (Isotope Dilution – Inductively Coupled Plasma – Mass Spectrometry) for work to resolve the discrepancy between elemental and oxidized mercury standards.

Recently, EPRI tested potential fixes to the nitrogen generators used by the calibrators in ThermoFisher mercury monitors. The goal is to assure constant O<sub>2</sub> levels as O<sub>2</sub> quenches the atomic fluorescence signal, causing unsteady readings when it varies. Two of the proposed fixes use backpressure regulators – one an orifice and the other a needle valve, to dampen the regulator effect. Both systems seemed to work but require “tuning” to each individual system by either changing the orifice or adjusting the needle valve. Tests of a method using a mass flow controller were inconclusive and an additional test is planned. For more information, contact Chuck Dene ([cdene@epri.com](mailto:cdene@epri.com), 650-855-2425).

### **Coal Combustion Product (CCP) Use (Program 78)**

***First-year field tests of FGD gypsum application to crops show slight benefits, no negatives.***

*Application on soils with high sodium levels at farms growing wheat showed slightly greater yields.*

Field research for the FGD Gypsum in Agriculture network began in 2007 on two farms in southwestern North Dakota, using gypsum (FGD and commercial) at various application rates to ameliorate soils with high levels of sodium. The gypsum increased total Ca and S in the soils, decreased extractable Mg, and had little effect on trace metal concentrations. On both farms, there were trends towards greater wheat yields for the high rate of both gypsum materials, but the yield increases were not statistically significant. There were no strong effects of gypsum applications on wheat grain chemistry that would have important impacts on grain quality. These results are being documented in a technical update due in December.

Additional field experiments for the network began in 2008 in five states, including New Mexico, Indiana, Arkansas, Alabama and Ohio. All are comparing FGD gypsum and locally-available commercial gypsum in various conditions and applications. For more information, contact Ken Ladwig ([keladwig@epri.com](mailto:keladwig@epri.com), 262-754-2744).

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## **COMBUSTION TURBINES**

### **New CT/CC Design, Repowering and Risk Mitigation (Program 80)**

***Reliability and availability of gas turbines and combined-cycle plants studied.***

F class gas turbines are approaching relative maturity in RAM performance. That’s one of the results of a recently completed study of more than 700 gas turbines installed in simple-cycle and combined-cycle configurations. The research examined their reliability, availability and maintainability (RAM) performance for the period from 2000 to 2007. The study also examined equivalent reliability and availability for more than 150 combined-cycle plants, including heat recovery steam generator and steam turbine sub-systems and their relative contributions to forced outages and scheduled outages. Although combined cycles based on D/E class and aero-derivative gas turbines demonstrated higher overall reliability and availability, the F class-based plants are approaching about the same RAM performance. The study concluded with updated benchmark expectations for reliability, availability and starting reliability. Detailed results will be published soon in report 1015798. For more information, contact Dale Grace ([dgrace@epri.com](mailto:dgrace@epri.com), 650-855-2527).

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## **RENEWABLES**

### **Dispersed Generation and Hydropower (Program 84)**

***Project to study adding solar to fossil plants launched.***

*NV Energy, Dynegy hosting natural gas projects.*

The Solar Augmented Steam Cycles for Natural Gas Plants project kicked off Oct. 27 with a meeting at NV Energy’s Chuck Lenzie Plant near Las Vegas. The project will include a conceptual design study to evaluate all possible solar integration options and two detailed case studies, including NV Energy’s 1100 MW natural gas combined cycle (NGCC) Chuck Lenzie Plant and Dynegy’s NCGG 570 MW Griffith Plant in Kingman, AZ. Six companies are cofunding the effort. Additional participants still are needed for both this project and a separate project that will focus on coal technologies. For more information, contact Cara Libby ([clibby@epri.com](mailto:clibby@epri.com), 650-855-2382).

### ***EPRI leads tour of Spanish central solar plants.***

*Visits include developer of new molten salt storage plant.*

In mid-October, EPRI's Cara Libby escorted three executives from Xcel Energy on a tour of central solar plants in southern Spain. The group visited two Spanish solar technology providers that have established themselves as leaders in solar thermal energy development and deployment. Abengoa's 11-MW direct steam central receiver tower, PS10, has been operating for a year and a half, and the performance has improved by 10% during that time by optimizing plant operation. A similar 20-MW tower will be completed in March 2009 and a 3 MW superheated steam tower is nearly complete. Abengoa is under contract with Arizona Public Service to provide a 280-MW plant with 6 hours of molten salt storage in Gila Bend, AZ.

A second developer, ACS Cobra, is within a couple months of demonstrating a 50-MW parabolic trough plant with 7.5 hours of molten salt storage (41% capacity factor). This will be the first commercial-scale molten salt storage system in the world. Currently, project development typically takes 3-4 years and is limited by turbine procurement, transmission access, and environmental permits.

Xcel recently announced that it is developing a Solar Technology Acceleration Center (SolarTAC) in Colorado, in partnership with SunEdison, Abengoa Solar and an R&D collaboration between NREL and three local universities. The site sits on 80 acres south of the Denver airport. The goal is to develop a test platform for solar technologies, including photovoltaic test beds, solar thermal technology demonstrations, and pilot-scale thermal energy storage development. The Colorado Public Utilities Commission has approved up to 600 MW of commercial solar thermal capacity development in the state.

For more information, contact Cara Libby ([clibby@epri.com](mailto:clibby@epri.com), 650-855-2382).

### ***Meeting sets RD&D priorities for marine and hydrokinetic energy.***

*Testing, environmental effects ranked highest.*

Eighteen areas for research, development, deployment and demonstration (RDD&D) in the marine and other hydrokinetic (MHK) energy industry were discussed during an Oct. 29 and 30 workshop. The broad set of participants included representatives from federal and state governments, national laboratories, non-governmental organizations, academia and private industry. The RDD&D need and priorities included all five MHK types (wave energy, tidal in-stream energy, ocean current energy, free-flowing river in-stream energy, and ocean thermal energy). The two highest-priority areas are testing (including experimental through pilot demonstration plants) and environmental (to address the system-environmental effects which requires testing).

A third priority is the need for an additional workshop as soon as possible to reach an industry-wide vision, goal and objective for developing and deploying MHK technology in the United States. The recommendation is that such a consensus would provide significant impetus for a funded program. This workshop also could be extended to develop an RD&D roadmap and objectives. For more information, contact Roger Bedard ([rbedard@epri.com](mailto:rbedard@epri.com), 650-855-2131).

### ***EPRI staff recognized for article.***

Congratulations to EPRI's Roger Bedard and Andree Houle, whose recent article on the status of wave and tidal technologies in *Hydro Review* was ranked as the "most useful" for that issue by the readers. For more information about the article, titled "An Overview: Ocean Wave and Tidal In-Stream Technology Development Status," contact Roger Bedard ([rbedard@epri.com](mailto:rbedard@epri.com), 650-855-2131).

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## **GENERATION PLANNING**

### **Understanding Power and Fuel Markets and Generation Response (Program 67)**

***"Market Impacts of Changing Natural Gas Infrastructure" report released.***

*Study includes data on new gas shale production.*

This report (1015703), released in October, examines the extraordinary expansion taking place in gas supply (e.g. shales), pipelines, storage and LNG regasification. Impacts are numerous, including establishment of the

first direct link between the Rockies and the major Northeastern markets, as well as expansion to the Pacific Northwest. A major spur to pipeline expansions is the surge in gas shale production, which is leading to significant changes in supplies, flows, and prices at hubs in the Gulf region and elsewhere. For more information, contact Jeremy Platt ([jjplatt@epri.com](mailto:jjplatt@epri.com), 650-855-2628).

***EPRI pens articles on natural gas markets, steel prices.***

An EPRI article in the October issue of *Natural Gas Market Outlook* framed the major changes in the U.S. gas market outlook to 2013. The article, titled “Natural Gas Supply and Demand Equation: Aligned for Excess Supply,” reviews each major component of supply and demand, spanning Canadian imports, U.S. production by region, LNG liquefaction and import scenarios, and demand in the electric, industrial and residential/commercial sectors.

A November article in *Steel Industry Outlook* identified the drivers behind steel's price escalation and the implications of the financial crisis on the steel market outlook over the intermediate term. The article, “Riding the Steel Roller-Coaster: Will It Always Be Like This?” is particularly timely in light of current volatility and turmoil, and it also suggests scenarios for future pricing. Insights into steel pricing from China likely will surprise many. For more information on either article, contact Jeremy Platt ([jjplatt@epri.com](mailto:jjplatt@epri.com), 650-855-2628).

***How much natural gas will the power industry require under CO<sub>2</sub> reductions?***

That's one of the questions to be answered by “Impacts of the Power Sector on Natural Gas Markets under Climate Change” (EPRI supplemental project notice 1016998). Another question – how will the market respond? – also remains unanswered and controversial. Does the surge in supply from gas shales make the problem go away? Companies are invited to join this project. For more information, contact Jeremy Platt ([jjplatt@epri.com](mailto:jjplatt@epri.com), 650-855-2628).

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**TECHNOLOGY TRANSFER**

***Ready Now: Boiler Tube Damage Kits.***

*Reduce boiler tube failures through expert training.*

Utilities now have the resources in EPRI's Boiler Tube Damage Kits to expertly train and qualify nondestructive evaluation (NDE) technicians to more accurately identify flaws commonly occurring in boiler tubes. NDE staff can use the kits to correctly locate and identify types of damage typically found in power plant boilers. The timely identification and remediation of this damage can reduce boiler tube failures and increase plant availability. To assist owners and operators in better understanding the technical basis of tube failures and creating permanent solutions, EPRI published a three-volume report entitled *Boiler and Heat Recovery Steam Generator Tube Failures* (1012757) in 2007. More information on the kits is available in EPRI document 1016981. Both documents can be downloaded at [www.epri.com](http://www.epri.com). For more information, contact Stan Walker ([swalker@epri.com](mailto:swalker@epri.com), 704-595-2081).

***Applications Success Stories database now available on epri.com.***

*Learn how to apply results of EPRI research on website.*

For the first time, EPRI members have on-line access to examples of successful applications of EPRI R&D. The Success Story database includes member applications since 2004 and are categorized by topic area. Once the area has been selected, the data displays the member name and technology applied. From there, simply click on the technology name to view a PDF of the entire story, which can be saved or printed. The database is accessible at [www.epri.com](http://www.epri.com). Once at the home page, select Applying Results from the blue navigation bar.

Another new feature of the site is the “Member-to-Member Knowledge Transfer.” With one click, members can view how others are applying research results. Other updates to the site include a streamlined information display; updated Technology Transfer Awards current year winners and historical database, and “Ready Now,” from which a selection of currently available research applications plans from the 2007/2008 research years can be downloaded. For more information, contact Susan Rodgers ([srodgers@epri.com](mailto:srodgers@epri.com), 704-595-2072).

### **Technology Transfer webcasts conducted for members.**

*Teleconferences provide effective technology transfer.*

Recent Technology Transfer webcasts for several members have provided an opportunity to reach plant staff and others with a single teleconference. These webcasts provide an overview of EPRI technology access through the web site and engagement through the advisory function and meetings. The overview is then followed by focused program reviews, including drivers and R&D emphasis, key deliverables, workshop schedules and engagement opportunities, provided by the program managers. For more information on conducting technology transfer webcasts, contact your account executive or Susan Rodgers ([srodgers@epri.com](mailto:srodgers@epri.com), 704-595-2072).

### **Thirty years of research on solar electric power.**

*Compilation of 100 titles of EPRI research now available.*

EPRI has been in the forefront of developing solar electric technology for more than 30 years. You now can search a compilation of 100 titles of EPRI research results by downloading EPRI Product 1018138, *EPRI Results on Solar Electric Research (1978-2008)*. It includes results on solar plant siting and performance, specific individual utility technology deployment interests (such as collaboration in plant feasibility studies and pilot demonstration projects), and modeling tools to explore the potential of these technologies to reduce CO<sub>2</sub> emissions from generation and respond to renewable portfolio standards and related policies. For more information on EPRI's solar electric research, contact Cara Libby ([clibby@epri.com](mailto:clibby@epri.com), 650-855-2382).

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## LEGISLATIVE ACTIVITIES

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**Coal Utilization Research Council (CURC)** – On Oct. 2 and 3, EPRI's Stu Dalton and John Novak participated in the CURC Technical Subcommittee and General Membership meetings. Dalton gave a presentation on the Industry Technology Demonstration projects.

**Center for the Study of the Presidency (CSP)** – On Oct. 8, Novak participated in a working session on climate change R&D held by the CSP, a non-partisan, non-profit organization founded in 1965 to promote leadership in the presidency and Congress to generate innovative solutions to current national challenges. The Center is the only organization that systematically examines past successes and failures of the presidency and relates its findings to present challenges and opportunities.

David Victor of Stanford and the Council on Foreign Relations chaired the working session. Carl Bauer, director of the DOE National Energy Technology Laboratory (NETL), was a participant. Key points from the session included the need for a climate technology policy including R&D, to ensure that other goals, such as energy independence, national security, are met; existing R&D programs do not provide enough funding for technology; there is no silver bullet technology; there is a difference between RD&D (demonstration) and deployment, including a big difference in funding, and how do we engage developing countries?

The Center will include recommendations from the session in its report to the president-elect. For more information, contact Novak ([jnovak@epri.com](mailto:jnovak@epri.com), 202-293-6180).

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