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Power Sector Study To Assess Advanced Coal Demands For Water Usage

A key electric power industry research group is poised to soon issue a report on the water usage required by advanced coal-burning facilities, including facilities using carbon capture and sequestration (CCS), in a bid to answer unresolved questions about how DOE, EPA and other policymakers can balance rising demands for electricity and freshwater.

The Electric Power Research Institute (EPRI) study, due for release later this month, will use the latest data to characterize the water usage requirements for new coal technologies including CCS, coal gasification, ultra-supercritical coal-combustion technologies operating at increasingly high temperatures and pressures and other advanced coal systems, according to Kent Zammit, EPRI's senior program manager for water and ecosystems research.

Zammit said in a Nov. 23 interview that the study will also examine how existing wastewater could be used to meet power plant water requirements, which could help to alleviate some of the demand for freshwater.

Zammit noted that another coal-focused study that EPRI is working on and is due next year will examine water capture and reuse, such as capturing water from coal-drying operations for use in cooling towers, or capturing flue gas stack water, or capturing some of the water from cooling towers that usually evaporates.

"Demand for freshwater is increasing and as a result constraints are already in place and will increase in the future," says another EPRI expert, Bob Goldstein, the group's senior technical executive for water and water sustainability, in the same Nov. 23 interview. All economic and social sectors in a community, including power generators, will be affected, Goldstein said, and therefore "we have to find ways to deal with it to achieve sustainability."

EPRI's efforts follow a widely circulated October report by the Harvard Kennedy School's Belfer Center for Science and International Affairs on "Water Consumption of Energy Resource Extraction, Processing, and Conversion," which noted, "Water is becoming increasingly important in several aspects of U.S. energy production, including the expansion of biofuels, some sources of renewable energy, and cooling technologies for large power plants."

According to a DOE source, a growing freshwater shortage and efforts to deal with it "are real" and "there's movement." Action is occurring even though a Sandia National Laboratory draft final water-energy "roadmap" that was submitted to DOE May 2009 has not yet been published because the department has sent the report out for comment by other federal agencies, according to the DOE source. A first draft was submitted to DOE in 2006.

As an example of progress on the issue, the source points to the fact that the U.S. Geological Survey (USGS) and U.S. Energy Information Administration (EIA) are working on a water census that was recommended in a 2009 Government Accountability Office (GAO) study on the issue of regional water demands.

In 2003 GAO found 40 states expect regional water reductions by 2013-2015, the DOE source says. In addition, Southwest and Southeast droughts over the past three years and climate change concerns have heightened attention, the source says, noting that most states are expecting 10-20 percent water supply losses as a result of changing climate patterns. A 30 percent precipitation reduction would mean 30-40 percent stream flow reduction.

How will the Colorado River, Rio Grande, and Columbia River compacts work with "shortage sharing"? the source asks, and adds that the issue has "gotten everyone's attention."

According to the Belfer report — which uses the same USGS data DOE relied on for its previous reports to produce the center's own insights into the energy-water problem — increased use of inland nuclear power and wide-scale CCS could "significantly increase water consumption." It also finds that some renewable energy technologies — wind and solar voltaic installations but not concentrating solar power — have low water consumption and could offset negative water-consumption trends. Alternative technologies are available for each energy process that would lower water consumption, "albeit at a higher cost, with lower efficiency and/or reduced reliability," the report says.

In addition, increased shale gas — which has lower water consumption than other fossil fuels — is a "beneficial trend," the report finds, even though the amount of water used upfront in hydraulic fracturing is large and potential contamination of freshwater supplies must be addressed. Furthermore, Belfer notes, natural gas-fired power plants, known as combined cycle gas turbine (CCGT) facilities, "have some of the lowest consumption of water per unit of electricity generated" because CCGT plants have a relatively high thermal efficiency.

"Water use concerns are clearly increasing," says a Belfer expert, noting that EIA is expanding its data collection on

water use in the energy sector. The Belfer study reviewed research conducted by others on energy-water and put the findings on “a similar scale” so the impacts of different technologies could be compared in a way that has not been done before, the source says, explaining that the October study builds a base for a second-phase study in 2011 looking at the policy implications of the comparative water usage of different energy technologies.

Zammit and Goldstein both agreed on the Belfer study’s contribution to understanding the problem and possible solutions. But Goldstein comments that the report “doesn’t address the full scope of the complexity of the issue.” For example, it “doesn’t discuss non-traditional sources of water in lieu of freshwater,” the focus of the imminent EPRI report for one energy resource — advanced coal — and later studies in the works.

In addition, Goldstein said, the report looks at water use for shale gas production alongside water use for electricity generation. But the water used to mine coal in Montana has nothing to do with the water used when burning the coal in North Carolina, thus making a comparison that is not meaningful, he says.