
ECO₂ Independent Assessment

ECO₂ PILOT ASSESSMENT & COMMERCIAL SCALE-UP ANALYSIS

In early 2010, global engineering firm WorleyParsons Group Inc. conducted a detailed assessment of the design, operation, and performance of Powerspan's ECO₂[®] pilot facility at FirstEnergy's R.E. Burger Plant, and evaluated the technology's readiness for commercial deployment on existing coal-fired electric power plants (200 MW and larger units) based on the pilot facility results. WorleyParsons was selected for this assessment based on its experience in supporting CO₂ capture and sequestration studies for the U.S. Department of Energy National Energy Technology Laboratory and the Global Carbon Capture and Storage Institute.

SCOPE AND APPROACH

As part of the assessment, the WorleyParsons team visited, inspected, and observed operations of the ECO₂ pilot facility. The team verified the pilot installation was in accordance with the process flow diagram and the piping and instrumentation diagrams (P&IDs). Operations, including instrument calibrations and cross-checks, were confirmed to be in compliance with operating procedures and standards. Using sources available in the public domain, the team counter-checked information on the process and the design. Finally the team evaluated scale-up of the major process equipment and evaluated the impact of an ECO₂ installation on a reference plant (approximately 200 MW subcritical pulverized coal plant) using WorleyParsons in-house simulation models.

CONCLUSIONS

WorleyParsons' validation team found that the Powerspan ECO₂ pilot is well-designed, instrumented, and operated, and provides a sound basis for the design and construction of a full-scale commercial ECO₂ system. The technology is ready for scale-up for use in commercial scale (200 MW or larger) generating plants.

The low regeneration energy of Powerspan's proprietary solvent, as well as the ability of the ECO₂ system to accept SO₂ inlet concentrations of 40 ppmv (or more), are significant advantages not found in other technologies. In addition, the current ECO₂ process can follow a traditional limestone forced-oxidation wet flue gas desulfurization (FGD) system, and no longer requires the use of Powerspan's ECO-SO₂ scrubber.

The capital and operating costs of the ECO₂ process retrofitted to a 220 MW_{net} subcritical pulverized coal plant were estimated at less than \$40 per ton, when electrical power was valued at \$50/MWh. To provide a comparison point with other technologies, publicly available process information for one of the advanced amine technologies was utilized to estimate operating costs for CO₂ capture for the plant used in this study. The ECO₂ process had lower regeneration heat, corresponding lower cooling load, lower pressure steam for solvent reclaim, and reduced reagent usage. This resulted in a lower cost per ton of CO₂ captured for the ECO₂ process.

If a value lower than \$50/MWh was assigned to the lost generation, there would be a corresponding reduction from the approximate \$40 per ton CO₂ removal cost.

Finally, the impact on plant output if the technology were installed on a supercritical or ultra-supercritical plant would be substantially less than estimated in the analysis performed as a consequence of the higher efficiency of the power plant. Powerspan models estimate for an ultra-supercritical plant with a nominal efficiency of 46 percent, there would be an 18 percent reduction in net output, rather than the 30 percent reduction in net output estimated for the subcritical plant assumed in the analysis.

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