



the **ENERGY** lab

PROJECT FACTS

Clean Coal Power Initiative (CCPI1)

TOXECON Retrofit for Mercury and Multi-Pollutant Control on Three 90 MW Coal-Fired Boilers

(Completed September 30, 2009)

Project Description

Wisconsin Electric Power Company (We Energies) has designed, installed, operated, and evaluated the TOXECON process as an integrated mercury, particulate matter, SO₂, and NO_x emissions control system for application on coal-fired power generation systems. TOXECON is a process in which sorbents, including powdered activated carbon for mercury control and others for NO_x and SO₂ control, are injected into a pulse-jet baghouse installed downstream of the existing particulate control device. The TOXECON configuration allows for separate treatment or disposal of the ash collected in the primary particulate control device. We Energies was assisted by the following team members: ADA-ES provided program management support and design and specifications for mercury control and monitoring; Cummins & Barnard provided architect and engineering services and construction management; Wheelabrator Air Pollution Control, Inc., provided baghouse design and installation support; and EPRI, the developer of TOXECON, was a technical advisor to the project.

This demonstration project was implemented at the We Energies Presque Isle Power Plant located in Marquette, MI. The Presque Isle plant burns low-sulfur, Powder River Basin subbituminous coal, and the TOXECON unit was installed on the combined flue gas stream of Units 7, 8, and 9, which total 270 megawatts electric (MWe). The key objectives of the project were to (1) achieve very high levels of mercury removal, (2) increase the collection efficiency of particulate matter (PM), and (3) determine viability of sorbent injection for SO₂ and NO_x control, while maximizing the use of coal combustion by-products. The project concept is depicted in the figure on the following page.



Presque Isle Power Plant

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PARTNERS

Wisconsin Electric Power Co.

Milwaukee, WI

PROJECT DURATION

Start Date

04/06/2004

End Date

09/30/2009

COST

Total Project Value

\$52,978,115

DOE/Non-DOE Share

\$24,859,578 / \$28,118,537

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Benefits

The NETL partnership with We Energies and the Presque Isle Power Plant successfully demonstrated the TOXECON process for mercury and multi-pollutant control of a combined flue gas stream from three Powder River Basin (PRB) coal-fired units totaling 270 MWe. In doing so, the project met all DOE project goals. In the TOXECON process, the high PM capture efficiency inherent in pulsed-jet baghouses is coupled with activated carbon injection to achieve high mercury capture efficiency while retaining the sales value of fly ash as a cement additive. Over a three year period, We Energies consistently demonstrated over 90 percent mercury removal based on monthly averages while maintaining acceptable baghouse pressure drops of 5 to 6 inches of water and providing significant opacity improvements. The TOXECON installation at Presque Isle cost \$128 per kilowatt (kW) and increased the cost of electricity by about 0.3 to 0.5 cents/kW-hour (kWh). Lower cost mercury controls are available but generally do not meet the multiple goals of high mercury capture, no impact on ash sales (particularly important in regions like Wisconsin and Michigan where disposal is very costly), and no potential increase in particulate emissions.

PRB coal is an excellent test of the technology and representative of a broad market application. PRB coal is widely used and, as with other western subbituminous coals, contains high percentages of elemental mercury that, because of its vapor state upon combustion, is more

difficult to remove than solid state oxides of mercury (the form more common in bituminous coals). As such, this technology is a primary mercury control choice for western coals and the only choice for units burning any coal type with hot-side electrostatic precipitators (ESPs). Thus, TOXECON has application at power plants burning any coals with hot side ESPs (a combined 18 gigawatts [GW]), bituminous coals with cold side ESPs (81 GW combined), and plants burning western subbituminous coals with cold side ESPs (68 GW combined). Using TOXECON to control SO₂ and NO_x further enhances its attractiveness for improved environmental control.

The TOXECON process has a potential application to an estimated 167 GW of existing coal-fired capacity. This project alone removed 97 pounds of mercury annually and an additional 4,020 tons of SO₂ and 32 tons of fine particulate matter (PM).

Status

The project was awarded in April 2004 as part of CCPI Round I. CCPI Round I was focused on efficiency and environmental and economic improvements to Advanced Coal-Based Power generation. The project was completed on September 30, 2009.

