

McIntosh Unit 4A PCFB Demonstration Project

Project Terminated

Participant

City of Lakeland, Lakeland Electric

Additional Team Members

Foster Wheeler Corporation—supplier of pressurized circulating fluidized-bed (PCFB) combustor and heat exchanger; engineer

Siemens Westinghouse Power Corporation—supplier of hot gas filter, gas turbine, and steam turbine

Location

Lakeland, Polk County, FL (Lakeland Electric's McIntosh Power Station, Unit No. 4)

Technology

Foster Wheeler's PCFB technology integrated with Siemens Westinghouse's hot gas particulate filter system (HGPFs) and power generation technologies

Plant Capacity/Production

137 MWe (net)

Coal

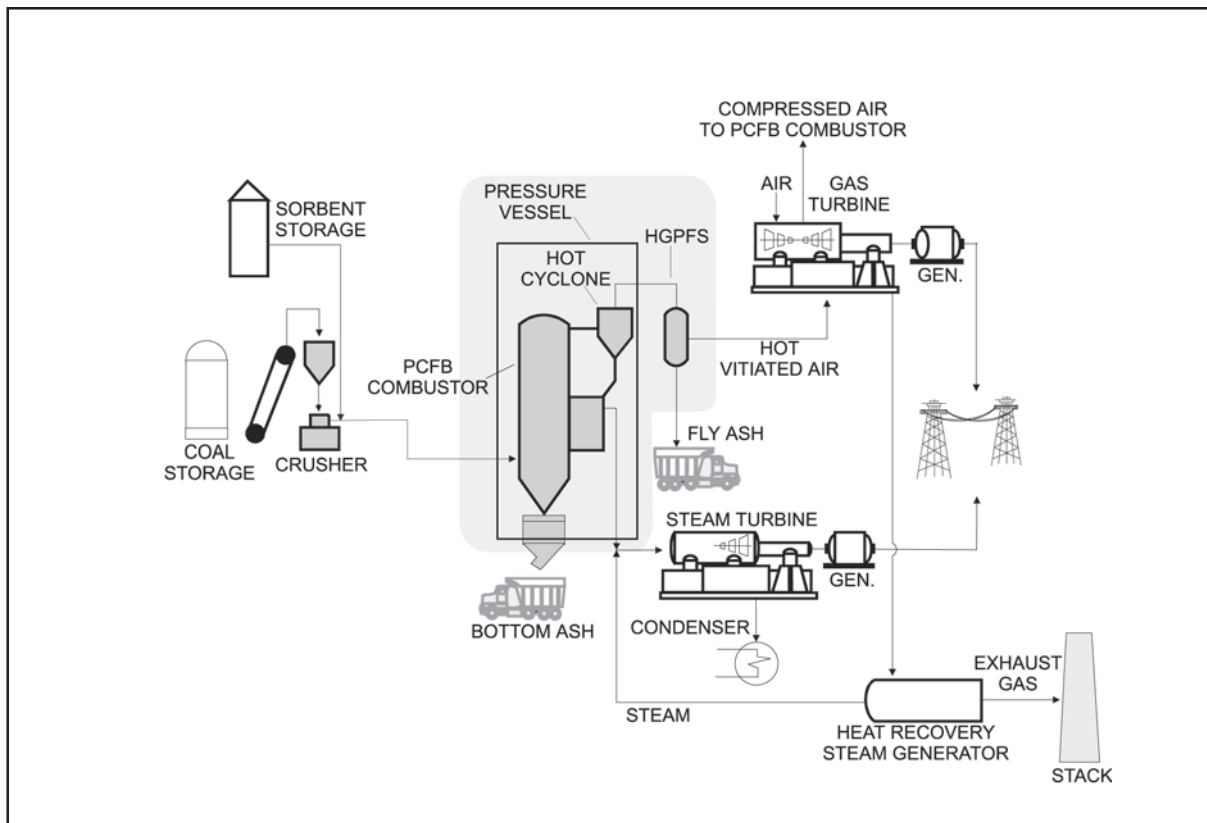
Eastern Kentucky and high-ash, high-sulfur bituminous coals

Project Funding

Total	\$186,588,000	100%
DOE	93,252,864	50
Participant	93,335,136	50

Project Objective

To demonstrate Foster Wheeler's PCFB technology coupled with Siemens Westinghouse's ceramic candle type HGPFs and power generation technologies, which represent a cost-effective, high-efficiency, low-emissions means of adding generating capacity at greenfield sites or in repowering applications.



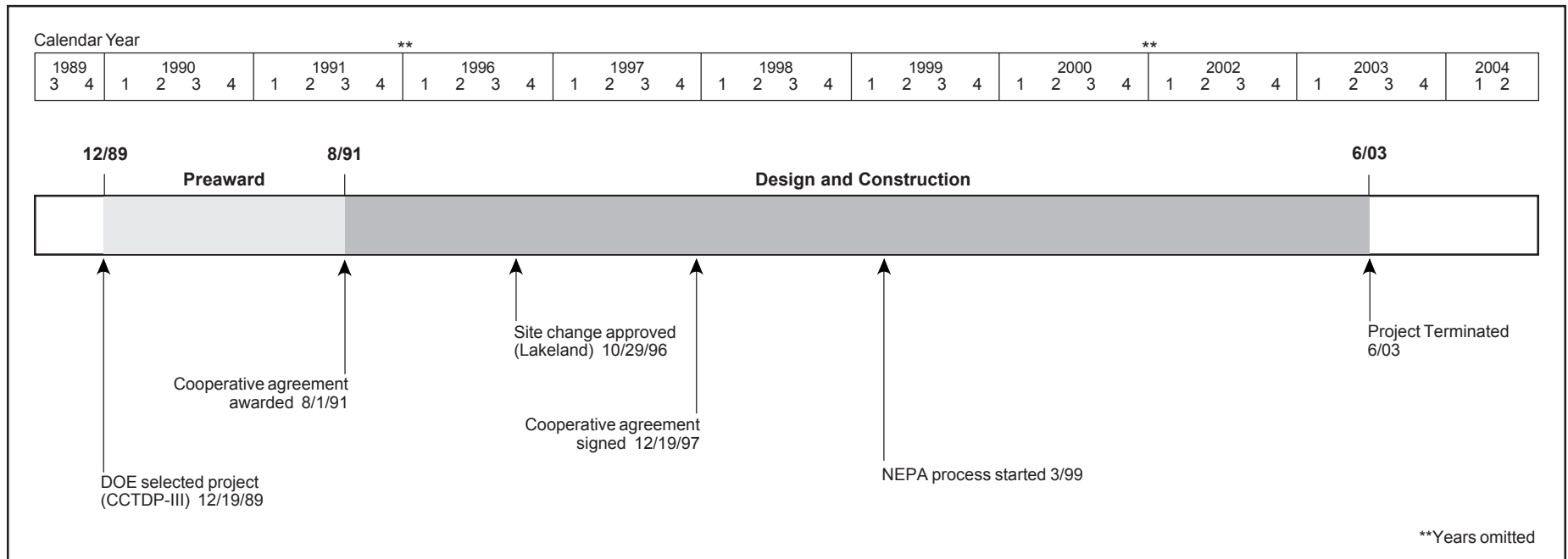
Technology/Project Description

In the first of the two Lakeland Electric projects, McIntosh Unit No. 4A would have been constructed with a PCFB combustor adjacent to the existing Unit No. 3 (see also McIntosh Unit 4B Topped PCFB Demonstration Project).

Coal and limestone are mixed and fed into the combustion chamber. Combustion takes place at a temperature of approximately 1,560–1,600 °F and a pressure of about 200 psig. The resulting flue gas and fly ash leaving the combustor pass through a cyclone and ceramic candle type HGPFs where the particulates are removed. The hot gas leaving the HGPFs is expanded through a Siemens V64.3 gas turbine. The gas inlet temperature of less than 1,650 °F allows for a simplified turbine shaft and blade-cooling system. The hot gas leaving the gas turbine passes through a heat recovery steam generator (HRSRG). Heat

recovered from both the combustor and HRSRG is used to generate steam to power a reheat steam turbine. Approximately 5–10% of the power is derived from the gas turbine, with the steam turbine contributing the balance. The project also includes an atmospheric fluidized-bed unit that can be fired on coal or char from the carbonizer and will replace the PCFB unit during times of PCFB unavailability, allowing various modes of operation.

The projected net heat rate for the system is approximately 9,480 Btu/kWh (HHV), which equates to an efficiency greater than 36%. Environmental attributes include *in-situ* sulfur removal of 95%, NO_x emissions less than 0.3 lb/10⁶ Btu, and particulate matter discharge less than 0.03 lb/10⁶ Btu. Solid waste will increase slightly as compared to conventional systems, but the dry material is readily disposable or potentially usable.



Project Status/Accomplishments

The project resulted from a restructuring of the DMEC-1 PCFB Demonstration Project awarded under CCTDP-III. On December 19, 1997, a Cooperative Agreement modification was signed implementing the project restructuring from DMEC-1 to the City of Lakeland. The Lakeland City Council gave approval in April 1998 for the 10-year plan of Lakeland Electric (formerly Department of Electric & Water Utilities), which included this project. However, the project was on hold while technical and economic issues were resolved. The issues could not be resolved and this project was terminated.

Commercial Applications

The project would have served to demonstrate the PCFB technology for widespread commercial deployment and would have included the first commercial application of hot gas particulate cleanup and would have been one of the first to use a non-ruggedized gas turbine in a pressurized fluidized-bed application.

The combined-cycle PCFB system permits the combustion of a wide range of coals, including high-sulfur coals, and would compete with the pressurized bubbling-bed fluidized-bed system. The PCFB technology can be used to repower or replace conventional power plants. Because of modular construction capability, PCFB generating plants permit utilities to add economical increments of capacity to match load growth or to repower plants using existing coal- and waste-handling equipment and steam turbines. Another advantage for repowering applications is the compactness of the equipment due to pressurized operation, which reduces space requirements per unit of energy generated.