Western Greenbrier Co-Production Demonstration Project

Project Discontinued

CCPI-1

Industrial Applications

Direct Coal Use ☐

By-Product Use ■

Participant
Western Greenbrier Co-Generation (WGC), LLC

Additional Team Members
Alstom Power, Inc. — technology supplier

ENERFAB — A/E Services/ Construction

Marshall Miller — Owners/ Construction Management

Location
Rainelle, Greenbrier County, WV

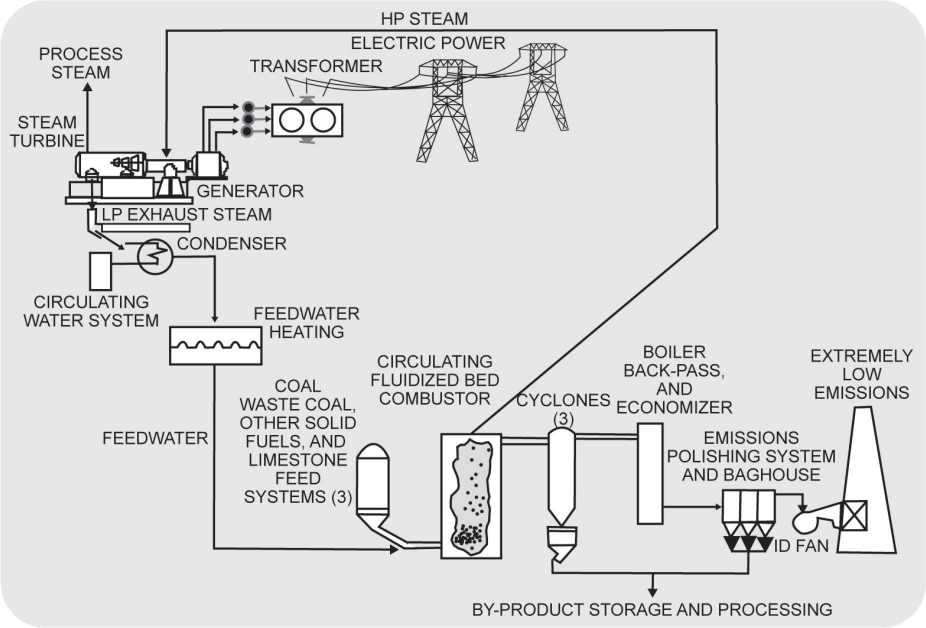
Technology
Alstom Power fluidized-bed combustion

Project Capacity/ Production
100 MW (net) electric power and steam for district heating, alkaline ash for remediation, and co-production of structural bricks or other marketable materials

Coal
4,000 tons/day of bituminous waste coal

Project Funding

Total	$214,983,758	100%
DOE	107,491,879	50
Participant	107,491,879	50

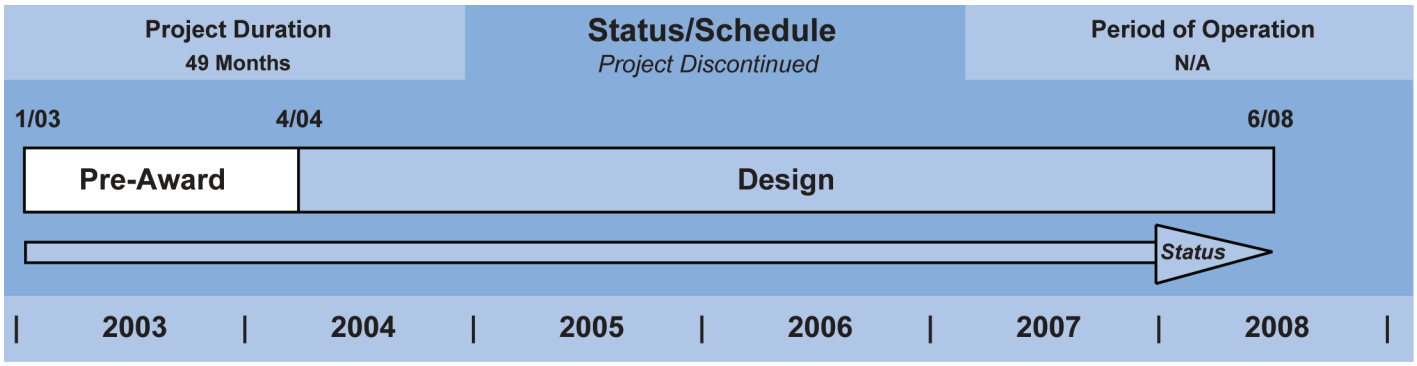


Objectives

To demonstrate advanced circulating fluidized-bed (CFB) combustion technology in the co-production of 100 MW (net) electric power and steam, and marketable ash by-products using bituminous waste coal as the primary feedstock; to use residual steam from the steam turbine for industrial use and district heating; and to apply alkaline ash from the CFB to remediate acid water formation in waste coal impoundments.

Technology/Project Description

The project applies advanced CFB technology to convert approximately 4,000 tons/day of coal mining waste materials ("gob") into 100 MW (net) of electricity. Also, up to 20,000 pounds/hour of steam/hot water for industrial use and district heating can be generated. Initially, about 10 percent of the ash generated will be used to produce a salable by-product, and about 800 tons/day will be used for remediation of acid water formation. The CFB power plant will be an anchor tenant in a planned, environmentally balanced industrial park (Eco-Park). The advanced CFB incorporates an inverted cyclone separator and mid-support structure designs to reduce assembly time (6–8 weeks), lower material costs (60 percent less structural steel tonnage), and provide a smaller footprint (30–40 percent) than conventional designs. Waste coal and limestone are simultaneously fed to the CFB, which raises steam by passing water through water walls lining the CFB. The limestone removes the bulk of the sulfur in the coal feedstock, and the solids are entrained and re-circulated via the cyclone separators to enhance limestone and carbon utilization. An economizer located downstream of the cyclones recovers additional heat from the flue gas. Selective non-catalytic reduction (SNCR), flash dryer absorber, and a baghouse provide additional control of nitrogen oxides, sulfur dioxide, particulate matter, and mercury. Steam from the CFB boiler drives a nominal 100-MW (net) steam turbine. Also, a portion of the steam can be used for ash by-product processing while hot water supplies district heating to tenants



in the Eco-Park. Bottom ash and a small portion of the fly ash are collected and returned to the source of the feedstock. The mildly alkaline nature of the ash assists in neutralizing the acid runoff from the waste pile, alleviating a significant environmental problem. Some of the fly ash is processed and used for production of salable materials, including cements and aggregates.

Benefits

The project is a model of industrial ecology at its best, applying advanced technology to: (1) generate energy from wastes, alleviating an environmental problem; (2) maximize energy generated and associated efficiency; (3) produce salable by-products, enhancing plant economics; and (4) produce remediation by-products, enabling significant land reclamation. West Virginia alone has over 400 million tons of waste coal in abandoned mine dump sites, or gob piles. Water coming in contact with these gob piles becomes highly acidic, absorbs minerals, and contaminates streams and rivers. Successful integration of project technologies and approaches can serve as a model for regions around the world interested in remediation of similar refuse sites.

Status/Accomplishments

On April 29, 2004, the project was awarded a cooperative agreement. In June 2003, the National Environmental Policy Act (NEPA) process was launched with a public scoping meeting to define the requirements for an Environmental Impact Statement. On January 4, 2007, a public hearing was held in Crawley, West Virginia, to gather input on the draft Environmental Impact Statement (EIS). The final EIS was released in December 2007. NEPA requirements were successfully completed with a Record of Decision (ROD) published in the Federal Register on May 2, 2008.

Alstom Power combusted about 150 tons of Anjean waste coal and 50 tons of the Greenbrier Valley limestone at its test facility to obtain furnace design parameters and to provide representative ash to Hazen Research for by-product development and qualification testing.

Following multiple time extensions, DOE ended participation in the project in June 2008. Construction and equipment costs had increased substantially and the participant was unable to secure the necessary private financing to move the project forward.

Contacts

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