Kentucky Pioneer Energy IGCC Demonstration Project

Project Withdrawn

Participant

Kentucky Pioneer Energy, LLC

Additional Team Members

Fuel Cell Energy, Inc. (formerly Energy Research Corporation) — molten carbonate fuel cell designer and supplier, and cofunder

Location

Trapp, Clark County, KY (East Kentucky Power Cooperative's Smith site)

Technology

Integrated gasification combined-cycle (IGCC) using a BG/L (formerly British Gas/Lurgi) slagging fixed-bed gasification system coupled with Fuel Cell Energy's molten carbonate fuel cell (MCFC)

Plant Capacity/ Production

580 MW (gross); 540 MW (net) IGCC; 2.0 MW MCFC

Coal

High-sulfur Kentucky bituminous coal and pelletized refuse-derived fuel (RDF)

Project Funding

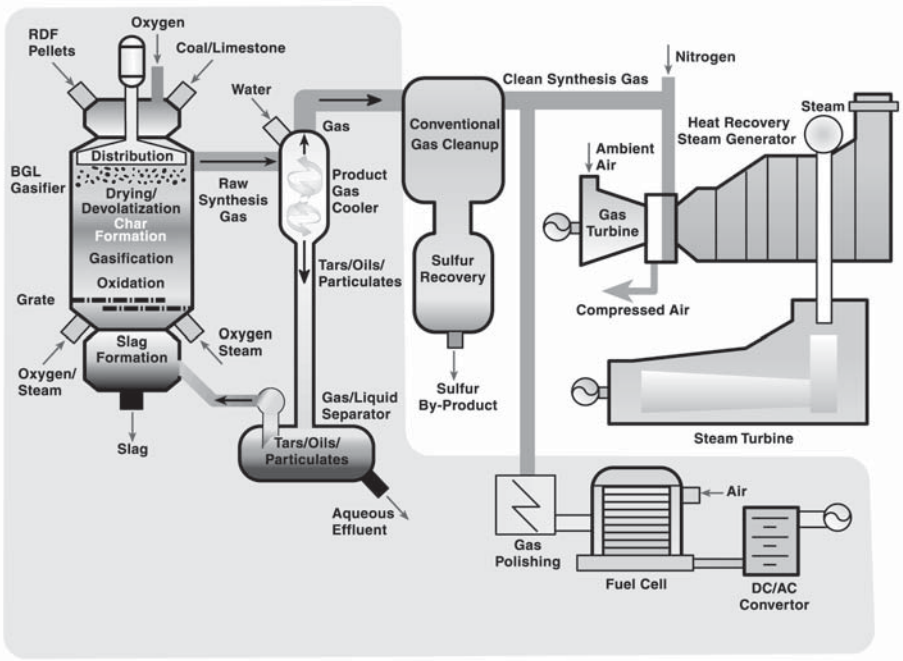
Total	$53,306,321	100%
DOE	20,045,329	38
Participant	33,260,992	62

CCTDP

Advanced Power Systems

IGCC ■ CFB □

Hybrid □ Adv Comb □



Objectives

To assess the operational, environmental, and economic performance of oxygen-blown, fixed-bed, slagging gasifiers fueled by high-sulfur coal and refuse-derived fuel (RDF) blends; and to assess the operational and environmental characteristics of a molten carbonate fuel cell (MCFC) fueled by coal-derived synthesis gas.

Technology/Project Description

Four BG/L gasifiers fueled with coal and pelletized RDF will produce synthesis gas to fire two gas turbines in an integrated gasification combined-cycle (IGCC) mode. In the gasifiers, a motorized distributor/mixer stirs and evenly distributes the incoming coal/RDF blend and limestone flux at the top of the gasifier, sustaining a bed of this mixture as the coal/RDF is consumed. Oxygen (from an on-site oxygen plant) and steam are injected into the gasifier through sidewall-mounted tuyeres (lances) at the base of the gasifier, where combustion and slag formation occur. The combustion provides process heat by consuming carbon remaining after gasification of descending fuel, produces a liquified slag with the aid of the limestone flux, and causes the bed of coal/RDF/limestone to descend with the aid of a moving grate. The upward moving heat and steam dry and release volatile material from the incoming coal/RDF, transform it into char, and gasify the char to produce a medium-Btu synthesis gas exiting the gasifier at approximately 1,050 °F. The synthesis gas exits near the top of the gasifier and passes into a water quench vessel (product gas cooler), which reduces the synthesis gas temperature to 300 °F and preheats boiler feed water. Water soluble materials, solids, and tars/oils separate from the synthesis gas; tars, oils, and particulates are further separated and recycled to the gasifier. Sulfur is removed and recovered with conventional systems. Integration of a gasifier and an MCFC is a part of the project, which is to be carried out at Global Energy's Wabash River Energy Ltd. commercial gasification facility in Terre Haute, Indiana. Tests employed a 2-MW Fuel Cell Energy MCFC (a Direct FuelCell® 3000).

Project Duration 69 Months	Period of Operation *Project Withdrawn*	Status/Schedule *Estimated date

Benefits

BG/L gasifiers offer proven performance at high reliability on a number of coals and represent a means to effectively dispose of wastes through use of RDF while far surpassing the efficiency and environmental performance of pulverized coal-fired (PC) plants. BG/L gasifier tolerance to RDF addresses a growing domestic solid waste management problem that PC plants have had limited effect upon because of basic design considerations. The heat rate of the IGCC demonstration facility is projected to be 8,560 Btu/kWh (40 percent efficiency on a higher heating value [HHV] basis), and the commercial embodiment of the system has a projected heat rate of 8,035 Btu/kWh (42 percent efficiency, HHV). These efficiencies represent a greater than 20 percent reduction in emissions of CO_2 when compared to a conventional PC plant equipped to meet New Source Performance Standards (NSPS). The IGCC system is expected to surpass NSPS by reducing SO_2 emissions to 0.1 lb/10^6 Btu (99 percent reduction) and NO_x emissions to less than 0.15 lb/10^6 Btu.

Status/Accomplishments

In November 1999, DOE signed the cooperative agreement that launched this project. The National Environmental Policy Act (NEPA) requirements for the IGCC portion of the project were met with an Environmental Impact Statement (EIS) and issuance of a Record of Decision on January 29, 2003. The NEPA process for the MCFC portion of the project was satisfied with a Categorical Exclusion (CX) on the same date.

Installation of the MCFC and associated support equipment at the Wabash River Generating Station was completed in August 2004, but operation was put on hold pending closure on a natural gas purchase agreement needed to support MCFC comparative testing on natural gas and synthesis gas.

In October 2004, the Kentucky Public Service Commission (PSC) withdrew its approval of an agreement by East Kentucky Power Cooperative, Inc. to purchase electric power from the proposed Kentucky Pioneer Energy generating plant.

Due to issues with proceeding at the proposed project site, and lack of progress in moving forward, DOE provided notice to the participant in August 2005 that project closeout activities had been initiated. A Final Report on the Fuel Cell Demonstration was issued in February 2006.

Contacts

Participant

H.H. Graves, President
(513) 621-0077
hhg@globalenergyinc.com

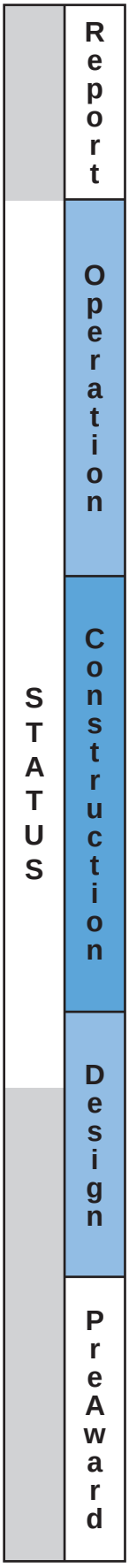
Kentucky Pioneer Energy, LLC
312 Walnut Street, Suite 2600
Cincinnati, OH 45202

NETL

Nelson Rekos
(304) 285-4066
nelson.rekos@netl.doe.gov

Headquarters

Joseph Giove
(301) 903-4130
joseph.giove@hq.doe.gov



Final Report Issued (Fuel Cell only)	*2/06*
Draft Report Issued	*N/A*
Operation Completed	*N/A*
Operation	*N/A*
Construction	*N/A*
Project Withdrawn	*8/05*
NEPA Completed	
IGCC (EIS)	*1/03*
MCFC (CX)	*1/03*
Award	*11/99*
Selection	*5/93*