

FY05-LI(51)-129

Lignite Coal Test at a Transport Reactor Gasification Facility in Wilsonville, AL

Contractor: Basin Electric Power Cooperative; Duration: 18 months

Principal Investigator: Michael Paul

PARTICIPANTS

<u>Sponsor</u>	<u>Cost Share</u>
Basin Electric Power Cooperative	\$12,143
Great River Energy	\$12,143
Ottertail Power Cooperative	\$12,143
Montana Dakota Utilities	\$12,143
Great Northern Power Development	\$12,143
SaskPower	\$12,143
Dakota Westmoreland Corp.	\$10,000
BNI Coal, Ltd	\$10,000
Falkirk Mining	\$ 5,000
Coteau Mining	\$ 15,000
NDIC	<u>\$125,000</u>
Total Cost	\$250,000

Project Schedule - 18 Months

Contract Date – 7/1/04

Start Date – 7/1/04

Completion Date – ~~12/31/05~~

Extended to 12/31/07

Project Deliverables

Contract Signed: 8/10/04 ✓

Quarterly Reports:

12/31/04(✓);6/1/06(✓);

Final Report 12/31/07(✓)

OBJECTIVE / STATEMENT OF WORK:

Conduct short & long-term lignite tests using an advanced IGCC Clean Coal Technology gasification system, Transport Reactor Integrated Gasification (TRIG), at the DOE's Power System Development Facility (PSDF) in Wilsonville, AL. Project sponsors will ship North Dakota lignite to the PSDF to resolve high-sodium lignite issues.

STATUS

July – December, 2004 Status Report. Previous tests using a low sodium Falkirk mine lignite demonstrated that good gasification could be achieved using the TRIG reactor. Recent tests using a high-sodium (8%) lignite identified downstream agglomeration in the reactor's loop seal area. Subsequent tests (TC16) were focused on eliminating the agglomeration issues and identified a temperature regime that operated trouble free. A long-term 500 hr test is scheduled for August, 2005 to verify the previous successful test.

A long-term lignite 1,000 hr test has been delayed to 2007. The delay is due to TRIG modifications for future lignite tests to increase throughput and minimize unburned carbon. The modifications will support Southern Company Service's efforts to design, construct and operate a full-scale commercial TRIG-based IGCC in support of a recently awarded DOE Clean Coal Technology contract, and ensure applicability of lignite gasification for power generation.

January 1, 2005 – December 31, 2006. No lignite tests were conducted during 2005. In December of 2005, a meeting was held with Southern Company representatives to discuss further testing at the PSDF. Modifications to the gasifier system were made during 2005 and 2006 to address fuel feed issues and agglomeration issues due to high-sodium lignite. On November 8, 2006 a 750-hour low/high sodium campaign began. The low-sodium of the test campaign (first part of test) produced favorable results; however, the high-sodium portion of the test resulted in shutdown of the gasification system. Tentatively, the high-sodium portion of the campaign is scheduled to resume. Contingent upon successful completion of the high-sodium campaign, two consecutive 1000-hour high sodium lignite tests (one in the air mode and one in the oxygen mode) are being planned.

Final Report. The purpose of the project was to investigate the applicability of Transport Reactor Integrated Gasification (TRIG) technology as a possible alternative power generation source for North Dakota high-sodium Freedom Mine lignite coal. North Dakota Freedom Mine lignite coal was shipped to the PSDF test facility in Wilsonville, Alabama, and used during each of the following test campaigns:

- TC16; 08/17/2004 – 08/24/2004
- TC21; 11/16/2006 – 01/26/2006
- TC23; 08/15/2007 – 08/27/2007

High-sodium (6.0 – 8.8% Na₂O wt. in ash) lignite coal was shipped to the Power Systems Development Facility in Wilsonville, Alabama. Three separate test campaigns (i.e. TC16, TC21 & TC23) were conducted at the PSDF facility to evaluate performance characteristics of TRIG technology when gasifying high-sodium ND lignite coal. Results varied between the three test campaigns based on use of different sorbent additive materials, sodium concentrations and operating conditions. Selection and use of kaolin sorbent material during the TC23 test campaign produced the most favorable results in terms of eliminating gasifier agglomerate formations, improved heat values, higher processing temperature conditions and acceptable carbon conversions. As power producers continue to seek innovative and cost effective methods of generating electricity from North Dakota's abundant lignite coal reserves, utilization of TRIG technology may offer a viable solution to meeting our future energy needs.