

**LRC-IV-18  
HOT WATER DRYING OF NORTH DAKOTA LIGNITE**

**CONTRACTOR:** BNI Coal, Ltd. And Minnesota Power

**PRINCIPAL INVESTIGATOR:** George R. Nehls, Jr.  
(218) 722-2641

**PARTICIPANTS**

<u>Sponsor</u>	<u>Cost Share</u>
BNI Coal	\$211,000
ND Industrial Commission	<u>70,000</u>
<b>Total</b>	<b>\$281,000</b>

**Project Schedule – 1 Year**

Contract Date – 3/21/90  
Start Date – 10/10/89  
Completion Date – 11/13/90

**Project Deliverables**

Progress Reports ✓  
Final Report – 11/13/90 ✓

**OBJECTIVE / STATEMENT OF WORK**

The ultimate objective of this proposal was to economically upgrade North Dakota lignite to an export quality boiler fuel and to locate a commercial plant in North Dakota. The intermediate objective of this program was to design, construct and successfully operate a demonstration-scale lignite beneficiation plant. Co-funding for the demonstration phase was applied for under DOE's Clean Coal Technology Program III. An immediate objective of this proposal was to continue to provide process refinements.

This proposal includes three primary tasks:

- Characterization of waste streams, treatment of waste streams, and waste stream byproducts are proposed to be done at the EERC.
- A market development study to assess the impact of the potential market for beneficiated lignite is proposed to be done by BNI.
- A working model of the hot-water-drying reactor hydraulics is proposed for the St. Anthony Falls Hydraulic Laboratory.

**STATUS**

Chemical characterization of the hot-water-drying process waste water streams was done. Waste streams from the EERC and IBT scale facilities were analyzed. Two bench scale activated sludge systems were used to evaluate treatability and activated sludge kinetic parameters were

developed. Identification of tertiary treatment steps to meet discharge requirements were initiated.

A study was done to identify potential markets for a high quality, low sulfur, low sodium coal derived from Northern Great Plains lignite. The target market included all or parts of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Ohio, North Dakota, South Dakota, Wisconsin and Ontario. In 1989, almost 245 million tons of coal were shipped into the 11-state area. Of this 245 million tons, about 15 million tons were destined for markets that could be considered potential users of a high quality, low sulfur, low sodium coal derived from lignite. It was projected that this market could increase to 50 million tons by the year 2000. The analysis of the potential market in Ontario was estimated at 630,000 tons by the year 2000.

A 9 ft. I.D. and 10 ft. high hot-water-drying reactor was modeled. The reactor system is counter current solid-liquid heat exchanger. The active region of the reactor vessel consists of two intermediate zones designed to heat the coal to reaction temperature and then remove the heat. The models predicted stable and unstable operating parameters. Further model simulation work was recommended.