Report Title:

PHASE II CALDERON PROCESS TO PRODUCE
DIRECT REDUCED IRON
RESEARCH AND DEVELOPMENT PROJECT

Report Type:

QUARTERLY

Reporting Period Start Date: 04/01/2001 End Date: 06/30/2001

Principal Author(s): ALBERT CALDERON

Report Issue Date: 07/23/2001

DOE Award No.: DE- FC22 -95PC92638

Submitting
Organization(s)

CALDERON ENERGY COMPANY

500 Lehman Avenue

Name & Address

P.O. Box 126

Bowling Green, OH 43402

(1)

(2)

(3)

(4)

(5)

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

QUARTERLY TECHNICAL PROGRESS REPORT
PHASE II CALDERON PROCESS TO PRODUCE DIRECT REDUCED IRON
RESEARCH AND DEVELOPMENT PROJECT

CALDERON ENERGY COMPANY
COOPERATIVE AGREEMENT NO. DE-FC22-95PC92638

Reporting Period: 4-01-01 to 6-30-01

Date of Report: 7-23-01;

Phase II Award Date: 6-23-00; Anticipated Completion Date: 12-03-03

Total Project: \$ 25,814,000.00 Budget II Total DOE Share This Action: \$6,457,000.00

Contracting Officer's Representative (COR): Carl Maronde;

Project Director: Albert Calderon

Assistant Project Director: Reina Calderon

Abstract

This project was initially targeted to the making of coke for blast furnaces by using proprietary technology of Calderon in a phased approach, and Phase I was completed. The project was then re-directed to the making of iron units. U.S. Steel teamed up with Calderon for a joint effort which will last 30 months to produce directly reduced iron with the potential of converting it into molten iron (hot metal) consistent with the Roadmap recommendations of 1998 prepared by the Steel Industry in cooperation with the Department of Energy. The work which is labeled as Phase II will take place at two levels; namely, the bench scale level and the process development unit level. During the past quarter approval for the re-direction took place and work was initiated at both levels.

TABLE OF CONTENTS

Introduction	Page 1
Accomplishments and Discussion	Page 1
Conclusion	Page 3

Introduction

The commercialization path of the Calderon technology for making a feedstock for steelmaking with assistance from DOE initially focused on making coke and work was done which proved that the Calderon technology is capable of making good coke for hard driving blast furnaces. U.S. Steel which participated in such demonstration felt that the Calderon technology would be more meaningful in lowering the costs of making steel by adapting it to the making of iron - thus obviating the need for coke.

U.S. Steel and Calderon teamed up to jointly work together to demonstrate that the Calderon technology can produce iron units from iron concentrate (ore) and coal quite competitively by eliminating pelletizing, sintering, coking and blast furnace operation. Such demonstration will also prove that, potentially, a significant reduction in pollution will occur including the minimization of greenhouse gases and specifically CO₂ by virtue of Calderon's technology being efficient and closed.

Accomplishments and Discussion

During the past quarter considerable progress took place. The Cooperative Agreement between Calderon and NETL was amended based on a revised cost estimate and a new Statement of Work (SOW) which was referred to in the previous quarterly report. The work was simultaneously initiated at the Bench Scale level and at the Process Development Unit (PDU) level.

With respect to the Bench Scale, engineering and procurement was completed and submitted to the fabricator. Fabrication was completed which included the pusher, the reactor and the elbow. Both the reactor and elbow were delivered to the refractory lining provider where they were lined with a 3000°F lining backed by insulation. These components were

cured at the provider and returned to Calderon's laboratory in Bowling Green, and the components were erected on structural supports. Photographs #1 through #4 are included in this report as an aid in briefly describing the Bench Scale.

Photograph #1 shows the equipment from the charging end, photograph #2 from the discharging end and Photograph #3 the lining at the discharging end. The unit was tested cold to find out if the pusher was capable of pushing ore concentrate through the reactor chamber – no problem was encountered; photograph #4 shows the piston in position during the push.

With respect to the field work at the PDU in Alliance, the following was accomplished:

Maintenance work on the feeding system included removal of standing water, cleanup of ball valves, checkout venting systems of valves and lockhopper, checkout of hydraulic drive of feeder, checkout pressure/flow/temperature and control signals to DCS Control.

Maintenance work on the pyrolyzer and system controls included venting and disconnection of burner, DCS Control checkout and defective electronic boards replaced, to bring system to operating condition.

The pusher was checked out, cycled and brought to operating condition.

The hydraulic system was checked out and oil samples were sent for analysis.

The hot cyclone was checked out and found to have a defective discharge which needs replacement. Work was initiated to repair it.

The lime feeder was checked out and brought to operating condition.

The coal feeder showed problems in its inability to rotate. It was disassembled; it showed that it needs new seals.

The flare was checked out and brought to operating condition.

The main compressors were checked out and brought to operating condition. The instrument air compressor was checked out and brought to operating condition.

Roofs of buildings were repaired for leaks.

The air conditioning in main office building was updated.

The maintenance building was cleaned, the bathroom toilet replaced and the restroom and shower were painted. An inventory of tools was taken and missing tools were replaced.

The electrical system was energized through its main transformer and oil samples were taken for analysis.

The skip hoist was checked. Some structural steel square tubing hoisting cable and brake linings were replaced.

The safety equipment was checked out and an inventory taken of replacements

The radio communication system was checked out – some equipment was identified as needing replacement.

Conclusion

The work plan for the next quarter is as follows:

At the Bench Scale, the unit is to be completed and testing will begin.

At the PDU the work will continue towards putting the facility into operating condition.

Submitted by:

Albert Calderon
Project Director

PHOTOGRAPH #1

PHOTOGRAPH #2

PHOTOGRAPH #3

PHOTOGRAPH #4