Horizon Sensing (Proposal #51)

January-March 2001 Quarterly Report (1st)

- **Principal Investigator:** Larry G. Stolarczyk, Sc.D., Stolar Research, Inc.
- **NETL Project Manager:** David M. Hyman
- **Partners:**
 - Los Alamos National Laboratory
 - CONSOL, Inc.
 - RAG American Coal
 - FMC Corporation
 - Lee Ranch Coal Company
- **Total Project Cost:** **\$1,860K**
 - DOE Share: \$ 900K (incl. \$40K to LANL)
 - Participant Share: \$ 960K
- **Project Period:** **36 months**
- **Project Start Date:** **20 December 2000**
- **Report Date:** **31 March 2001**
- **DOE Award No.:** **DE-FC26-01NT41050**

Project Objectives

- To demonstrate the feasibility of real-time stress measurement, bit loading, and horizon sensing on a longwall shearer, boring machine, continuous miner, and loading bucket.

Project Cost Summary

(Amount in Thousands of Dollars)

	First Year		Second Year		Third Year		Total	
	Plan+	Actual*	Plan+	Actual*	Plan+	Actual*	Plan	Actual
Participant	320	1,960	320	3,360	320	3,360	960	
DOE	303		298		298		900	
Total	623		618		618		1,860	

Key

+ Planned costs for the full year

* Actual costs through the reporting period. Based on full Stolar Horizon staff deployment of the Horizon Sensor Project at \$280K/month

Milestones and Status

Major Milestones Planned to Date/Status

Planned Milestone

Status

– Power generator design	Feb. 01/ Complete
– Generator vibration tests	Mar. 03/ In Progress
– RF circuit design	Feb. 14/ Complete
– RF circuit testing	Mar. 01/ In Progress
– MSHA submission	Feb. 05/ Complete
– Calibration sequencing	Feb. 30/ Complete
– RMPA antenna design	Mar. 13/ In Progress
– GUI design and software	Mar. 15/ In Progress
– HS-3 prototype testing	Mar. 30/ In Progress

Key Accomplishments

Progress to Date Highlights

- **MSHA submission for X/P certification complete - February 2001**
- **RF circuit (Millennium PCB) design complete, prototype board assembly initiated - March 2001**
- **Power generator design, assembly and testing complete - March 2001**
- **Drum CM shock and vibration measurements at Consol yield 80g shock expectations - March 2001**
- **Sandia National Lab shock and vibration tests initiated - March 2001**
- **HS-3 operational and calibration sequencing complete - March 2001**
- **Graphical user interface design complete and prediction algorithms progressing - March 2001**

HS-3 OPERATING MODES

Diagram of the cutter drum showing the 4 modes of functionality which occur during a single rotation of the HS-3 Sensor.

HS-3 SUMP SEQUENCE

Diagram of the Calibration Cycle Sequencing. The CAL Cycle flows much like a regular sump-in cycle but is done once before mining to record all necessary CAL variables and create all the CAL tables.

Photo Library

Generator motor size reduction

Prototype sensor stack

Stack vibration testing

Photo Library

Generator enclosure design

Sensor enclosure design

Display enclosure design

Good News!

- **Prototype Installation of HS-2 Horizon Sensor proved that uncut coal could be measured in Real-Time.**
- **Mining Companies believe that the Horizon Sensor is essential to the cleaner coal mining technologies.**
- **Senate and House members support Clean Coal Technologies.**
- **To increase the ‘science’ factor in the Art and Science of mechanical design for mining equipment, Sandia National Laboratories offered the services of its Centers of Excellence in areas of structural analysis and vibration testing of the HS-3 Horizon Sensor.**

Project Recognition

- Trade Show Booth Featuring HS-2 at Mine Expo 2000
- Trade Show Booth Featuring HS-2 at SME 2001 Annual Meeting
- Trade Show Booth Featuring HS-3 at 2001 Longwall USA
- Trade Show and Televised New Conference Featuring HS-2 in Albuquerque, 2001

Project Assessment

(Internal DOE Use Only)

- **Open Issues and/or Problems**
 - None noted
- **Overall Assessment**
 - Off to a good start