APPENDIX U-15

EXECUTIVE SUMMARY OF INVESTIGATION OF PROGRAMMABLE LOGIC CONTROLLER COMPONENTS

U.S. Department of Labor

Mine Safety and Health Administration
Approval and Certification Center
765 Technology Drive
Triadelphia, West Virginia 26059

November 28, 2011

MEMORANDUM FOR NORMAN G. PAGE
Accident Investigation Team Leader

FROM: JOHN P. FAINI
Chief, Approval and Certification Center

SUBJECT: Executive Summary of Investigation of Programmable Logic Controller Components Recovered from Performance Coal Company's Upper Big Branch – South Mine

The Approval and Certification Center (A&CC), as requested by Upper Big Branch Mine Accident Investigation Team Leader, Norman Page, assisted the accident investigation team in the investigation of Programmable Logic Controller (PLC) components of the longwall mining system. These components were recovered from a fatal mine explosion at the Upper Big Branch Mine-South which occurred on April 5, 2010.

The components examined were:

1. Exhibit No. PE-0168 Allen-Bradley PanelView 600 recovered from the Automatic Chain Tensioner (ACT) controller enclosure located at the longwall tailgate. Note: The exhibit was placed into Exhibit No. PE-0250 protective case.

2. Exhibit No. PE-0214 Allen-Bradley PanelView Plus 1000 and PanelView Plus 24 Vdc power supply recovered from the longwall headgate master controller enclosure.

3. Exhibit No. PE-0222 which consisted of two pieces of evidence in the same protective case:

    a. Allen-Bradley PLC-5/20 processor module recovered from the longwall headgate master controller enclosure and;

    b. Allen-Bradley PanelView Plus 1000 recovered from the longwall power center.

4. Exhibit No. PE-0223 Allen-Bradley PLC-5/40 processor module recovered from the longwall starter.

5. Exhibit No. PE-0253 Allen-Bradley SLC 500 7-Slot Rack containing a SLC 5/04 processor module, power supply, three input modules and one output module recovered from the ACT controller enclosure located at the longwall tailgate.

6. Exhibit No. PE-0261 Allen-Bradley PanelView Plus 1000 recovered from the emulsion pump starter.

7. Exhibit No. PE-0262 consisted of two pieces of evidence in the same protective case:
    a. Allen-Bradley PLC-5/30 processor module recovered from the emulsion pump starter;
    b. Allen-Bradley Enhanced PLC-5 Controller (PLC-5/30 processor module) recovered from the longwall power center.

8. Exhibit No. PE-0274 consisted of two pieces of evidence in the same protective case:
    a. Allen-Bradley DL40 Dataliner Message Display recovered from the longwall starter;
    b. Allen-Bradley SLC 5/04 processor module recovered from the water pump starter.

9. Exhibit No. PE-0309 Allen-Bradley Enhanced PLC-5 Controller (PLC-5/20 processor module) recovered from the longwall headgate master controller enclosure. The exhibit was a spare processor module that was not installed.

The PLC components used on the longwall mining system consisted of six processor modules. Each processor controlled a different system. These processors were mounted in separate locations and were intended to operate on a network. The PLC components were not configured with any additional hardware (storage medium) or software code to allow for data logging; however, some of the components retained the last state of the PLC output registers.

Attempts were made to retrieve this information from these PLC components in order to find data relative to the operating status of the longwall mining system immediately prior to the mine explosion. The MSHA accident investigation team requested the assistance of the longwall electrical equipment supplier and contracted with the PLC component manufacturer.

The examinations and tests found:

- No PLC inputs or outputs were observed to be "forced" (no processors were found in a state where the software logic control was overridden).
- Due to conflicting data when examining the retained last state of the PLC output registers, no definitive conclusions of the operating status of the longwall mining system could be obtained.