Duquesne Light Company Beaver Valley Power Station
P.O. Box 4
Shippingport, PA 15077-0004

JOHN D. SIEBER
Vice President - Nuclear Group

(412) 643-5255

June 8, 1988

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Reference: Beaver Valley Power Station, Unit No. 2
Docket No. 50-412, License No. NPF-73
Follow-up Actions on Annunciator Cabinet Fire of 1/28/88

Gentlemen:

Provided is a response to your request for additional information regarding the fire event at our BVPS Unit 2 facility involving the annunciator cabinets on January 28, 1988. The enclosure (Attachment A) addresses each of the three (3) specific issues raised in your letter of April 18, 1988.

If there are any additional questions or clarifications relative to this matter, please contact my office.

Very truly yours,

J. D. Sieber
Vice President
Nuclear Group

Enclosure

cc: Mr. J. Beall, Sr. Resident Inspector
Mr. W. T. Russell, NRC Region I Administrator
Mr. P. Tam, Project Manager

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Attachment A

BVPS-2 Followup Actions on Annunciator Cabinet Fire of 1/28/88
Issues and Responses

ISSUE #1:

Any significant findings identified during the course of your on-going investigation of the fire.

Response:

A complete description of the event, root cause analysis and conclusions are provided below.

Description of Event:

At about 1908 hours on January 28, 1988 the Unit 2 control room experienced a total loss of annunciators. Status of the plant was Cold Shutdown - Mode 5. Approximately one-half (1/2) hour prior to the incident, the gaseous waste system trouble alarm had flashed in and out with no message on the computer display or the printer. This alarm originates from MI Card #65 where the fire initiated. Operations personnel were dispatched to the instrument rack room where they discovered a fire in logic cabinet #5. The fire was put out with portable CO_2 fire extinguishers. At the power supply bay, Inverters #1 and #3 had tripped. Inverter #2 was on-line and oscillating, and subsequently was turned off.

Upon a close inspection of logic cabinet #5, it became apparent that the fire damage was limited to a specific group of P.C. cards. All the cards in the affected card frames were pulled out except the most severely burned, which had to be removed with pliers. The system was then re-energized, the cards inserted one at a time, and each alarm point verified. A total of six (6) MI cards were found to be damaged. A list of all affected alarm points was compiled by computer group personnel and a temporary log established to monitor the out-of-service alarm points.

At 2140 hours on January 28, 1988, approximately 95% of the annunciator alarms had been restored. By 2200 hours on January 31, 1988, all repairs had been completed and the system was fully functional.

Root Cause Analysis:

Following the incident and upon restoring the annunciator system to normal operation, DLC undertook a series of activities aimed at pinpointing the root cause of the incident. The following potential causes were analyzed:

1. Personnel Error
2. Procedure Deficiency
3. Equipment Failure
4. Programmatic Deficiency

Personnel Error - No testing, surveillance or maintenance activities on the annunciator system were in progress at the time of the incident. Therefore, personnel error was not a contributing factor to this incident.

Procedure Deficiency - As stated above, no procedures were being performed when the incident occurred and therefore procedure deficiency could not have caused the incident.

Equipment Failure - Indications are that a random component failure occured on Multiple-Input (MI) Card #65 causing the initial electrical fault.

A complete system check was performed and no abnormalities were observed. The system was checked for grounds and input voltages. The input/output of the inverters and power supplies were tested and found to be within limits. Soon after the incident it was observed that input breakers of Inverters #1 and #3 tripped, but the power supply fuses did not blow. Inverter #2, set at the lowest output voltage, did not trip because the fault had cleared by this time. A review of the rating of the fuses and breakers was performed and it was determined that although the breakers have a higher continuous rating (30 Amps) than the fuses (10 Amps), the breakers are magnetic while the fuses are dual-element time-delay. This explains why the fuses did not blow, and actual tests conducted in the shop confirmed this to be true.

Programmatic Deficiency - Although there is no required periodic surveillance or preventive maintenance program for the annunciator system, functional checks are performed on those alarm points associated with system that have scheduled surveillance or PM tasks. In addition, Maintenance Work Requests (MWR's) are generated for any suspect alarm point. In summary, no programmatic deficiency exists and, therefore, could not have been a contributing factor to the fire incident.

Conclusion:

Based on observations and information available, we have concluded that this was an isolated incident caused by a random equipment failure. However, due to inadequate fuse protection of the system, a resulting failure increases the potential for a fire event.

ISSUE #2:

Corrective actions taken or planned to be taken to increase your level of confidence in the reliability of the suspect printed circuit boards and associated solid-state components.

Response:

Immediate corrective actions were discussed previously regarding repairs, system checkout and return to service of the Annunciator System. Since the system is relatively new (less than 4 years since initial energization), there are no plans for replacement of the equipment.

Monitoring of the subject cabinets for abnormalities or indications of overheating is being conducted once-per-shift on an interim bases until the long-term corrective actions are implemented.

Long term corrective actions include:

1. Providing adequate fault protection by the addition of supervised fusing at a card group level which will limit the maximum fault current on a per card basis.

2. Providing ionization-type smoke detectors inside the cabinet bays which will be interlocked with the fans and provide remote indication in the Control Room.

ISSUE #3:

Your conclusions pertaining to similar control systems in service at your facility, especially those control systems that can inadvertently operate at high temperature conditions which could lead to other potential fire hazards.

Response:

An evaluation was conducted pertaining to similar electronic systems in service at our facility. The scope of the review was directed towards all high-density electronic enclosures and local annunciators supplied by Electro-Devices. To determine if similar systems could inadvertently lead to a potential fire hazard condition, the following characteristics were reviewed:

- adequacy of local fusing
- existence of fire barriers between rows inside the cabinets
- type of power source

The results of the review concluded the following:

1. Adequate fault protection exists for all other high density electronic circuit card systems which would limit maximum fault current and prevent an ignition source and subsequent fire condition.

2. The construction of the cabinets would mitigate the potential for spread of fire damage due to the physical barriers (i.e., metal plates) located between the racks within the cabinets.

3. In all cases, the equipment reviewed was determined acceptable and does not pose a fire hazard as experienced with the annunciator system.