

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-412/88-03

Docket No. 50-412

License No. NPF-64 Priority - Category C

Licensee: Duquesne Light Company
Post Office Box 4
Shippingport, Pennsylvania 15077

Facility Name: Beaver Valley Unit 2

Inspection At: Shippingport, Pennsylvania

Inspection Conducted: February 1-3, 1988

Inspectors: *S. Pullani*
S. Pullani, Senior Operations Engineer

2-26-88
date

Approved by: *D. J. Lange*
D. Lange, Chief, BWR Section

3-4-88
date

Inspection Summary: Inspection on February 1-3, 1988 (Report No. 50-412/88-03)

Areas Inspected: Special inspection to follow up the total loss of control room annunciators event on January 28, 1988.

Results: No violations were identified. One item remained unresolved at the end of the inspection.

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DETAILS

1. Summary of Event

At approximately 1908 hours on January 28, 1988, with the unit in cold shutdown (Mode 5), the control room experienced a total loss of all annunciators. A small fire was discovered in an annunciator logic cabinet (Bay 5) two floors below the control room and was immediately extinguished by the two operators who had been dispatched to investigate. Plant parameters were available throughout the event at the control room instruments and the Safety Parameter Display System (SPDS). Due to the sustained loss of annunciators (greater than 5 minutes), the licensee declared an ALERT in accordance with the Emergency Preparedness Plan and made all required notifications. The damaged solid state cards were removed and the annunciation system was restored to all but a few known annunciator windows. Following the restoration of the system, the ALERT was terminated at 2245 hours.

2. Description of Event

About half an hour prior to the event, the Gaseous Waste System Trouble annunciator flashed in and out with no message on the CRT or the printer. This annunciator is fed from Multiple Input (MI) Card 65, where the fire apparently started (see Section 3). The next indication of a problem was all existing annunciators which were in "red" went to "white" with all horns sounding. The operators were unable to control the annunciators for about 30 seconds. Then the annunciators returned to normal. All annunciators were acknowledged and horns silenced for about 15 seconds. Then the annunciators went out again. The above sequence of events occurred between approximately 1905 and 1908 hours.

Two operators were dispatched to the 707 feet elevation of the Control Building (2 floors below the Control Room) to investigate the problem when, at 1908 hours, a fire was discovered in Annunciator Logic Cabinet IHA-LOG-M1 (Bay 5). The Control Room then assembled the emergency squad and dispatched to the location of the fire.

At 1915 hours, the fire was reported extinguished by the two operators investigating the problem. Damage was reported in a number of cards in the logic cabinet (Bay 5). Notes: (1) No early warning fire detection alarms were received and no automatic CO2 discharges occurred in the room. Subsequently, the CO2 system was placed in lock out by the emergency squad to prevent its unnecessary operation. (2) One of the two operators found, of the three invertors which powers the Annunciator System, the #1 and #3 invertors in tripped condition and the #2 invertor making noise and its lights flickering in synchronism with the noise oscillation. Therefore, he tripped the #2 invertor.

At 1920 hours, an ALERT was declared in accordance with the Emergency Preparedness Plan (EPP), due to sustained loss of annunciators for greater than 5 minutes. Notifications were immediately commenced. I&C personnel were called in to repair the damaged components. At 1940 hours, the NRC was notified in accordance with 10 CFR 50.72.

At 2245 hours, the ALERT was terminated. No radiological releases occurred. The control of the plant was not compromised as all control board and vertical board instrumentation and controls remained available to monitor plant systems.

3. Apparent Cause of Event

At the time of this reporting, the licensee is still investigating the root cause of the event. A possible cause is a power supply problem or degradation of insulation which caused arcing and fire. From the physical appearance of the fire damage, the problem appears to be initially caused by a component failure resulting in arcing and fire in MI Card 65. The failed component appears to be one of the four "Varistors" labelled VR3 in Card 65. Varistors are used to protect the cards from surge over-voltage.

The licensee identified six cards around the location of the fire which were severely damaged (i.e., Cards 52, 53, 54, 64, 65, and 66). These cards were subsequently replaced. The most severe damage was in Card 65, especially around Varistor VR3 which had completely ~~evaporated~~. This is why the failure of Varistor VR3 is suspected as most probable root cause. The insulation of coils of nearby Relays RS5 and RS6 were found completely burnt. Approximately 10 cards around the location of the fire experienced smoke damage which were subsequently cleaned out and tested satisfactorily. All annunciators were completely returned to normal operation at approximately 0700 hours on February 1, 1988.

4. Licensee Corrective Actions

The licensee's immediate corrective actions included:

1. Dispatching emergency squad to combat fire and de-energizing the annunciator bay.
2. Calling out I&C personnel to repair annunciator circuits.
3. Utilization of control board and vertical board instruments and computer to monitor plant systems.
4. Declaration of ALERT to assemble additional support.

At the time of this reporting, the licensee has not finalized their course of long term corrective actions, pending completion of their event evaluation to identify the root cause.

With respect to the licensee corrective actions, the inspector had several questions. The licensee's response to these questions are discussed below:

1. In response to the inspector's question on the history of failures of Varistors, the licensee stated that this event is an isolated case. Although there are approximately 730 cards in the system, with up to 4 Varistors in each card, this is the first time it failed resulting in a fire. The licensee also verified with General Electric, the manufacturer of the Varistor, (Note: Electro Devices Inc., the manufacturer of the Annunciator System, is now out of business) that no known similar failure history existed. The licensee also stated that to the best of their knowledge, they do not have Varistors in other plant systems although other type or make of voltage surge protectors have been used and that there was no known failures of a similar nature. The licensee will further verify the usage of Varistors in other systems.
2. In response to the inspector's question regarding a surveillance testing program for the cards, the licensee stated that the annunciators are a non-safety related (Non-Class 1E) system and their failure rate is small and as such they have no existing surveillance testing program. They do not plan to have a program unless a high future failure rate dictates such a program.
3. The inspector noted that there are several fuses rated 1.0 or 1.25 amperes in the dc circuits downstream of the 3 inverter breakers which in turn are 20 or 30 amperes. The inspector questioned why these fuses did not blow during the event before their upstream breakers tripped (see Section 3). The licensee clarified that these fuses are slow blow type design, and are in series with the inverter breakers. Blowing of the fuses will have same effect as tripping of the breakers and would not have prevented the event.

The NRC will follow up on: (1) the licensee's investigation of the root cause of the problem (Section 3), (2) the long term corrective actions (Section 4) and (3) a complete resolution of the inspector's question as discussed in Item 1 above. They collectively constitute an Unresolved Item, pending completion of licensee's actions to resolve these issues (50-412/88-03-01).

5. Unresolved Items

Unresolved items are matters for which more information is required in order ascertain whether they are acceptable, violations, or deviations. An unresolved item is discussed in Section 4. of this report.

6. Exit Interview

The inspector met with the licensee representatives, denoted in Attachment 1, at the conclusion of the inspection of February 3, 1988. The inspector summarized the scope and findings of the inspection at that time.

The inspector and the licensee discussed the contents of this inspection report to ascertain that it did not contain any proprietary information. The licensee agreed that the inspection report may be placed in the Public document Room without prior licensee review for proprietary information (10 CFR 2.790) .

At no time during this inspection was written material provided to the licensee by the inspector.

ATTACHMENT 1

Persons Contacted

1. Duquesne Light Company (DLC)

- * P. Bienick, Assistant Superintendent, Engineering
- * J. Crockett, Senior Manager, Nuclear Operations
- * J. Forney, I&C Engineer
- L. Freeland, Nuclear Operations Supervisor, Unit 1
- * E. Haley, I&C Foreman
- * R. Hecht, Director, I&C
- * W. Lacy, Plant Manager
- * L. Lipchick, Senior Licensing Supervisor
- * J. Maracek, Senior Licensing Supervisor
- * A. Mizia, Supervisor, QA Operations
- * J. Nazar, Design Engineer, NED
- * T. Noonan, Assistant Plant Manager
- B. Sepelak, Licensing Engineer
- * J. Sieber, Vice President, Nuclear
- * G. Svaranowic, Fire Protection Engineer
- * D. Szucs, Senior Engineer, Licensing
- * C. Trasada, I&C Engineer
- * R. Wittschen, Licensing Engineer

2. Nuclear Regulatory Commission (NRC)

- * J. Beall, Senior Resident Inspector
- S. Pindale, Resident Inspector

* Denotes those present at the exit meeting.