U. S. Nuclear Regulatory Commission
Region I

Docket/Report: **50-334/92-14 and 50-412/92-13**

License: **NPF-66 and NPF-73**

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

Facility Name: **Beaver Valley Atomic Power Station**

Inspection: **June 9-10, 1992**

Inspection At: **Shippingport, Pennsylvania**

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Scope: Routine, announced emergency preparedness (EP) inspection and observation of the annual, full-participation exercise.

Results: Exercise performance demonstrated the ability to protect public health and safety. No safety inadequacies were identified. Exercise strengths included briefings by the Emergency Recovery Manager in the Emergency Operations Facility and proactive Operations Support Center equipment restoration efforts prior to TSC activation. Exercise weaknesses were identified by the NRC in control of on-site damage control teams and in the miscommunication of field team radiation measurements that contributed to a failure to consider the use of potassium iodide for field teams.

DETAILS

1.0 Persons Contacted

The following individuals attended the exit meeting on June 10, 1992.

R. Brosi, Manager, Emergency Preparedness Planning (EPP)
E. Chatfield, Manager, Nuclear Training
A. Dulick, Manager, Chemistry
R. Hecht, Director, Site I&C
J. Kosmal, Manager, Health Physics
T. Noonan, General Manager, Nuclear Operations
D. Spoerry, General Manager, Nuclear Operations Services
H. Szklinski, Health Physics Specialist
G. Thomas, General Manager, Corporate Nuclear Services
N. Tonet, Manager, Nuclear Safety
S. Vicinie, Senior QA Specialist

The inspectors also interviewed and/or observed the actions of other licensee personnel.

2.0 Emergency Exercise

The Beaver Valley Atomic Power Station conducted a full-participation exercise on June 9, 1992, from 2:30 p.m. to 10:30 p.m. The Commonwealth of Pennsylvania and the States of Ohio and West Virginia participated. Also, on June 10, Ohio demonstrated ingestion pathway objectives and West Virginia demonstrated ingestion pathway and recovery objectives. Pennsylvania demonstrated ingestion pathway objectives on June 10 and demonstrated recovery objectives on June 11. The Federal Emergency Management Agency observed the performance of off-site activities.

2.1 Pre-exercise Activities

Exercise objectives were submitted to NRC Region I on February 21, 1992. The complete scenario package was submitted to the NRC on March 13, 1992. Following NRC review of the submitted scenario, Region I representatives had telephone conversations with the licensee's emergency preparedness staff to discuss the scope and content of the scenario.

Minor revisions were made to the scenario, which allowed adequate testing of the major portions of the Beaver Valley Atomic Power Station Emergency Plan and its Implementing Procedures. The scenario also provided the opportunity for the licensee to demonstrate those areas previously identified by the NRC as in need of corrective action.

NRC observers attended a June 9, 1992 licensee briefing on the revised scenario. The licensee stated that certain emergency response activities would be simulated and that controllers would intercede in exercise activities to prevent disrupting normal plant activities.

2.2 Exercise Scenario

The scenario provided a challenging test of the Emergency Response Organization's (ERO's) ability to analyze and mitigate a severe accident. It included the following simulated events:

- Chlorine gas release from the Midland Water Treatment Plant, which is about a mile from the site. That led to the declaration of an Unusual Event.
- An explosion near Emergency Diesel Generator "B" led to an Alert declaration.
- A water temperature indicator failure in the Fuel Handling Building led to a simulated release of slightly radioactive water via an unmonitored pathway (storm drain).
- An injured and contaminated individual, with subsequent transport of the individual off-site for additional medical care.
- A failure to trip on low steam generator level led to a Site Area Emergency declaration.
- Total loss of normal 4 KV buses C and D. Auxiliary Feedwater Pump "A" tripped.
- Charging Pump "C" tripped. A pressurizer power operated relief valve (PORV) opened and the Pressurizer relief tank rupture disk failed. Simulated station evacuation was begun.
- Loss of cooling led to fuel damage. Auxiliary Feedwater Pump "A" was returned to service. Water was supplied to Steam Generator SG-C. The open PORV closed. Cold water shock caused SG-C tube ruptures and an un-filtered release to the environment via the SG-C Code Safety valve. That led to the declaration of a General Emergency based on loss of two fission product barriers with potential loss of the third.
- Recovery plan development and exercise termination.

The following area for improvement was identified.

- Off-site objectives controlled the scenario appropriately, but better prediction of player actions nonetheless may be warranted to avoid lengthy scenario holds for demonstration of objectives.

2.3 Activities Observed

The NRC observed the activation and augmentation of the Emergency Response Facilities and actions of the Emergency Response Organization staff. The following were observed:

1. Selection and use of control room procedures.
2. Detection, classification, and assessment of scenario events.
3. Direction and coordination of emergency response.
4. Notification of licensee personnel and off-site agencies.
5. Communications/information flow, and record keeping.
6. Assessment and projection of off-site radiological doses, and protective action recommendations.
7. Provisions for in-plant radiation protection.
8. Provisions for communicating information to the public.
9. Accident analysis and mitigation.
10. Accountability of personnel.
11. Post-exercise critique by the licensee.

3.0 Exercise Finding Classifications

Emergency preparedness exercise findings were classified as follows.

Exercise Strength

A strong positive indicator of the licensee's ability to cope with abnormal plant conditions and implement the Emergency Plan.

Exercise Weakness

Less than effective Emergency Plan implementation which does not, alone, constitute overall response inadequacy.

Areas for Improvement

An aspect which did not significantly detract from the licensee's response, but which merits licensee evaluation for corrective action.

4.0 Exercise Observations

The NRC team noted that the licensee's activation of the Emergency Response Organization (ERO) and Emergency Facilities, and the use of these facilities, was generally consistent with the Emergency Plan and Emergency Plan Implementing Procedures.

4.1 Overall Observations

The following expected actions were done well.

- Classifications were timely and correct.

- Emergency facilities were activated promptly.

- Command and control of the Emergency Operations Facility (EOF), Technical Support Center (TSC) and Control Room (CR).

The individual making the report to the control room (CR) about the chlorine release did not characterize the event in a manner which led the shift supervisor to declare an Unusual Event as prescribed by the drill scenario. This was not, however, a licensee response inadequacy.

Information on initial conditions could have been better disseminated. For example, when the operators were told to perform the diesel-generator operational surveillance test (OST), the players assumed that the test was to start at the beginning of the OST. It was intended that the players begin at a specific step of the OST in order to keep the scenario on schedule.

The on-shift doctor and nurse responded to the scene of the injured-contaminated individual. While such a response may well be appropriate, it was prescribed that they report to the CR in order to interface with off-site medical professionals. Additional procedural flexibility may be warranted for these individuals.

The following areas for improvement were identified.

- Controller provision of scenario information to players.

- Re-evaluation of the role of the on-shift doctor and nurse and their responsibilities under the emergency plan.

4.2 Control Room (CR)

Overall, the control room operators performed well and responded appropriately to scenario events. Proper classifications were made and notifications to off-site agencies were timely. Emergency Plan Implementing Procedures (EPIPs) were properly implemented. Communications were established with appropriate on-site and off-site personnel in a timely manner. Operators demonstrated health and safety concern for site and local personnel throughout the drill. The Nuclear Shift Supervisor/CR Emergency Director (ED) log was well detailed.

Several control room communications discrepancies were observed. Specifically, spent fuel pool leakage was reported as 150 gpm and as 5-10 gpm. Also, one report said that the service water system was aligned to feed the steam generators whereas another report said it was not capable of being aligned due to valve damage. Another communication problem originated in the control room when the communicator to the Technical Support Center (TSC) identified the incorrect 4160 V bus ("B" instead of "D") as being de-energized.

Several complications arose from "table-topping" the exercise instead of using the simulator. Safety Parameter Display System (SPDS) handout sheets were used to disseminate plant status information. It took five minutes from the beginning of the ATWS (valid reactor scram signal with failure of control rods to insert) before an operator was dispatched to trip the MG set breakers in order to insert the control rods. In another instance, the operators were not aware that reactor coolant system (RCS) pressure had dropped below 1700 psig when SG-C tubes ruptured. Use of a monochromatic digital printout of the SPDS did not aid the operators in quickly identifying changing plant conditions: for 17 minutes the operators had the false understanding that RCS pressure was at 1700 psig. Overall, the operators had difficulty remembering plant equipment status because they lacked the visual and control manipulation feedback provided in the control room and simulator environments. That resulted in minor delays and some confusion when responding to changing plant conditions.

No exercise strengths or weaknesses were found.

The following area for improvement was identified.

- Communication of event information.

4.3 Technical Support Center (TSC)

The TSC was staffed and activated 27 minutes after the Alert declaration. The TSC Emergency Director (ED) verified that the TSC staff was ready prior to facility activation. The TSC ED provided good support to the Emergency Recovery Manager (ERM) and maintained good focus on plant conditions. The TSC ED provided informative briefs directly to the TSC staff over the Emergency Response Facility (ERF) page system and frequently communicated with the ERM via phone. Throughout the exercise, the TSC staff evaluated plant conditions, anticipated potential problems, and attempted to develop strategies to mitigate the accident. For example, the Radiological Coordinator quickly recognized the potential for a release from the leak in the fuel building and continued to obtain information to evaluate the situation. The TSC ED log was well detailed. Overall, expected TSC actions were well done.

The licensee's procedures direct preparation for station assembly at an Alert. That was accomplished as noted by NRC review of facility logs. At 1757 the TSC ED recognized that a Site Area Emergency (SAE) emergency action level (EAL) had been reached. It was then decided to declare the SAE several minutes later. Also, the TSC ED stated over the ERF paging system that accountability was to begin at 1815. NRC review identified no valid reason for delaying either declaration of a recognized emergency condition or personnel accountability.

NRC review noted that, had the Loop Isolation Valves been closed after the SG-C tube ruptures, the simulated release to the environment would have been reduced. No serious consideration was given towards this effort as the licensee's EOPs and Westinghouse guidance direct against

utilizing them in order to prevent the wrong SG from being isolated. Also, Loop Isolation Valve operation for maintenance/outage evolutions was described by the licensee as not being a problem-free evolution.

In this case, licensee response personnel knew that SG-C had faulted tubes. Also, post-exercise review indicated that the Loop Isolation Valve design specifies the ability to close with a 500 psi differential pressure. Had additional knowledge of the specific capabilities of and constraints on the Loop Isolation Valves been available, it may have been appropriate to consider shutting them on the faulted loop in order to mitigate this accident.

No exercise strengths or exercise weaknesses were identified.

The following areas for improvement were identified.

- Declaration of emergency conditions when recognized.
- Timely initiation of accountability.
- Knowledge of the conditions under which Loop Isolation Valves might be used to mitigate accidents.

4.4 Operations Support Center (OSC) and Radiological Operations Center (ROC)

Frequent briefings were given by OSC coordinators to keep OSC members apprised of plant status. Status boards were maintained. The OSC log was well detailed.

The OSC was aggressive in attempting to restore equipment to service prior to TSC activation. When indications existed that various systems were not operating satisfactorily, OSC coordinators initiated questions to the Control Room (CR) and asked if OSC teams should be dispatched. Repair activities were appropriately prioritized by OSC coordinators. For example, discussions were held as whether a charging pump or the 4.16 KV bus should be returned to service first. Resources were then applied accordingly.

Emergency brigade response to the contamination incident was observed. A health physics technician was quickly dispatched to evaluate the contamination. The turnover briefing given by emergency brigade members to the off-site emergency medical technicians on the injury and the contamination levels was thorough.

The ROC Coordinator ensured that briefings conveyed existing radiological hazards and appropriate precautions, including the proper routing of personnel to lower dose areas. The ROC log was very well detailed. Communication between the OSC and ROC was adequate overall, but the following problems were evident.

- In one instance, the ROC was not informed that a damage control team (DCT) was dispatched to the safeguards area to investigate the steam-driven auxiliary feedwater pump. Although no adverse radiological conditions existed at the time, plant conditions could have degenerated without this team being promptly informed. Additionally, the safeguards area was not provided with a manned health physics control point. These circumstances prevented the ROC from analyzing and mitigating potential threats to this DCT until the OSC informed the ROC of the DCT in the safeguards area about 45 minutes later.

- Coordination and dissemination of DCT prioritization from the OSC to the ROC was weak. For example, four teams arrived at the ROC within several minutes for their brief on radiological conditions. The four teams included a maintenance team sent to shut the SG relief valve, an operations team sent to isolate the faulted SG, an operations team sent to start the Hydrogen recombiner, and a operations team sent to isolate several floor drains. Priorities were not communicated to the ROC as to which team was to be dispatched first. The purpose of the first two teams was not communicated adequately to the ROC Coordinator, who believed that these two tasks were identical. This misunderstanding resulted in a 30-minute delay in the briefing for the maintenance team. The maintenance team had been given higher priority by the OSC, but was briefed after an operations DCT. About 50 minutes elapsed before three teams were dispatched from the ROC. Part of this delay was attributable to the extensive emergency exposure controls which had to be implemented for the two teams entering the main steam valve room.

The following exercise strength was identified.

- OSC action to restore equipment prior to TSC activation.

The following exercise weakness was identified.

- Control of damage repair teams (IFI 50-344/92-14-01).

No areas for improvement were found.

4.5 Emergency Operations Facility (EOF)

Overall, licensee response personnel were well coordinated. Staff augmentation was prompt and facility activation was timely. Event classifications were appropriate and notifications to off-site authorities were timely. Interfaces with Commonwealth and State representatives present in the EOF provided continual status updates. Logs relating to the Emergency Recovery Manager (ERM) position were well detailed. NRC review of press releases found them appropriately detailed and understandable.

ERM command and control was effective. This was demonstrated through excellent ERM briefings to EOF staff and Pennsylvania and Ohio officials. The recovery discussions/plan were well designed and presented.

The Environmental Assessment and Dose Projection group (EADP) performed a liquid release calculation as expected from the scenario developments, and the results were within the range of scenario expectations. These calculations were timely.

The EADP group also performed timely dose projections. Field measurements for whole body dose equivalent rates were in general agreement with scenario data. The plume was properly tracked and plotted. Despite the difficulty in acquiring a sufficient number of iodine samples, the EADP Coordinator controlled the teams well and maintained personal cognizance over ALARA considerations for the field teams. Lack of confirmatory measurements for iodine contributed to the failure to consider use of potassium iodine. It may be appropriate to consider sharing field team data with state responders in order to acquire more data and maximize limited Commonwealth, State, and licensee resources.

Thyroid dose estimation was based on a single air sample from a licensee field team. The scenario data provided for a simulated thyroid site boundary dose equivalent rate of 70 to 100 rem/hr. The EADP group's thyroid dose estimation (about 3.5 rem/hr at the site boundary) was erroneous due to a controller error and a miscommunication of the location at which the sample was taken (The sample was taken at 3.8 miles while the EADP understood it to be at 2 miles; it was understood, appropriately, by the players that the maximum dose receptor location was slightly closer than two miles). This led the EADP to believe that the non-conservative dose projections were, in fact, correct. However, the EADP group also realized that core damage had occurred, and that the simulated release was un-filtered. This should have led the EADP group to consider the use of potassium iodide per EPIP 3.4, "Respiratory Protection," Section 2.0. Notwithstanding, the EADP group directed field teams to enter into the plume and take air samples without considering the use of potassium iodide.

The following exercise strength was identified.

- EOF briefs and recovery plan.

The following exercise weakness was identified.

- Communication of field team data and consideration of potassium iodide for licensee field teams (IFI 50-344/92-14-02).

The following areas for improvement was identified.

- Post-exercise licensee evaluation of increased Licensee, Commonwealth, and State cooperation concerning field team measurements

4.7 Fire Protection Activities

The scenario included an on-site fire which required response from the emergency brigade and simulated off-site fire department support. The emergency brigade chief demonstrated good command and control. All communications to the control room were directed through the chief so as to minimize multiple and repetitive communications. One emergency brigade member appeared to be unfamiliar with fire-fighting equipment as the wrong end of the hose was laid out to the fire. This was corrected quickly and did not affect the overall effort to combat the fire.

No exercise strengths, weaknesses, or areas for improvement were found.

5.0 Licensee Action on Previously Identified Items

The following areas for improvement identified during the previous annual emergency exercise (Inspection Report Nos. 50-334/91-03 and 50-412/91-04) were acceptably demonstrated and not repeated:

Control Room
- Liquid release pathway analysis.
- Contamination Control.

Technical Support Center
- Event Notification Worksheet approval.
- Exercise control/observation.

Operations Support Center/Radiological Operations Center
- ALARA considerations.
- Plant page audibility.

In addition, the inspectors reviewed the following NRC-identified concerns (Reports 50-334/92-11 and 50-412/92-12) from the May 4-8, 1992 inspection.

OPEN (URI 50-334/92-11-01 and 50-412/92-12-01) Emergency Response Facility ventilation system testing adequacy.

The inspectors noted good progress towards the resolution of this issue. The licensee had made plans to install a differential pressure monitoring device. Also, the licensee was developing two new procedures to facilitate mechanical leak testing of the HEPA filters and carbon adsorber of the recirculation filter of the ERF ventilation system. The licensee planned to conduct these surveillances on an annual basis, which exceeds the guidance in Regulatory Guide 1.52,

"Design, Testing, And Maintenance Criteria For Post Accident Engineered-Safety-Feature Atmosphere Cleanup System Air Filtration And Adsorption Units Of Light-Water-Cooled Nuclear Power Plants." This item will remain open until the adequacy of the new procedures and the ability to monitor positive pressure is shown.

CLOSED (URI 50-334/92-11-02 and 50-412/92-12-02) Adequacy of ERO qualification and of ERO call list accuracy.

During the May 4-8, 1992 inspection the licensee removed those individuals who appeared to have not completed EP training, and initiated a complete review of the ERO call list. That review identified five additional individuals with apparently expired training. Licensee causal analysis indicated that inconsistent use of the existing tracking system was the root cause of the problem. As a result the licensee removed the eight individuals with expired training and improved the EP training attendance review process (implemented June 3). Additionally, the licensee planned to conduct a complete review of the ERO call list on a bimonthly basis (July implementation). The annual training program requirements were reissued to ERO members. The licensee was evaluating whether to develop a computer-based tracking system.

The inspectors reviewed the training records for twenty-five individuals. No discrepancies were found. This item is closed based on adequate licensee actions and measures to prevent recurrence, and ongoing NRC examination of this area incident to routine EP inspections.

6.0 Licensee Critique and Exit Meeting

The NRC team attended the licensee's exercise critique on June 10, 1992. Licensee lead controllers discussed their observations. The licensee's critique was constructive and provided a thorough self-examination. In general, items in need of corrective action were identified.

Following the licensee critique, the inspectors met with the licensee personnel denoted in Detail 1 to discuss the inspection scope and findings. The exercise weaknesses were identified. The inspectors also discussed areas for improvement. The licensee acknowledged the findings.