

U.S. NUCLEAR REGULATORY COMMISSION  
REGION I

Report No. 50-334/85-24

Docket No. 50-334

Licensee: Duquesne Light Company  
One Oxford Center  
301 Grant Street  
Pittsburgh, PA 15279

Facility Name: Beaver Valley Power Station, Unit 1

Location: Shippingport, Pennsylvania

Dates: November 1-30, 1985

Inspector:

*for* L. E. Tripp  
W. M. Troskoski, Senior Resident Inspector

12/17/85  
Date

*for* L. E. Tripp  
A. A. Asars, Resident Inspector

12/17/85  
Date

Approved by:

L. E. Tripp  
L. E. Tripp, Chief, Reactor Projects Section 3A

12/17/85  
Date

Inspection Summary: Inspection No. 50-334/85-24 on November 1-30, 1985

Areas Inspected: Routine inspections by the resident inspectors (117 hours) of licensee actions on previous inspection findings, plant operations, housekeeping, fire protection, radiological controls, physical security, engineered safety features verification, surveillance activities, cleanup of Unit 2 contaminated areas, IE Bulletin followup, and review of licensee event reports.

Results: No violations were identified. Potentially significant items identified were main feedwater valve reliability problems that resulted in the introduction of loose parts to the main feedwater lines of the A and C steam generators (discussed in Details 3.b.3 and 4), and the one-time failure of the C charging pump discharge check valve to close when required (Detail 5).

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## DETAILS

### 1. Persons Contacted

J. J. Carey, Vice President, Nuclear Group  
R. J. Druga, Manager, Technical Services  
T. D. Jones, General Manager, Nuclear Operations  
W. S. Lacey, Plant Manager  
J. D. Sieber, General Manager, Nuclear Services  
N. R. Tonet, General Manager, Nuclear Engr. & Constr. Unit

The inspector also contacted other licensee employees and contractors during this inspection.

### 2. Followup on Outstanding Items

The NRC Outstanding Items (OI) List was reviewed with cognizant licensee personnel. Items selected by the inspector were subsequently reviewed through discussions with licensee personnel, documentation reviews and field inspection to determine whether licensee actions specified in the OIs had been satisfactorily completed. The overall status of previously identified inspection findings were reviewed, and planned and completed licensee actions were discussed for those items reported below:

(Closed) IFI (85-22-03): Cleanup activities of contaminated areas of Unit 2 which resulted from the October 31, 1985, spill of radioactive liquid is discussed in detail 6 of this report.

(Closed) IFI (85-17-03): Special report due per TS 6.9.2, regarding inoperable rad monitor RM-MS-100B. The licensee issued Revision 1 to this special report on November 12, 1985. The cause of the inoperable main steam monitor was determined to be a loose triaxial connector which was replaced. Other similar rad monitors were also checked and no further problems were noted. This item is closed.

(Closed) Unresolved Item (85-22-02): Determine the amount of activity released during the Unit 1 - Unit 2 spill of October 31, 1985. The licensee obtained a sample of the liquid discharged from the boron hold tank at the uncapped line outside the Unit 2 condensate polishing building during the event. Analysis identified Cesium 134, 137, Cobalt 58 and 60 as the primary radionuclides present. An estimated 300 gallons, initially diluted with about 700 gallons of residual sump water, was pumped to the storm sewer and eventually to the river. This resulted in a potential body dose of 0.47 mRem at the site boundary, which represents about 33% of the quarterly limit defined in Technical Specification 3.11.1.2. The concentration as compared with the maximum permissible concentration (MPC, defined in 10 CFR 20.106) of the 1000 gallons, undiluted by storm sewer flow, was calculated to be about 45, excluding tritium. Total activity excluding tritium was 2.24 E-3 Ci, and when averaged over one hour (10 CFR 20.106a) including dilution represents about 0.77 MPC. A special report was issued per TS 3.11.1.1 on November 29, 1985, detailing the release. It noted that the total concentration including tritium for the five minute discharge (with dilution) to the Ohio River exceeded the

maximum permissible concentration by a factor of 37.7. This is a violation of TS 3.11.1.1 that will not be cited because it is the result of the unauthorized operation of a Unit 1/2 system boundary isolation valve that resulted in violation (85-22-01). The inspectors had no further concerns and this item is closed.

### 3. Plant Operations

#### a. General

Inspection tours of the plant areas listed below were conducted during both day and night shifts with respect to Technical Specification (TS) compliance, housekeeping and cleanliness, fire protection, radiation control, physical security and plant protection, operational and maintenance administrative controls.

- Control Room
- Primary Auxiliary Building
- Turbine Building
- Service Building
- Main Intake Structure
- Main Steam Valve Room
- Purge Duct Room
- East/West Cable Vaults
- Emergency Diesel Generator Rooms
- Containment Building
- Penetration Areas
- Safeguards Areas
- Various Switchgear Rooms/Cable Spreading Room
- Protected Areas

Acceptance criteria for the above areas included the following:

- BVPS FSAR
- Technical Specifications (TS)
- BVPS Operating Manual (OM), Chapter 48, Conduct of Operations
- OM 1.48.5, Section D, Jumpers and Lifted Leads
- OM 1.48.6, Clearance Procedures
- OM 1.48.8, Records
- OM 1.48.9, Rules of Practice
- OM Chapter 55A, Periodic Checks, Operating Surveillance Tests
- BVPS Maintenance Manual (MM), Chapter 1, Conduct of Maintenance
- BVPS Radcon Manual (RCM)
- 10CFR50.54(k), Control Room Manning Requirements
- BVPS Site/Station Administrative Procedures (SAP)
- BVPS Physical Security Plan (PSP)
- Inspector Judgement

b. Operations

The inspector toured the Control Room regularly to verify compliance with NRC requirements and facility technical specifications (TS). Direct observations of instrumentation, recorder traces and control panels were made for items important to safety. Included in the reviews are the rod position indicators, nuclear instrumentation systems, radiation monitors, containment pressure and temperature parameters, onsite/offsite emergency power sources, availability of reactor protection systems and proper alignment of engineered safety feature systems. Where an abnormal condition existed (such as out-of-service equipment), adherence to appropriate TS action statements were independently verified. Also, various operation logs and records, including completed surveillance tests, equipment clearance permits in progress, status board maintenance and temporary operating procedures were reviewed on a sampling basis for compliance with technical specifications and those administrative controls listed in Paragraph 3a.

During the course of the inspection, discussions were conducted with operators concerning reasons for selected annunciators and knowledge of recent changes to procedures, facility configuration and plant conditions. The inspector verified adherence to approved procedures for ongoing activities observed. Shift turnovers were witnessed and staffing requirements confirmed. Except where noted below, inspector comments or questions resulting from these daily reviews were acceptably resolved by licensee personnel.

- (1) The outer containment airlock door failed its six month leak rate test on October 31, 1985. The licensee initiated a hold on containment entries per TS 3.6.1.3. After replacing the O-rings and adjusting the breech, BVT 1.3-1.47.8, Personnel Airlock Type B Leak Rate Test, was successfully completed on November 1, 1985. The inspector reviewed the test data calculations which indicated that the leak rate was 196.4 scfd. This is within the acceptance criteria of 324.5 scfd.
- (2) A load reduction to about 30% power was initiated on November 1, 1985, to allow maintenance on the A and C main feed-reg valves. During the load reduction, a containment entry was made after the Type B test to repair steam generator low point drain valve FW-602. This valve had been responsible for an increase in the containment sump pumpout rate. After repair, the pumpout rate dropped from 14 gph to a nominal value of 6 gph.

The reactor was placed in Mode 3 (hot standby) at 11:45 p.m. on November 2, 1985, after excessive leakage of hot feedwater through the clearance points prevented mechanics from disassembling the feed-reg valves while on bypass flow. With the area temperature limited to a workable range for the mechanics, the reactor was returned to Mode 2 (less than 5% thermal power) at 6:25 a.m. on November 3, 1985.



Inspection of the A and C feed-reg valves revealed that the valve plugs anti-rotation devices were missing. The anti-rotation device remained intact for the B valve. These loose parts consist of a 2" x 1/2" bolt and two nuts, which are assumed to be in either (1) the feedwater line elbow located at the vertical rise just inside containment, (2) the feedwater ring, or (3) inside the steam generators. The cause of the failure was attributed to fatigue of the individual tabs of the one-sixteenth inch thick lock washers. The licensee redesigned the lock washers using one-eighth inch thick stainless steel material and replaced all three anti-rotation devices.

A review of the loose parts safety analysis prepared by Westinghouse, the NSSS vendor, indicated that the missing material did not present an immediate problem. The analysis did recommend retrieval of the loose parts at the earliest opportunity, not to exceed startup from the next refueling outage scheduled for May, 1986. Review of licensee actions to retrieve those parts and identification of any damage to the pipe elbow, feedwater ring, or steam generator tubes is Unresolved Item (85-24-01).

- (3) Control room operators rapidly reduced reactor power to about 25% on November 9, 1985, due to B steam generator feedwater control problems. Investigation revealed that the feed-reg valve stem threads that attach to the valve plug had worn smooth enough to disengage. The valve stem was replaced. Maintenance engineers informed the inspectors that one of the other two feed-reg valve stems had been replaced with a new assembly on November 3, 1985. An inspection of the other stem identified no problems. When the B valve was disassembled the first time to check its anti-rotation device, no inspection of its stem was conducted. The licensee has been in contact with Copes-Vulcan, the valve vendor, to determine what actions can be taken to improve the reliability of these 8 inch feedwater valves. Further review is Inspector Follow Item (85-24-02).

c. Plant Security/Physical Protection

Implementation of the Physical Security Plan was observed in the areas listed in paragraph 3a above with regard to the following:

- Protected area barriers were not degraded;
- Isolation zones were clear;
- Persons and packages were checked prior to allowing entry into the Protected Area;
- Vehicles were properly searched and vehicle access to the Protected Area was in accordance with approved procedures;

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- Security access controls to Vital Areas were being maintained and that persons in Vital Areas were properly authorized;
- Security posts were adequately staffed and equipped, security personnel were alert and knowledgeable regarding position requirements, and that written procedures were available; and
- Adequate lighting was maintained.

No discrepancies were observed.

A Regulatory Effectiveness Review of the plant physical security was performed in April, 1985. The results, which identified several safeguards inadequacies, program concerns and general observations were forwarded to DLC by letter dated August 29, 1985. The licensee responded to these items in a letter dated November 13, 1985, and committed to complete corrective actions by July, 1986. Verification that those commitments are implemented, is Inspector Follow item (85-24-03).

d. Radiation Controls

Radiation controls, including posting of radiation areas, the conditions of step-off pads, disposal of protective clothing, completion of Radiation Work Permits, compliance with the conditions of the Radiation Work Permits, personnel monitoring devices being worn, cleanliness of work areas, radiation control job coverage, area monitor operability (portable and permanent), area monitor calibration and personnel frisking procedures were observed on a sampling basis.

The licensee informed the inspector that an error had been discovered in the method used to calculate the gaseous waste dose contained in the semi-annual report. The corrected values are less than 1% of the technical specification limits. The licensee's representative stated that a calculation package would be prepared to formally document the errors and corrections. Review of this package and verification that the previously reported values are updated in the next semi-annual report, is Inspector Follow Item (85-24-04).

e. Plant Housekeeping and Fire Protection

Plant housekeeping conditions including general cleanliness conditions and control of material to prevent fire hazards were observed in areas listed in Paragraph 3a. Maintenance of fire barriers, and fire barrier penetrations and verification of posted fire watches in these areas were also observed.

4. Engineered Safety Features (ESF) Verification

The operability of the Low Head Safety Injection System was verified on November 14, 1985, by performing a walkdown of accessible portions that included the following as appropriate:



- (1) System lineup procedures matched plant drawings and the as-built configuration.
- (2) Equipment conditions were observed for items which might degrade performance. Hangers and supports were operable.
- (3) The interior of breakers, electrical and instrumentation cabinets were inspected for debris, loose material, jumpers, etc.
- (4) Instrumentation was properly valved in and functioning; and had current calibration dates.
- (5) Valves were verified to be in the proper position with power available. Valve locking mechanisms were checked, where required.

No deficiencies were identified.

#### 5. Surveillance Activities

To ascertain that surveillance of safety-related systems or components is being conducted in accordance with license requirements, the inspector observed portions of selected tests to verify that:

- a. The surveillance test procedure conforms to technical specification requirements.
- b. Required administrative approvals and tagouts are obtained before initiating the test.
- c. Testing is being accomplished by qualified personnel in accordance with an approved test procedure.
- d. Required test instrumentation is calibrated.
- e. LCOs are met.
- f. The test data are accurate and complete. Selected test result data was independently reviewed to verify accuracy.
- g. Independently verify the system was properly returned to service.
- h. Test results meet technical specification requirements and test discrepancies are rectified.
- i. The surveillance test was completed at the required frequency.

The following in-progress tests were witnessed by the inspector:

- OST 1.36.1, Diesel Generator No. 1 Monthly Test, November 6, 1985.
- OST 1.11.2, Safety Injection Pump Test (SI-P-1B), November 6, 1985.

- OST 1.7.6, Charging Pump 1C Test, November 14, 1985.
- OST 1.11.1, Safety Injection Pump Test (SI-P-1A), November 20, 1985.
- MSP 6.22 & 6.40, Monthly Test and 18 Month Calibration of Channel III Overtemperature and Delta Temperature, November 20 - 21, 1985.

After an extended outage for modification and alignment, the C charging pump was returned to service on November 14, 1985, and left in continual service until the next charging pumps monthly surveillance test came due on November 19, 1985. When CH-P-1C was shutdown after startup of the second pump, RCP seal injection was lost. Control room personnel immediately restarted CH-P-1C to restore seal injection. The operator at the pump indicated that no reverse rotation was observed during the several seconds it was off; the pump was still coasting down. It was determined that the discharge check valve, CH-24, failed to properly seat. The pump was secured a second time without further loss of seal injection flow, indicating proper seating.

The discharge valve is a 3 inch Velan swing check valve that had been modified after a failure resulted in an overpressurization of the charging pump suction line in 1981 (See NRC Inspection Report 50-334/81-08, Detail 7, and Immediate Action Letter 81-16, dated March 27, 1981, for additional information). It represents a boundary between the high pressure piping (2500 psig) and the low pressure suction line (275 psig). The operations supervisor informed the inspector that the valve would be disassembled and inspected during the fifth refueling outage provided no further problems occurred. Review of the results of this inspection is Unresolved Item (85-24-05).

#### 6. Cleanup of Unit 2 Contaminated Areas

On November 1, 1985, the licensee began removing the radioactive water from the Condensate Polishing Building (CPB) sump which had collected there as a result of the release from the Unit 1 Boric Acid Hold Tank (BR-TK-7) on October 31, 1985 (see Inspection Report 85-22, Detail 3.b.5). The waste was pumped, per TOP 85-03: Transfer of Unit 2 Spill to Unit 1, and RCM Chapter 1, Procedure F, Use of Temporary Hoses/Piping, to the Unit 1 Fuel Building (FB) sump via a temporary hose. From there, it was transferred to low level waste drain tanks (LW-TK-3A, 3B), as liquid waste.

The transfer of water continued until the morning of November 2, 1985, at which time LW-TK-3A and 3B became full. All sump pumps were secured and the contents of LW-TK-3A and 3B were pumped to steam generator drain tank 7B (LW-TK-7B). Later that afternoon a high level alarm was received for the tunnel sump and the sump pump was started to transfer the water to LW-TK-3A and 3B. Check valve DA-207 on the fuel building sump pump 2A failed, creating a flow-path from the tunnel sump to the FB sump due to the temporary alignment described above. The FB sump filled and overflowed about 130 gallons of water onto the floor. It went unnoticed by the operators due to a failure of the sump high level alarm, until discovery at approximately 4:00 p.m. Operators investigated and subsequently started DA-P-2A and 2B at 4:10 p.m. and pumped

the excess water into LW-TK-3A and 3B. The FB sump high level alarm was satisfactorily tested and declared operable but as an added precaution, an operator was posted at the FB sump to monitor level during all pumping activities involving the sump.

In both instances, Unit 2 CPB and Unit 1 FB spills, there were no internal uptakes of radioactivity. Only two Unit 2 personnel received minor contamination on shoes and pant cuffs during the Unit 2 CPB spill. During the Unit 2 CPB release, Radcon sampled the water coming from the 1.5 inch uncapped line. The gross activity of the water was  $2\text{E-}3$  micro Ci/ml. Area air samples showed a gross activity of  $1\text{E-}11$  micro Ci/ml, indicating that there was no airborne radioactivity. Radiation levels in the CPB (elevation 722') hallway ranged from 2 mr/hr to 0.1 mr/hr in the area between the Unit 2 end of the pipe trench and the furthest point affected by the water. Approximately 60 pounds of dirt was washed from the pipe trench into the hallway by the spill. Surveys indicated that it was reading about 12 mr/hr on contact. The contaminated dirt was transferred to solid waste for processing. Surface dirt outside the CPB around the pipe trench was sampled and showed a gross activity of  $5\text{E-}3$  micro Ci/ml.

Unit 2 CPB decontamination efforts included removal of radioactive water, CPB sump pumps, and assessment and cleaning of affected areas. Radcon personnel determined the affected areas to consist of portions of CPB (elevation 722') floor, all drains on and lower than elevation 722' which empty into the CPB sump, the CPB sump, the pipe trench between units and the dirt and debris it contains, and the affected surface dirt outside the CPB. Radcon personnel used high pressure water, detergents, acids and finally, a concrete chisel to remove contamination from the affected surfaces. Criteria used to determine if an area was fully decontaminated were (1) less than 450 pci/100 cm(2) swipe or (2) less than 100 cpm above background.

Radcon personnel determined the general area radiation levels of the FB (elevation 735') to be about 0.2 mr/hr; with the "hot spot" being a floor drain at 0.5 mr/hr (this drain goes to the tunnel sump). The FB has railroad tracks which lead outside. These tracks and a puddle between them also filled with water from the FB sump but the water remained within approximately 10 feet of the FB. A grab sample indicated a gross activity of  $8.8\text{E-}5$  micro Ci/ml. Decontamination of the FB was completed satisfactorily using squeegees and rags. Cleanliness criteria were the same as those for Unit 2 CPB. The inspectors closely followed the cleanup process, and had no additional concerns.

## 7. IE Bulletins

### a. IE Bulletin 85-01: Steam Binding of Auxiliary Feed Pumps

This bulletin addresses the possible inoperability of the Auxiliary Feedwater (AFW) pumps as a result of steam binding. Information Notice 84-06 also dealt with this problem (see Inspection Report 85-12, Detail 6.b). Steam binding of the AFW pumps is caused by leakage from the main feedwater system past several check valves to the pump discharge and

possibly the pump suction. This is of particular concern if the AFW pumps either discharge into common piping to feed the steam generators or if the pumps take suction from a common header. At BVPS, Unit 1, this is not the case; each AFW pump has independent piping on its discharge and suction. Additionally, licensee personnel routinely check and log the temperatures of the AFW piping.

The inspectors had no further concerns.

b. IE Bulletin 85-02; Undervoltage Trip Attachments of Westinghouse DB-50 Type Reactor Trip Breakers.

This bulletin was issued to inform licensees of recent DB-50 reactor trip breaker (RTB) reliability problems. It also required those plants currently operating with DB-50 RTBs that have not yet installed automatic shunt trip devices to perform an undervoltage trip attachment (UVTA) force margin test. Beaver Valley, Unit 1, is currently scheduled to make those modifications during the next refueling outage, in May, 1986, and is one of three plants falling into this category.

Required actions and station responses were as follows:

- (1) Test the UVTA of each RTB in service to determine that adequate force margin exists by attaching a 20 oz. weight to the trip bar. This test is required to be performed with the breaker in the as-found condition prior to any lubrication or other maintenance and must be successfully performed three times in succession.

The inspectors observed testing of the reactor trip bypass breakers on November 8, 1985, and RTBs on November 12, 1985. The licensee used a 19 oz. weight, traceable to the NBS. Discussions with the bulletin's technical contact indicated that this was acceptable. Each of the four DB-50 breakers was successfully tested three times without incident per one-time modified preventive maintenance procedures.

- (2) The monthly surveillance test procedure for the reactor protection system is required to be modified to add the UVTA force margin test prior to any lubrication or adjustment of the UVTA. If a RTB fails the force margin test, the redundant breaker is to be similarly tested within eight hours. This procedure modification is to remain in effect until the automatic shunt trip modification is implemented.

The licensee revised the maintenance surveillance procedures (MSP) used to test the reactor protection system logic, trip breakers and bypass breakers, to incorporate the above requirements. On November 26, 1985, the inspector observed the bi-monthly check of RTB B and bypass breaker A per those MSPs. No problems were observed.



- (3) The plant operating staff is to be provided written instruction containing the content of this bulletin, to be reviewed by each licensed operator at the start of their next duty shift. Additionally, an RTB is to be declared inoperable if the UVTA either does not successfully pass the test or otherwise, may not be capable of performing its intended safety function.

Through discussions with shift personnel, the inspector determined that the current operating staff was informed of the bulletin's information and requirements. Most non-control room licensed personnel had also been informed as evidenced by completed training rosters. Standing orders were issued to ensure remaining operators completed the reading prior to assuming shift duties. Licensee action is satisfactory.

- (4) The NRC is to be notified via the emergency notification system within four hours of any RTB being declared inoperable.

Since this is a new reporting condition, the Shift Reporting Matrix was appropriately updated. No other actions were required.

#### 8. Inoffice Review of Licensee Event Reports (LERs)

The inspector reviewed LERs submitted to the NRC:RI office to verify that the details of the event were clearly reported, including the accuracy of the description of cause and adequacy of corrective action. The inspector determined whether further information was required from the licensee, whether generic implications were indicated, and whether the event warranted onsite followup. The following LERs were reviewed:

- LER: 85-18 Vital Bus III Inverter Input Fuse Failure Causing Reactor Trip.
- LER: 85-19 Reactor Trip Due to Loop Flow Instrumentation Spike.

The actual event leading to LER: 85-18 was discussed in detail 3.b.1 of NRC Inspection Report 334/85-22. Since those initial discussions with the I&C supervisor concerning the root cause, the licensee has reported that it is now believed to be attributable to high ambient temperature in the switchgear rooms which caused the control rectifier to misfire. Due to previous temperature related problems in this area, a station modification is being considered to improve ventilation in this area (Inspector Follow Item 85-24-07).

LER: 85-19 reported a reactor trip due to a loop flow instrument spike. The spike was caused by a low flow signal due to a procedure deficiency for repair and calibration of loop flow transmitters. This resulted in a reactor trip from 100% power on October 25, 1985 (see detail 3.b.3 of Inspection Report 334/85-22). The licensee has initiated RCS loop flow surveillance procedural changes to correct the valve identification discrepancy before March 1986. Incorporation of these procedure changes will be tracked as Inspector Follow Item (85-24-06).



9. Exit Interview

Meetings were held with senior facility management periodically during the course of this inspection to discuss the inspection scope and findings. A summary of inspection findings was further discussed with the licensee at the conclusion of the report period.