

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-412/87-67

Docket No. 50-412

License No. NPF-73

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

Facility Name: Beaver Valley Unit No. 2

Inspection At: Shippingport, Pennsylvania

Inspection Conducted: November 19-25, 1987

Inspectors:

Peter C. Wen, Reactor Engineer, DRS

12/28/87
date

Approved by:

K. G. Murphy, Acting Chief,
Special Test Programs Section, EB, DRS

12/28/87
date

Inspection Summary: Inspection on November 19-25, 1987
(Inspection Report No. 50-412/87-67)

Areas Inspected: Startup Test Program, Power Ascension Tests and test results.

Results: No violations were identified.

NOTE: For acronyms not defined, refer to NUREG-0544, "Handbook of Acronyms and Initialisms."

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DETAILS

1.0 Persons Contacted

Duquesne Light Company

- R. Bernier, Senior Test Engineer
- *J. Godleski, TCT Engineer
- J. Houghton, Consulting Engineer
- *D. Hunkele, Director, Quality Assurance Operations
- *J. D. Johns, Supervisor, Quality Assurance Surveillance
- T. F. McGourty, Principle Engineer
- *T. P. Noonan, Assistant Plant Manager
- R. Oliveri, Test Engineer
- G. L. Shildt, Senior Test Engineer
- *D. G. Szucs, Lead Compliance Engineer
- *G. R. Wargo, Assistant Director Quality Control
- *R. G. Williams, Principle Engineer
- *T. G. Zyra, Director, Site Test and Plant Performance

Stone and Webster Engineering Corporation

- *R. Wittschen, Licensing Engineer

U.S. Nuclear Regulatory Commission

- *J. Ball, Senior Resident Inspector

The inspector also contacted other administrative and technical licensee in personnel during the course of the inspection.

*Denotes those present at the exit meeting held on November 25, 1987.

2.0 Power Ascension Testing

2.1 Startup Test Program

The licensee completed the 100-hour warranty run and declared Unit 2 in commercial operation on November 17, 1987. The majority of the startup tests have been completed. However, some tests, primarily of secondary, non-safety related systems, were deferred due to test schedule restraints. These test deferrals were reviewed and approved by the Joint Test Group (JTG) and Onsite Safety Committee (OSC). The inspector reviewed the associated 10 CFR 50.59 safety evaluations and concurred with the licensee's conclusion that these test deferrals have no unreviewed safety questions involved. The licensee uses test log entries and a station planning schedule to track these deferred tests until their completion.

The inspector informed a licensee representative that the following deferred items had impact on the plant operations:

- Since the Steam Generator Moisture Carryover Test (SOV-2.21A.01) had not been completed, the value of moisture carryover (0.25%) used in the Thermal Power Calorimetric procedure (IST-2.02.06) was not a conservative approach. The associated uncertainty in the full power determination is about 0.2% of full power. At the end of this inspection period, the inspector reviewed a revised IST-2.02.06 procedure, and noted that the licensee has corrected this item.
- The overall reactor coolant resistance temperature detector (RTD) response time was not obtained in the 100% plant trip test. The licensee tracked this test deficiency via retest log 4-002 by directing I&C to connect a memory type strip chart recorder to the RTD outputs. The inspector toured the Primary Process Rack Room and noted that these instrumentations were in place. The required data can be obtained when the next reactor trip occurs from 100% power. Until this data is available, the licensee continues to operate the plant with overtemperature delta T and overpower delta T setpoints reduced 3% below the TS allowed values.

The startup testing program is essentially completed. Tests were accomplished in accordance with approved procedures. Test identified problems were properly disseminated to the appropriate groups for action. Test deficiencies were followed up for resolution and were found acceptable. Overall, the licensee performance in the test area is considered effective and acceptable.

2.3 Test Results Review

Those test results listed in Attachment A were reviewed by the inspector to verify that:

- test changes were approved and implemented in accordance with administrative procedures;
- changes did not impact the basic objectives of the test;
- test deficiencies and exceptions were properly identified and resolved;
- the cognizant engineering group had evaluated the test results and signified that the test demonstrated design conditions were met; and,
- test results compared satisfactorily with established acceptance criteria or were properly resolved.

All test results reviewed satisfied the above attributes.

No unacceptable conditions were identified.

2.3 Followup of Anomalies Identified During Previous Tests

Anomalies identified during startup tests were documented in the previous startup test inspections. The inspector verified that these anomalies were resolved or followed up by the cognizant licensee group, as discussed below:

Pressurizer (PZR) Bypass Spray Valves Flow

The licensee's inability to maintain the PZR spray line temperature above the low temperature alarm setpoint of 530°F through normal bypass spray valve flow was identified in a previous test. Adequate spray line temperature is needed to maintain the piping and spray nozzle within specified design limits. Since identifying the problem, the licensee has operated the system by utilizing the PZR back-up heaters to maintain a spray valve (PCV 445A or PCV 455 B) in a throttled position which ensures that the spray line temperature is kept above 530°F.

In the previous inspection, the inspector expressed his concern of using this operating strategy in the long term (until the first refueling outage) without performing an adequate evaluation. During this inspection period, the inspector discussed this issue with licensee representatives from the Engineering Department and the Licensing Group. The inspector was informed that the licensee had assessed this concern and concluded that there was no safety questions involved. The inspector had no further questions.

Operating Procedure on the Resetting of Reactor Coolant Pump (RCP) Underfrequency Relay

All 3 RCPs tripped during the Net Load Rejection Test (IST-2.04.06), which was performed on October 24, 1987. Due to unclear operating procedure guidance for the resetting of the underfrequency relay, the RCPs were unable to be restarted until 1 hour and 18 minutes later. The licensee later initiated an Operating Manual Change Notice (2-87-709). The inspector reviewed the change and determined that a clear instruction for resetting the RCP bus underfrequency relays had been added in OM 2.6.4 Section AAA.

The most recent event involving the loss of all 3 RCPs occurred on November 17, 1987. Subsequent to this event, the RCPs were restarted within 5 minutes utilizing the revised Operating Manual instructions.

The inspector had no further questions.

Reactor Coolant System Water Inventory Balance

The inspector performed an independent RCS leak rate calculation during the previous inspection (50-412/87-57) and determined that the licensee's leak rate calculation results were consistently more conservative than the inspector's. Some portions of the instruction for the identified leak rate calculation, however, were not clear. During this inspection period, the inspector reviewed the licensee's revised surveillance procedure (OST 2.6.2), and noted that clearer guidance for the identified leak rate determination had been added. The revised guidelines included instructions specifying that no credit be taken for a decrease in drain tank level during the test.

The plant has recently experienced excessive RCS valve leakage on October 20 and 31, 1987. In both cases, the licensee's RCS Water Inventory Balance surveillance procedure was able to identify the excessive RCS leakage.

The inspector had no further questions.

Resolution of Turbine Driven Auxiliary Feedwater Pump (TDAFP) Test Deficiencies

The inspector reviewed the Test Results Report for Test No. PO-2.24B.02, "Turbine Driven Auxiliary Feedwater Pump Test", with specific emphasis devoted to the licensee's resolution of previously identified test deficiency reports (TDR). The inspector discussed the resolution of TDR No. 33 which identified high humidity values in the South Safeguards area during operation of the TDAFP. This deficiency was caused by opening the turbine casing and steam inlet line drain valves more than the required 1/4 - 1/2 turn. The licensee satisfactorily corrected the operating manual procedures to correctly position these valves. The inspector questioned the operations personnel as to whether the procedure changes were verified as satisfactorily resolving TDR No. 33 during the recent performance of the TDAFP operational surveillance test (OST). The inspector was advised by the surveillance test coordinator that the excessive humidity problem did not resurface in the recent monthly surveillance test performed on November 10, 1987. The inspector considered this acceptable and had no further questions.

Test Deficiencies of the Net Load Rejection Test

As documented in the previous NRC startup test inspection report, 50-412/87-63, three major test deficiencies were identified during the performance of this test: (1) reactor tripped on 10-10 S/G level, (2) all 3 RCPs tripped on underfrequency immediately following the reactor trip/turbine trip, and (3) a partial loss of offsite power occurred during the fast bus transfer. These test deficiencies are discussed below:

- (1) The licensee and Westinghouse had determined that the inadequate Tref input signal during the test had prevented the steam dump valves from fully opening. Only two out of the four banks of steam dump valve had fully opened. The insufficient steam relief through the steam dump system caused the excessive S/G level shrink, and resulted in the reactor trip.

Although the test failed to demonstrate the plant's 100% load rejection capacity, there was no safety concern. The safety valves did not lift, and ESFAS was not challenged. It was also determined that the steam dump system responded correctly to the Tref input signal sensed during the test.

- (2) The cause of the bus underfrequency was attributed to the inherent turbine EHC response under this unique test configuration (both generator output breakers were open for the test). Immediately following the generator output breaker open, the unit's EHC successfully limited the overspeed condition. However, it could not regulate the turbine speed as the turbine started slowing down, thus generating an underfrequency condition.

The inspector discussed the potential of losing all 3 RCPs during operations with the plant management. The inspector was informed by the assistant plant manager that the probability of having both generator output breakers open is very remote and no corrective actions are considered necessary.

- (3) The net load rejection test also revealed a fast bus transfer problem. Thirty (30) second after the turbine trip, the generator trip signal opened the main generator exciter breaker and initiated a fast bus transfer to the offsite power sources. Only Busses 2C and 2D transferred smoothly. It took about 1.5 seconds for Bus 2A to complete the transfer. Bus 2B failed to initial transfer and was manually transferred by the operator about 16.5 seconds later.

The design flaw in the fast bus transfer scheme also caused a temporary loss of offsite power for about 17 seconds on November 17, 1987. A detailed investigation of both events and the licensee's corrective actions are described in the special NRC team inspection 50-412/87-68.

3.0 Independent Calculation/Verification

The inspector independently verified the Sequence of Events and test data obtained during the Net Load Rejection Test (IST-2.04.06). The causes of reactor trip due to inadequate steam dump response was verified. The inspector had no further questions.

4.0 QA/QC Interface

The licensee QA Surveillance Group has continuously provided test coverage for the startup test program. Through direct observation and discussion with the QA supervisor, the inspector noted that QA personnel had effective interface with other departments. The inspector reviewed the surveillance deficiency reports and noted that no unacceptable issues were pending.

5.0 Licensee Action on Previous Inspection Findings (Closed) Unresolved Item (50-412/87-53-01): Pressurizer Spray Line Temperature Problem

The pressurizer spray line temperature problem had been followed up through various startup test inspections, for example, 50-412/87-55 and 87-62. As discussed in Section 2.2, the licensee currently is using the pressurizer backup heaters to maintain a spray valve open, and subsequently heat the spray line to a temperature above the alarm setpoint of 530°F. The licensee had performed an engineering assessment and concluded that this operating strategy had no adverse impact on the plant safety. Based on this information, this item is closed.

(Closed) Unresolved Item (50-412/87-38-01) Preoperation Test Deficiency Review

Through discussion with a licensee cognizant test engineer and review of test deficiency tracking log, the inspector noted that all previously identified Preoperation (PO) Test Deficiencies were either resolved or followed up by the licensee's Test and Plant Performance Group. There are 4 PO tests that will be deferred until the first refueling outage. These tests are:

- PO-2.20.01 Fuel Pooling System Test
- PO-2.20.02 Spent Fuel Pool and Refueling Cavity Leak Test
- PO-2.66.01 Fuel Handling Equipment
- PO-2.66.02 Cranes and Lifting Equipment Test

Adequate safety evaluations had been performed to justify these test deferrals. Since these test deferrals have no safety impact on the current plant operations and there is reasonable assurance that these tests will be completed, this item is closed.

6.0 Exit Meeting

An exit meeting was held on November 25, 1987 to discuss the inspection scope and findings, as detailed in this report (see paragraph 1.0 for attendees).

At no time during this inspection was written material provided to the licensee. Based on the NRC Region I review of this report and discussions held with the licensee representatives at the exit, it was determined that this report does not contain information subject to 10 CFR 2.790 restrictions.

ATTACHMENT A

Test Results Evaluation

- IST-2.03.03 Measurement of Core Parameters During Steady-State Conditions
- IST-2.04.06 Verification of Plant Performance Following Plant Load Rejection/Trip (Section B - The Net Load Rejection Test)
- IST-2.07.02 Failed Fuel Detection System Test
- IST-2.02.05 Alignment of Process Temperature Instruments
- IST-2.01A.08 Full Power Demonstration Test (100-Hour Warranty Run)
- IST-2.02.01 Alignment of Nuclear Instrumentation System
- IST-2.02.04 Power Coefficient Measurement
- SOV-2.34.04 Containment Instrument Air Design Verification Test
- SOV-2.44C.05 Containment Air Recirculation Fans Test (Containment Air Temperature Verification)
- BVT-2.1-8.49.1 Power Distribution Limit Check (100% Power Flux Map)
- BVT-2.1-1.2.2 Incore/Excore Axial Imbalance Monthly Check (100% Power)