U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-412/86-01

Docket No. 50-412

License No. CPPR-105

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

Facility Name: Beaver Valley Power Station, Unit 2

Dates: January 6 - 30, 1986

Inspector: W. M. Troskoski, Senior Resident Inspector

Approved by: J. E. Tripp — 2/5/86
J. E. Tripp, Chief, Reactor Projects Section 3A — Date

Inspection Summary: Inspection No. 50-412/86-01 on January 6 - 30, 1986.

Areas Inspected: Routine inspections by the senior resident inspector (54 hours) of licensee actions on previous inspection findings, initial test program open items specified in BV-2 SER (NUREG-1057), reactor coolant system hydrostatic test procedure review, preoperational program implementation, and reactor protection system and emergency diesel generator testing status.

Results: No violations were identified. This inspection identified concerns related to verification of system restoration during preoperational testing and use of temporary operating procedures (Section 5).

DETAILS

1. Persons Contacted

R. Coupland, Director, Site Quality Control
C. E. Ewing, Manager, Quality Assurance
T. P. Noonan, Station Superintendent
R. J. Swiderski, Startup Manager
D. Williams, Chairman, Joint Test Group

The inspector also met with other licensee and contractor personnel during the course of the inspection.

2. Project Status Summary

Construction activities are currently estimated to be 92% complete, with 248 of 450 subsystems turned over for flushing and proof-testing. For software, 46 out of 123 preoperational (PO) and initial startup test procedures (IST) have been issued. The remainder are in various phases of development.

Approximate dates for the major project milestones, as currently estimated by the licensee are as follows:

--	Reactor Coolant System Cold Hydrostatic Test	March 17, 1986
--	Integrated Hot Functional Test	October 20, 1986
--	Fuel Receipt	December 1, 1986
--	Loss of Power Test	February 2, 1987
--	Integrated Leak Rate Test	February 23, 1987
--	Fuel Load	May 1, 1987
--	Initial Criticality	May 16, 1987
--	Commercial Operation	August 30, 1987

Major activities planned for next month include CVCS and RCS flushes, shot peening steam generator tube sheets for stress relief, and initial turnover of the Low Head Safety Injection System. The remaining ESF systems are not scheduled for turnover until after the RCS hydro.

3. Licensee Action on Previous Inspection Findings

(Closed) IFI (85-16-08): Determine whether BV-2 battery cells are of the same model (E size cells, Type ECH), referenced in the Exide 10 CFR 21 Report, or are subject to a similar failure mechanism. By letter ND2552:1163, dated August 30, 1985, the inspector was informed that the vendor had been contacted by the station to resolve this concern. The vendor had changed his manufacturing process after March, 1983, to eliminate the cracked boss seal deficiency for all cell models. A visual examination of the color coded parts (grease) determined that the type GN battery cells at BV-2 had been manufactured after that date. This item is closed.

(Open) IFI (85-16-07): Determine whether or not the BV-2 battery seismic support rack design considered the need for expansion space in the metal support racks as the batteries aged. Through discussions with NECU engineers, the inspector determined that the battery rack design should include an additional quarter inch space for the end cells to accommodate thermal expansion. The Unit 2 Station Superintendent informed the inspector that this information had yet to be routed to him through the plant's internal communications channels.

Prior to the BV-1 battery cell failure, an NRR review addressed this issue in BV-2 FSAR Question 430.33 (Amendment 3, October, 1983). The licensee was informed of recent operating experience that demonstrated the incompatibility between the battery rack and the battery which could cause cracking. The licensee was requested to describe the relationship between the plant support bridge and the battery rack supports and how the seismic qualification test program encompasses the stress-related aging of the battery case. The licensee's response only addressed stress-related failures during testing and failed to account for age related expansion of the case. The licensee stated that this would be reviewed for inclusion with the next BV-2 FSAR revision. The IFI remains open pending completion of the rack modification.

(Closed) IFI (85-16-05): Determine how the station intends to administratively phase in the operations QC program during startup. Through discussions with the Maintenance Section Director, and review of Startup Manual (SUM) Chapter 4, Maintenance, and Chapter 7, Milestone Management, the inspector determined the jurisdictional controls established to phase in the operational quality control (OQC) for nuclear operations. Basically, a system comes under one of three jurisdictional controls; construction, startup testing or nuclear operations. Ninety days prior to fuel load, the licensee intends to implement the operation QA program and hence, the OQC controls. Prior to that, any rework items performed during the startup testing phase will be conducted under the administrative controls of SUM Section 7 and fall under the jurisdiction of Site QUality Control (SQC). Corrective maintenance activity during testing will be performed under the startup work request system (SUM Chapter 4.3). All SWRs are routed to SQC for review and assignment of appropriate hold points. Preventive maintenance activities during the testing period are conducted per approved procedures that have been routed to SQC for review and assignment of hold points. Once the nuclear operations QA program is phased in, corrective maintenance will be done under the maintenance work request (MWR) system that will closely parallel the one in existence at BV-1. The licensee intends to implement one system for both units. As with Unit 1, all MWRs will be routed to OQC for review and assignment of any desired hold points. All corrective maintenance and preventive maintenance will be completed by the nuclear group's maintenance section whereas rework activities will be conducted by the construction division. The inspector was satisfied that the licensee has instituted controls to assure a continuity of the quality control program. This item is closed.

(Open) Unresolved Item (85-16-04): Review QA involvement for independently assuring that preoperational tests adequately demonstrate the functional capability of safety systems. The inspector met with the QA Manager and Startup Manager on January 27, 1986, to discuss QA/QC surveillance of preoperational test activities conducted by the DLC Startup Group. The inspector was informed that a separate QA surveillance group would be assigned the responsibility. The organizational structure and charter outlining its responsibilities and authorities are scheduled to be completed by about April, 1986. This action is acceptable based on the total plant status and extensive SQC involvement in the upcoming RCS hydrostatic test scheduled for March 17, 1986. Other ESF systems are not due to be turned over until after test completion. This item remains open pending inspector review of the effectiveness of the QA preoperational test surveillance program.

(Open) IFI (85-16-06): Review resolution of inverter output voltage fluctuations. As noted in the previous inspection report, a red tag was placed on the equipment by SQC to note this condition. The inspector reviewed the nonconformance and disposition report (12293) issued on June 26, 1985. It noted that the uninterruptible power supply vital buses 2-1, 2-2, 2-3, and 2-4, did not conform to purchase specification requirements of a plus or minus 3% voltage regulation under all load conditions. Instead, the licensee found that the units were apparently designed by Elgar Corporation, to perform within plus or minus 10% under all conditions. The licensee subsequently had the vendor's representative effect repairs to the static switch control logic boards for 2-1 and 2-2. However, UPS inverters for 2-3 and 2-4 could not be satisfactorily readjusted and it was recommended that they be shipped back to the factory for repairs on December 17, 1985. This item remains open pending (1) repair or replacement of the inverters and (2) rerun of the appropriate proof tests.

4. Initial Test Program

NUREG-1057, Safety Evaluation Report Related to the Operation of Beaver Valley Power Station, Unit 2, issued October, 1985, identified a number of open items related to the licensee's initial test program. The nine items (Section 14 of NUREG-1057) will require NRR concurrence for resolution of the test programs' adequacy.

Verification that these items are subsequently addressed as appropriate and review for possible impact on the test program is Inspector Follow Item (86-01-01).

5. Reactor Coolant System Hydrostatic Test Procedure Review

Purpose

The inspector reviewed test procedure PO-2.06.01, Cold Hydrostatic Test of the RCS, Issue 1, Revision 0, approved June 26, 1985, to ensure technical adequacy and consistency with regulatory requirements, guidance and licensee commitments.

References

FSAR Section 14.2.12.8.1, Initial Test Program - Cold Hydrostatic Test of the RCS.

NUREG-1057, Safety Evaluation Report Related to the Operation of Beaver Valley Power Station, Unit 2, Issued October, 1985

ASME Boiler and Pressure Vessel Code, Section III, 1971 thru Winter Addenda - 1972.

Test Review Technical

There were no previous outstanding regulatory concerns or open items associated with this test. The hydrostatic test pressurizes the RCS and high pressure piping through several pressure - temperature plateaus to a test pressure of 3107 psig; 1.25 times the lowest design pressure of any system component. Pressure is required to be held at this level for 10 minutes before a slow depressurization to about 2490 psig, at which time, a detailed inspection of all pipes, flanges, welds and vessels within the system boundary is performed by QC personnel and Authorized Nuclear Inspectors using as-built isometric drawings. Test acceptance criteria includes: (1) no leakage from welded joints, and (2) minimal leakage from mechanical joints. Mechanical joint leakage is logged for correction and future verification of leak tightness at normal operating pressure.

Through discussions with the Unit 2 Station Superintendent, the inspector was informed that acceptance criteria 2, above, would be verified during the integrated hot functional test, scheduled for about October, 1986, providing the leakage is minimal so as not to interfere with the conduct of the test. This is acceptable.

Specific items the inspector verified through document review or discussions with test engineers were as follows:

a. System boundary includes all pressure vessels, piping, pumps, and valves which are part of, or connected to the RCS up to:

   (1) The outermost containment isolation valve in piping that penetrates containment;

   (2) Second of two valves normally closed in piping that does not penetrate containment; and,

   (3) The RCS safety and relief valves.

   The inspector noted that various high pressure lines of the CVCS were to be pressurized during the test, but not inspected for leakage. Licensee representatives stated that these lines were to be tested at a higher pressure at a later date because it was designed for 2735 psig versus 2485 psig for the RCS. The inspector had no further questions.

b. The system is vented during the filling operation. The test procedure referenced a temporary operating procedure (TOP) that is to be furnished at a later date. The responsible test engineer provided the inspector with an unapproved copy for information. Approval per the administrative controls of the Startup Manual would be required prior to issue. The inspector noted several human factor concerns. The TOP references several other approved operating manual procedures that have integral initial conditions and action steps, and directs the operator to perform the procedure while disregarding some of those specific steps. The inspector noted that a stronger practice would require either editing the OM procedures for incorporation into the TOP, or assuring that pre-marked procedures are distributed as a package with the TOP. Licensee action will be reviewed as IFI (86-01-02).

The inspector also noted that the TOP lacked sign-off spaces for specific action steps as recommended by Startup Manual, Section 3.4.6.G. Additionally, the various attachments provided to document replacement of blank flanges, plugs or caps, do not require double verification. This concern is further addressed below.

c. Water quality requirements are specified per applicable Westinghouse recommendations for RCS temperatures limited to 180 F.

d. Reactor coolant system liquid and metal temperature requirements (165-175 F) are stated to ensure primary components are maintained above the nil ductility transition temperature (Westinghouse letter DMW-D4634, December 17, 1984). The steam generator tube sheets are the limiting components.

e. Minimum hydrostatic test pressure is 3107 psig, which is 1.25 times the lowest design pressure. Overpressure protection devices will be provided for one of the SV lines, rated at 100 gpm. This is sufficient to envelope the hydro test pump (about 24 gpm) and two hydro laser pumps (about 30 gpm each). Additionally, relief devices will be provided at each hydro laser pump discharge.

f. Maximum hydrostatic test pressure is 3262 psig. The steam generator tube sheet is the limiting component per ASME III, subsection NB-3226.

g. Maximum test pressure is required to be maintained for at least 10 minutes.

h. A complete examination for leakage (including visual inspection of steam generator tube sheets) is performed at 2490 psig. Site QC provides independent inspections.

The test is written in such a manner that the FSAR objectives and acceptance criteria are met.

Test Review - Other

The inspector noted that system restoration steps lacked a double verification of critical steps such as restoring RCS safety valves, blank flanges, replacement of check valve internals and removal of safety valve gages. Licensee action to address this concern in the preoperational test program is Unresolved Item (86-01-03).

PO-2.06.01 is essentially a complex guide that refers test and operations personnel to numerous other procedures for explicit instructions for performing the various functional activities such as starting/stopping reactor coolant pumps, isolating the CVCS, etc. In total, these procedures are several hundred pages long. The prerequisites, initial system lineups and actual test performance will last through several shifts. The inspector conducted discussions with key test personnel on how the various evolutions would be tracked by control room personnel to ensure that they are cognizant of the numerous system alignments and multiple functional activities within the RCS hydro test. The licensee stated that for the more complex and involved tests (RCS hydro, HFT), a level III plan would be used as an aid. This appears acceptable and the inspector had no further concerns.

Joint Test Group Review

The inspector attended the JTG meeting of January 24, 1986, at which time RCS cold hydro test review comments were discussed. Membership was as specified in SUM, Chapter 3.3. The inspector noted that several members had previous startup experience with Unit 1 and other commercial plants. This experience was evident by the thorough and rigorous review provided for the hydro test. The JTG appears to be effectively implementing their responsibilities under the current work load.

6. Reactor Protection System

The licensee currently plans to use about six different preoperational tests to verify proper operation of reactor trip switchgear, RPS and ESF actuation system time responses, setpoints, safeguards test cabinet actuation, Solid State Protection System (SSPS) cabinet test panel logic, and RPS actuation system logic. These tests are currently scheduled to begin about mid-May, 1986, after initial turnover. Currently, the licensee has not issued any of the procedures at this point in time. The inspector was informed that the responsible test engineer slot is currently vacant, but scheduled to be filled shortly. Additionally, the licensee plans to have Westinghouse, the NSSS vendor, participate more widely in the development of these specific procedures.

Information Notice 85-98, Missing Jumper From Westinghouse Reactor Protection System Cards For Overpower Delta Temperature Trip Function, was issued after two plants discovered that their 7300 Series Solid State Protection System Racks were missing the specified jumpers. The purpose of these jumpers is to limit the lead circuit response so that it will not raise the trip setpoint

under conditions of decreasing average temperature. The original preoperational tests at these plants and subsequent surveillance testing failed to detect the misconfigurations because none of the tests included test signals that simulate conditions of decreasing T-avg. Additionally, it was determined that vendor drawings and documents did not contain explicit guidance regarding the need for the missing jumpers. Since BV-2 uses the 7300 Series racks for their SSPS, review of followup actions is Inspector Follow Item (86-01-04).

7. Emergency Diesel Generators

The emergency diesel generators and support auxiliary systems have been installed at BV-2 and initial two hour vendor test runs completed. The licensee currently intends to provide five preoperational tests encompassing the 4KV station service system and the emergency diesel generators. Currently, these tests are still in the initial development stages. The site blackout test scheduled to be run as part of the electrical AC independence test, is scheduled to be conducted during early February, 1987. The emergency diesel generator test runs are scheduled to be conducted during July, 1986, preceeded by the emergency AC power distribution system tests during early May, 1986.

A possible generic problem has been identified concerning Colt emergency diesel generators (Colt-Pielstick Product Line) that power emergency AC generators manufactured by Beloit Power Systems. The problem relates to the structural integrity of the brush holder arm assembly on the AC generators. A fatigue failure occurred in the brushholder assembly after about 120 hours of preoperational testing at another plant. The DC field excitation brushes are supported by this holder connected to a shaft that threads into a tacked section in a hexagonial nut. A threaded extension from the hexagonial nut is then used to bolt the brushholder onto a cross-brace mounted either on the generator frame or on the generator bearing housing. Apparently, the failure was induced by vibration. This resulted in a loss of DC field excitation to the generator rendering it inoperable. The inspector brought this to the attention of the Maintenance Section Supervisor for review by DLC and appropriate corrective actions. At the exit meeting, the inspector was provided material addressing this issue. Review is Inspector Follow Item (86-01-05).

8. Exit Interview

A meeting was held with senior DLC startup testing personnel on January 30, 1986, to discuss the inspection scope and findings.