

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-353/88-22

Docket No. 50-353

License No. CPPR-107

Category B

Licensee: Philadelphia Electric Company
2301 Market Street
Philadelphia, Pennsylvania 19101

Facility Name: Limerick Nuclear Generating Station, Unit 2

Inspection At: Limerick, Pennsylvania

Inspection Conducted: September 12-23, 1988

Inspectors:

Henri F. van Kessel
Henri F. van Kessel, Reactor Engineer

10-17-88
date

James M. Trapp
James M. Trapp, Reactor Engineer

10-17-88
date

Daniel T. Moy
Daniel T. Moy, Reactor Engineer

10-17-88
date

Approved by:

P. K. Eapen
P. K. Eapen, Chief, Special Test Programs
Section, EB, DRS

10/18/88
date

Inspection Summary: Routine Unannounced Inspection on September 12-23, 1988
(Inspection Report No. 50-353/88-22)

Areas Inspected: Preoperational test program, including the review of the preoperational test program implementation requirements, preoperational test procedures; activities in the QA/QC interface with preoperational test program; preoperational tests for Emergency Diesel Generators A, C, and D and for Recirculation Pumps A and B; and the Integrated System Flush Test, procedure 2F62.1.

Results: No violations were identified.

1. Persons Contacted

Philadelphia Electric Company (PECO)

- *W. D. Bradley, QA Engineer (Bechtel)
- M. Brittingham, Test Director
- *J. M. Corcoran, Manager Quality Assurance
- R. Chester, QA Engineer
- E. Cosgrove, Shift Supervisor
- *J. A. Dannert, QC Staff (Bechtel)
- *T. Dey, QA Engineer
- *D. A. Di Paolo, QA Superintendent, Unit 2
- M. Franchuk, QA Engineer
- M. Gearhart, Test Director
- *R. Hatton, Quality Engineer (Bechtel)
- J. Higgins, Startup Engineer
- *G. Lauderback, Startup QC Supervisor
- *W. L. McCullough, Project Startup Engineer (Bechtel)
- K. W. Meck, Assistant Superintendent QA
- J. Mitman, Shift Startup Engineer
- T. S. Panetta, Startup Engineer
- *R. L. Payne, QA Engineer
- *R. H. Slaughter, Project Quality Engineer (Bechtel)
- S. Slickers, Startup Engineer
- B. Stanley, Shift Superintendent
- *W. T. Ullrich, Startup Manager, Unit 2
- W. White, Startup Engineer
- *H. R. Wiegler, Startup Superintendent Operations

U.S. Nuclear Regulatory Commission

- *R. L. Fuhrmeister, Resident Inspector

*Denotes those present during exit meeting held on September 23, 1988

2. Preoperational Test Program

2.1 Preoperational Test Procedure Review

The following test procedures were reviewed:

- 2F62.1, "Cleanness Verification Procedure, Startup System No. 62A, Reactor Vessel," Rev. 0.
- 2F64.1, "Preoperational Test Reactor Recirculation System," Startup Subsystems 64A and 64C.

The above test procedures were reviewed for the following attributes:

- Management review and approval
- Procedure format
- Clarity of stated objectives
- Prerequisites
- Environmental conditions
- Acceptance criteria and their sources
- References
- Initial conditions
- Attainment of test objectives
- Test performance documentation and verification
- Degree of detail for test instructions
- Restoration of system to normal after testing
- Identification of test personnel
- Evaluation of test data
- Independent verification of critical steps or parameters
- Quality control and assurance involvement

The following observations were made with respect to flush procedure 2F62.1:

1. The procedure was concise and had clearly stated objectives, prerequisites, initial conditions and acceptance criteria.
2. The instructions did not always accomplish the procedure objectives. Nearly all of the instruction sections required temporary modifications prior to execution. Most of the changes were caused by system changes and water inventory problems.
3. The temporary procedure modifications reviewed were adequately controlled and approved.
4. The procedure referred to valves by number only and did not supply the function of the valve. Without knowing the function, a typographical error on the valve number has the potential to cause the wrong valve to be operated.

Observation No. 4 above was discussed with startup management. It was agreed that all valve numbers in the remaining flush procedures will be checked against the applicable system drawings to make sure that there are no typographical errors.

The review of preoperational test procedure 2P64.1 for the RCS did not reveal any unacceptable conditions.

2.2 Test Witnessing

The inspectors witnessed the following tests:

- 2P24.1, "Preoperational Test Procedure, Standby Diesel Generators System, Startup Subsystem 24A," Rev. 0.
- 2P64.1, "Preoperational Test Procedure, Reactor Recirculation System, Startup Subsystems 64A and 64C," Rev. 0.
- 2F62.1, "Cleanness Verification Procedure, Startup System No. 62A, Reactor Vessel," Rev. 0.

Test witnessing by the inspector included observations of the following attributes:

- Overall crew performance
- Use of latest revised and approved procedure by test personnel
- Designation of one person in charge of conducting the tests
- Availability of sufficient test personnel to perform the tests
- Coverage of test prerequisites
- Use of acceptance criteria to evaluate test results
- Verification that plant supporting systems are in service
- In-service status of calibrated special test equipment required by the test procedure
- Adherence to the test requirements of the test procedure during the tests
- Timely and correct action by test personnel during the performance of the tests
- Data collection for final analysis by test personnel

For procedure 2P24.1, the inspector witnessed the unloaded and loaded run on Standby Diesel Generator "D" (SDG). This unit had experienced high vibration levels during a previous run. An extra balancing weight was placed on the fly wheel near the coupling of the diesel-generator. The vibration level was reduced by approximately 2 mils, but was still high during the unloaded run. The vibration level was acceptable during runs at load. Additional efforts were also made to bring the vibration down to more normal levels.

Bearing No. 10 of SDG-D was damaged during the loaded run. Examination of the damaged surface of the lower aluminum bearing half suggests the intrusion of foreign material, perhaps a burr from the new bearing itself. The damaged bearing will be replaced shortly.

The inspector witnessed the logic functional tests of SDG-C and independently verified the results of steps 16.4.1.6(9) and 16.4.2.1(4) for Filter Dynamic Valve 92-2406C. Bubbles were observed to rise in the lube oil in the crankcase. The test instruments, used for the logic functional tests, had valid calibrations i.e., PECO Number 01-0438 (Digital Clamp) with due date 9-13-89 and PECO Number 57-0620 (Fluke Multimeter) with due date 11-17-88.

The inspector witnessed air starts on SDG"A" and SDG"C". The acceptance criteria for recovery time for frequency and voltage (<10 sec.) and the 5 starts on the air receiver without excessive pressure loss, were met in all cases observed. Test exception 34 was issued for the error in the procedure (2P24.1) with regard to the valve line up on the air system (valve 92-23DA). Test exception 35 was issued to record the slow frequency response problem of the visicorder. The rpm signal was used to replace the frequency signal.

The inspector witnessed the flow tests of Recirculation Pump "B" using preoperational test 2P64.1. The scoop tube positioner was unstable. Test exception TE-39 was issued to address this concern. Pump speed was restricted to 36.5% to avoid cavitation during the test.

The inspector witnessed flushes, using procedure 2F62.1, for the following flow paths:

- The main recirculation flow path; RPV to hotwell and hotwell back to RPV.
- Main recirculation flow path and RHR system operating in the shutdown cooling mode.
- Main recirculation flow path with Core Spray Pumps injecting into the PRV.
- Main recirculation flow path and RHR system injecting into the vessel via the LPCI penetrations.

The inspector conducted field walks to verify that the initial conditions were established in accordance with the procedure. Initial Condition Step 4.1.7 required numerous blind flanges to be installed on the RCIC Steam Supply/Exhaust lines and a hose be connected between the Steam Supply and Exhaust. The inspector verified that these steps were completed and the temporary equipment used was adequate for the applications. The inspector found the initial conditions steps were completed in accordance with the procedure and all the temporary modifications were logged indicating that they were

for use during this procedure. The inspector conducted similar inspections of the temporary modification made to HPCI (initial condition step 4.1.6) and the SRV's (initial condition step 4.1.3).

The purpose of the integrated flush is to clean vessels and piping following construction. Systems are flushed by pumping Condensate Storage Tank (CST) or Suppression Pool Water through the piping and vessels. The main recirculation flow path was from the Hotwell via the condensate pumps, through the normal feedwater paths to the Reactor Pressure Vessel (RPV) and back to the hotwell via the Main Steam lines. During this procedure the RPV Head was removed and the steam dryer and moisture separator were removed from the RPV.

The flush was continued until water samples taken from the flow stream were found to meet pre-established acceptance criteria. The samples were first passed through sample cloths to check for large particles of debris. If the sample cloths were found acceptable a sample was sent to chemistry for analysis. The chemist measured the following parameters:

- Ph
- Fluoride
- Chloride
- Conductivity
- Silica
- Turbidity

The inspector found the overall execution of the procedure to be adequate. Equipment was operated by a licensed Reactor Operator (R.O.) under the direction of the test engineer. The communications established between the test engineer, R.O. and field operators were good. The test engineer kept the master copy of the test procedure up-to-date. Quality Assurance also was active in covering the execution of this procedure.

Other systems flushed using this procedure are:

1. RHR System
2. Core Spray System
3. Recirculation System
4. Steam Supply/Exhaust to RCIC and HPCI

The inspector examined the sample cloths from the FWCU System Flush Test. The personnel were experienced and knowledgeable in conducting this type of testing. The inspector reviewed the chemistry test results of the RHR and Core Spray Systems. The samples were acceptable as they met the acceptance criteria specified in the procedure.

3. Licensee Actions on Previously Identified Items

(Open) Unresolved Items 353/88-13-01 and 02: Cleanliness class definition of fuel oil systems and lube oil system; and cleaning procedures for on-skid piping and components.

References

1. Field Change Request ME-1218-M, "Cleanliness Control of Piping and Equipment," for revision of design document 8031-P-303, approved on 6-16-88.
2. Field Change Request ME-1254-M, "Cleanliness Control of Piping and Equipment," for revision of design document 8031-P-303, approved on 7-13-88.
3. Field Change Request ME-1279-M, "Cleanliness Control of Piping and Equipment," for revision of design document 8031-P-303, approved on 7-28-88.
4. "Specification for Cleanliness Control of Piping and Equipment," 8031-P-303, Rev. 13, approved 12-28-87.

Discussion

The concerns with respect to the cleaning methods, acceptance criteria for cleanliness of systems and components and the cleaning procedures for the lube oil and fuel oil systems of the Emergency Diesel Generators (EDGs), as discussed in inspection report 50-353/88-13, have been addressed by the licensee.

Reference (1) was issued to add Section 1.5 to Spec. P303, (ref. 4). This step included the lube oil systems in the specification for the first time. It also adds the classification of these oil systems in Table II as class "C." This classification is not adequate to maintain the required cleanliness for the fuel oil piping and the fuel injection pumps downstream of the 5 micron fuel oil filters.

Reference (2) was issued to add Section 8 to Spec. P-303 (ref. 4). In this section the inspection criteria for the lube oil systems, as identified in Section 1.5 (see above), are identified to be those of paragraph 1.3.2 of P-303 which specifies that there shall be "no particles of sand, metal, or slag regardless of size." This is a very tight specification and it will not allow the presence of any lapping compound containing silicates (for abrasion) of any particle size no matter how small.

Section 8 also states that "procedures shall be established for performing work on flushed lube oil systems for maintenance of cleanliness levels". It should be noted that new section 8 does not address fuel oil systems directly. This tie-in, however, is made via note 20. Section 8, however, applies only to the fuel oil piping and equipment downstream of the 5 micron fuel oil filters of the EDGs. Classification D for fuel oil piping is considered to be too low a classification for all of the EDG fuel oil piping. It is also inconsistent with the acceptance criteria of P-303, paragraph 1.3.2 which are applied to the fuel oil piping downstream of the 5 micron filter via note 20. On the basis of note 20, the classification of this fuel oil piping needs to be changed to Class A. The fuel oil piping upstream of the 5 micron filter then would automatically classify as Class B by its own definition in P-303 (ref. 4).

In summary, the following observations are made:

- A. The cleanliness criteria of paragraph 1.3.2 of Specifications P-303, as applied to EDG lube oil and to EDG fuel oil (via note 20) are acceptable .
- B. The classification of the EDG lube oil and fuel oil systems, both on-skid and off-skid installation, are not consistent with the strict cleanliness criteria of paragraph 1.3.1 of P-303. Class C, for instance, has its own acceptance criteria which are well below those of paragraph 1.3.2.
- C. Procedures are not in place to assure adherence to the acceptance criteria of paragraph 1.3.2 of P-303 upon intrusion into the EDG lube oil or fuel oil systems. It should be noted here that the reconditioning of EDG bearings requires the temporary exposure of the lube oil system. There is no procedure to meet the high cleanliness standards inherent in paragraph 1.3.2 of P-303. Lapping compounds containing silicates (sand), therefore, must be completely removed after bearing/journal repair because "sand particles are not to be present regardless of size."

(Closed) Unresolved Item 353/88-08-02: "Revision number and date on exhibit forms for turnover packages."

During NRC inspection 353/88-08, the inspector identified that the forms (Exhibits) provided in Bechtel procedure CP-T-1, and used to control 3 turnover packages, did not contain revision numbers. This had led to the use of two different revisions of Exhibit 4 in turnover packages 2-05A-1F and 2-15A-1F.

In response to this finding, the licensee has performed a complete review of all exhibits/forms shown in the jobsite Construction Procedures.

As a result of this review, construction has revised (as necessary) the exhibits/forms used to document quality information in the field to include the procedure exhibit and revision number. These exhibits/forms will be controlled via a matrix maintained by the Quality Engineering Department and contain the following information.

- Discipline
- Procedure Number
- Title
- Exhibit Number
- Revision
- Remarks

Based on the above review, the inspector considers this unresolved item to be closed.

4. QA/QC Interface

The QA Audits and Surveillances as listed in Attachment B were reviewed to ascertain the continued QA/QC involvement with the preoperational test program.

Finding Report 2S-169 (from Report 2S-115) discussed deficiencies in identifying and controlling temporary system modifications, installed for testing purposes. Temporary test equipment installed in the Reactor Enclosure Cooling Water (RECW) system for test 2FB14.1 (para. 4.1.2) was not identified with T-Mod tags. The corrective action was to provide the T-mod tags for all of the test equipment used in test procedure 2 FB 14.1. To prevent recurrence of this problem, training bulletin 88-G-068 was issued to all startup engineers to reemphasize the requirements of administrative procedure AD.6.8 for temporary modifications. This finding by startup QA is in the same area exposed by the inspector in Section 5 below.

Finding Report 2S-171 (from report 2S-120) observed that a number of test instruments, as used in Technical Test Procedure 2F49.1 for RHR System Cleanness Verification, had expired calibration due dates. The instruments were recalibrated or exchanged for calibrated instruments. A recommendation was made to retrain personnel for the procedural/program requirements. The inspector found this corrective action acceptable.

5. Temporary Modifications (70302)

A number of temporary modification items were selected from the Temporary Modification Log (TML) as shown in Attachment A. Conditions, as recorded in the TML were checked against the actual conditions as found in the field.

Items 37-001 and 87-007 were consistent with the TML. TML No. 88-008, indicated that the two steam inlet blind flanges were tagged for the Integrated Recirc. Flush, 2F62.1, Step 4.1.2.3. However, this TML tag was missing. In the case of TML No. 88-001, the two hoses at valves 48-2F0 25B and 48-2F0 15 were found disconnected (quick disconnects) and at a small distance from the valves. The tags for TML 88-001 were found on the hoses. While this condition, as found, would theoretically be a restored condition, the disconnected hoses make this restoration incomplete. The corrective actions for the above two items will be followed under Unresolved Item 353/88-22-01.

6. Plant Tours (70302)

The inspector made several tours of the plant including the Control Room, Reactor Enclosure, Drywell, Turbine Enclosure, and Emergency Diesel Generator Enclosures, to observe the status of construction, work in progress, housekeeping, testing activities and cleanliness.

In the Control Room, the inspector verified a report that the feedwater suction and discharge valve controls are located on panel 20C-651 while the feedwater pump controls are on panel 20C-603, approximately 8 feet away from the controls on panel 20C-651. This is seen as a Human Engineering Deficiency (HED). The licensee is in the process of performing an analysis to determine this HED's impact on safety. The completion of this analysis will be followed under Unresolved Item 50-353/88-22-02.

It was also noted that the mimics of the bench boards were rather minimal. The inspectors will followup on this item in a future inspection. Apart from the above items, no unacceptable conditions were noted.

7. Unresolved Items

Unresolved items are matters about which more information is required in order to determine whether they are acceptable, items of noncompliance, or deviations. New unresolved items in this report are identified in Sections 5 and 6.

8. Exit Interview

At the conclusion of the site inspection, on September 23, 1988, an exit interview was conducted with the licensee's senior site representatives (denoted in Section 1). The findings were identified and previous inspection items were discussed.

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

ATTACHMENT A

Selected Items from Temporary Modification Log

<u>T Mod Log No.</u>	<u>System</u>	<u>Description</u>
87-001	Core Spray	Blank Flange in lieu of Strainer, showed restored condition in log.
87-007	RCIC	Pump Suction Strainer, spool piece w/o basket installed; not restored.
87-008	RCIC	Two steam inlet blind flanges and steam exhaust drain blind flange installed.
88-001	SLC	For flush of 2F53.1, had attached drain hoses for SWO-253-007 in area 17 at elevation 283' in Reactor Enclosure.

ATTACHMENT B

Review of QA Audit/Surveillance Reports

<u>Report No.</u>	<u>Description</u>	<u>Rep. Date</u>
2S-120	Technical Testing of RHR System 2P-49A	9-14-88
2S-119	Technical Testing of Core Spray System 2P-51A	8-29-88
2S-118	Startup Control of Flush procedures	9-2-88
2S-116	Preop. Testing Fuel Pool Cooling & Cleanup System 2P-35A	8-29-88
2S-115	Flow Balance Rx Enclosure Cooling Water	8-29-88
2S-121	Performance of Core Spray System: Flush	9-12-88