U. S. NUCLEAR REGULATORY COMMISSION
REGION I

REPORT NOS.	50-334/92-12 50-412/92-08
DOCKET NOS.	50-334 50-412
LICENSE NOS.	DPR-66 NPE-73
LICENSEE:	Duquesne Light Company
FACILITY NAME:	Beaver Valley Units 1&2
INSPECTION AT:	Shippingport, Pennsylvania
INSPECTION DATES:	April 20-24, 1992 and April 27-30, 1992

INSPECTORS: P. Patnaik — 5/19/92
P. Patnaik, Reactor Engineer, Materials Section, EB, DRS — Date

for P. Patnaik — 5.19.92.
H. J. Kaplan, Sr. Reactor Engineer, Materials Section, EB, DRS — Date

APPROVED BY: P. Johnson for E.H. Gray — 5.20.92
E. Harold Gra[illegible]ief, Materials Section, Engineering [illegible]n, DRS — Date

Areas Inspected: Review of a sample of inspection data on the March eddy current examination of steam generator tubes and the inservice inspection of the reactor coolant system. The inservice inspection plan for the present refueling outage of Beaver Valley Unit 2 was reviewed for compliance to the applicable codes and the regulatory requirement. The inspection also included an assessment of the site welding program, and a review of two metallurgical reports covering two (2) steam generator (SG) tubes and the failure of two river water pump shaft couplings.

Results: The inservice inspection program and the eddy current examination program reviewed for the third refueling outage of Beaver Valley Unit 2 complied with the applicable code and the regulatory requirements. Review of sample data on eddy current examination and other inservice inspections indicated compliance to procedures. The licensee's evaluation of indications found during inservice inspection was satisfactory as reviewed from the licensee's deficiency reports. The welding program was found to be in accordance with code requirements. Some weakness was observed in the contractual services provided by a metallurgical laboratory. A common welding manual is currently being prepared to be used by the maintenance and construction groups. The manual is to be issued with appropriate administrative specifications and instructions. The report of the two steam generator tubes revealed numerous longitudinal stress corrosion cracks that initiated on the outside diameter (OD) surface. The report of the river water pump shaft couplings indicated that the failures were due to embrittlement as a result of improper heat treatment.

1.0 INSERVICE INSPECTION (ISI)(Inspection Procedure 73753)

1.1 Scope

Inservice inspection by ultrasonic, magnetic particle, liquid penetrant and visual examinations is performed to ensure integrity of the reactor coolant pressure boundaries. An inservice inspection is mandated by the ASME Boiler and Pressure Vessel Code, Section XI, and is essential to promote public health and safety.

1.2 Findings

During the third refueling outage of Unit 2, Duquesne Light Company (DLC) conducted an inservice inspection in accordance with the ASME Code Section XI, 1983 edition including the summer 1983 addendum. The current refueling outage is the first scheduled outage of the second period of the first ten-year interval. DLC has identified a total of 1181 examinations for the second period in "Schedule of Examinations" for Unit 2. A review of a sample of components from their scheduled examinations, indicated compliance to the applicable ASME Code Section XI.

During this inspection, DLC's program for disposition of indications or deficiencies found during nondestructive examination was reviewed. In this regard, DLC's procedures, "Initiation of a Quality Services Deficiency Report" and "Corrective Action Requests" provided adequate guidance to initiate deficiency reports, prepare and control corrective action requests. A review of a sample of deficiency reports indicated that the non-conforming conditions were clearly identified and properly evaluated. The corrective action or disposition of deficiencies were found to be satisfactory. DLC's start-up check list ensures that all ISI related deficiencies are resolved prior to plant startup.

The ultrasonic data on the reactor vessel head to the weld and the pressurizer nozzle inner radii (N 10, 11 and 12) were reviewed. The licensee's volumetric evaluation reports (E-92-9 and 10) characterized reflectors found during ultrasonic examination of the vessel head to flange weld. However, there was no recordable indication found in the pressurizer nozzle inner radii examination. The ultrasonic data met the requirement of licensee's ultrasonic procedure.

The VT-3 visual examination reports on control rod drive mechanism (CRDM) seismic supports and the VT-2 examination report of component cooling water piping were reviewed. The examination data conformed to the requirements of procedures VT-503, Rev. 12 and VT-500, Rev. 5.

The following nondestructive examination procedures were reviewed to ensure compliance with the ASME Codes Section XI and Section V.

UT-303, Rev. 10	Ultrasonic examination of piping systems and components less than or equal to two inches wall thickness.
UT-313, Rev. 1	Ultrasonic examination of vessel inner radius sections from the nozzle outside surface.
LT-102, Rev. 5	High temperature visible dye penetrant examination.

Licensee's contracted quality control personnel were certified to the appropriate ASNT-TC-1A level to perform nondestructive examination. These personnel also received site specific training in accordance with licensee's quality services procedures 2.5, Rev. 0.

The inspector reviewed surveillance reports on quality assurance audit #BV-C-92-06 and determined that the quality assurance coverage of the inservice inspection activities was adequate.

1.3 Conclusion

For those areas inspected, DLC's ISI program complied with the regulatory and the ASME Code requirement. DLC's implementation of the program was in accordance with the procedures established by the Quality Services Department and was found to be satisfactory.

2.0 STEAM GENERATOR EDDY CURRENT EXAMINATION

2.1 Scope

The steam generator eddy current examination of Beaver Valley Unit 2 was conducted during the third refueling outage in order to comply with the requirement of the Technical Specification stated in Section 4.4.5.1. The licensee has established a steam generator examination program (ISIE-ECP-2, Rev. 0), which addresses applicable specifications, examination requirement, personnel and equipment requirement among other requirements of the program.

2.2 Finding

The licensee performed full length bobbin coil examinations on 100% of all inservice tubes in each steam generator. Also, rotating pancake coil (RPC) examinations in each steam generator were performed on:

- All inservice U-bends in rows 1 and 2

- 150 tubes at the top of tubesheet interface
- All locations where distorted support plate signals were obtained in previous outages.
- Six B&W roll plugs in "C" steam generator cold leg.
- A random sample of dents

Visual inspections were also performed on all plug retainers in each steam generator.

As a result of the examination, eleven tubes were plugged in all steam generators with the breakdown as follows.

Steam Generator	Tubes Plugged Due to Indication (Percent Thru Wall)	Tubes Plugged Preventively Due to Dents at Support Plate	Total Tubes Plugged
A	1 (70%)	3	4
B	2 (41%, 39%)	2	4
C	0	3	3

Reviews of records on mechanical and robotic plugged tubes indicated that the plugging operation conformed to procedure MRS 2.3.2 GEN-13, Rev. 15.

Calibration records on MIZ-18 equipment used for eddy current examination and other records of calibration on mechanical plugging system were reviewed. The documents verified that the calibration was up-to-date and the equipment was acceptable for use.

Certifications of the contractor's personnel for eddy current examination and for mechanical plugging were readily available and met the requirements of the applicable procedure.

The certified material test report of the plug material was reviewed. The plugs were made of Inconel alloy 690 and were heat-treated to conform to the material specification.

2.3 Conclusion

The decision to inspect 100% of tubes in each of the three steam generators is indicative of DLC's intent to maintain the plant in a safe condition. For the areas inspected, the eddy current examination program, the plugging of tubes, met the industry standards and the regulatory requirements.

3.0 WELDING (55050)

3.1 Scope

The purpose of this inspection was to assess the site welding program in order to ensure that welds which are made at the site are metallurgically sound and meet code requirements.

3.2 Findings

The welding activities at the site are essentially divided into two independent groups: maintenance group and construction group. The construction group manages the services provided by Bechtel and generally handles major replacements or repairs. The maintenance group handles the unplanned tasks. The maintenance activities which provide job assignments to construction are described in administrative procedures 5.2. Although both groups utilize their own welding procedures (construction uses Bechtel Procedures), DLC is currently preparing a common welding manual to be used by both groups.

In order to assess the quality of the welding activities, the inspector reviewed several work packages from both groups. These packages were identified as follows:

Maintenance

DCP-001064 - Feedwater to steam valve refurbishment
DCP-004342 - RCS sample valve refurbishment
DCP-009287 - Equipment hatch interlock shear pin replacement

Construction

DCP-1636 - Modification of containment loop stop valves

Using the information found in the weld data sheets, such elements as welding procedure specifications, welder qualification, nondestructive examination (NDE) results and filler materials pedigree were reviewed to determine their validity. No deviations were uncovered in this review. Welders accreditation was maintained using filler material withdrawal slips to provide the required process/time information. The electrode storage area was also inspected. As required by NCAP-5.16 procedure, ovens #22, #23, #24 and #26, were found to be within the prescribed temperatures (300°F ± 50°F). Only one type of electrode was found in each oven.

In addition to the welding procedure specification noted above, the following procedures and attendant qualification records were reviewed: (1) 8-GT-01, (2) 1-SM-01, (3) 8/43-GT-01, and (4) 1/6-SM-01. No discrepancies were uncovered in this review.

A number of audit and surveillance reports (12) covering the welding activities of the maintenance and construction groups were reviewed. These reports covered the period between May 1?, 1991 through April 21, 1992. All reports were comprehensive and addressed various welding elements. Except for one weld which required rework because of surface irregularities, no deficiencies were observed. This condition was described in QA audit BV-C-91-14 dated January 17, 1992.

The inspector also reviewed the status of two laboratories employed by DLC to provide metallurgical services such as bend and tensile testing of welder and procedure qualification test assemblies. In the case of Professional Service Industries (Pittsburgh Test Laboratory), a comprehensive audit report dated January 3, 1990, indicated that, except for several administrative deficiencies, the laboratory was effectively implementing its quality assurance program. The deficiencies were subsequently resolved on March 16, 1990. In the case of Industrial Testing Laboratory (ITL), the inspector found that ITL was still providing services, even though they were not an approved vendor because of several administrative findings uncovered in an October 1989 audit. In addition, a recent purchase order failed to reference ASME Section IX as the appropriate specification for mechanical testing, even though their test reports included this information. It is noted that ITL has consistently provided valid test results to the nuclear industry for many years. Although a violation was found with the laboratory services provided by ITL, it is not being cited because previous test results were considered valid, and immediate corrective action was taken when ITL was removed from the approved bidders' list.

3.3 Conclusion

DLC's welding program, as followed by the maintenance and construction groups, was found to be in accordance with code requirements. DLC is presently preparing one set of welding procedures and instructions (welding manual) to be followed by both maintenance and construction groups. Up to this time, each group maintained their own set of documents A revised set of administrative procedures will be prepared to compliment the new welding manual.

4.0 UNIT 1 STEAM GENERATOR (SG) PULLED TUBES LABORATORY REPORT (TR-MCC-191 dated April 1992)

The inspector reviewed a metallurgical report of two (2) SG tubes from Unit 1. The investigation was performed by ABB Construction Engineering. The Inconel 600 tubes had been removed from the hot leg of a SG by cutting the tubes below the fourth tube sheet support plate because of eddy current indications found during the eighth refueling outage. The report concluded that the indications which were located at the tube support plate and at the top of the tube sheet, were caused by numerous, short, longitudinal intergranular stress corrosion cracks that initiated on the outer diameter (OD) surface. Caustic stress corrosion cracking (SCC) was believed to be the probable failure mechanism on the basis of the nature of the oxides found in the cracks. Although a crack up to 93% throughwall was found in one

of the tubes (the average crack depth was 54% throughwall), the burst strength of the tubes was not severely degraded. The report also stated that, even though no obvious material deficiencies or anomalies were found to be associated with the tubes (material was typical of mill annealed tubing), the relatively high strength (>55,000 Y.S psi) of the tubing and its microstructure which featured fine grains with predominately intergranular carbides as opposed to a network of intergranular carbides, makes the material susceptible to primary water stress corrosion cracking. The report recommended that future inspections should be on the lookout for this type of inner diameter (ID) surface cracking. The inspector concurred with the conclusions of the subject report and considered the report to have investigated all aspects of the failure.

5.0 RIVER WATER PUMP SHAFT COUPLING FAILURE

The inspector reviewed DLC's report of the failures of two coupling shafts from two Byron Jackson river water pumps. The first failure was experienced in June 1991. It occurred in one of the three (3) pumps in use. Each shaft is made of six 410 stainless (hardenable) steel couplings. An investigation on the failed coupling indicated that the failure was due to embrittlement caused by faulty heat treatment. The embrittlement condition was verified by low charpy impact test values (8 ft-lbs). A second failure of a coupling from another pump was subsequently found. It was determined that the failed couplings were from the same heat (lot) of material and showed similar properties (low impact value and/or relatively high hardness). The embrittled condition was caused by either cooling too slow from the tempering temperature or initially tempering at too low a temperature. Even though the majority of the other couplings were from other heat(s) and did not fail, all couplings from three pumps were eventually replaced with properly heat treated material qualified to assure adequate toughness. The inspector concurred with the conclusion in this report. DLC submitted a 10CFR Part 21 report of the failure on November 1, 1991. In addition to the coupling problems, the key material was reported to be soft. It is made of 316 stainless steel instead of 410 stainless. DLC provided the inspector a letter dated January 8, 1992 from Byron Jackson that the softer material was acceptable for the application.

6.0 FASTENER TESTING

The inspector reviewed DLC's quality assurance program that is intended to preclude the use of fasteners (bolts, studs and nuts) that do not meet specification requirements. As of October 1991, DLC has controlled the procurement of fastener in accordance with specification 3PPS-OGEN-001, which provides detailed requirements covering all aspects of fasteners to assure conformance to codes and attendant specifications, and includes dedication requirements when necessary. One of the key requirements of 3PPS-OGEN-001 is that one specimen per lot or heat of new material is required to be tested for mechanical and chemical properties.

7.0 CLOSEOUT OF VIOLATION 50-334/91-11/01

A severity level IV violation (supplement I) was identified in NRC Inspection Report 50-334/91-11, against failure to identify, record and evaluate a linear indicator on weld P12-H1-S-0S. Based on the corrective actions taken by the licensee, including re-examination of NDE technicians, evaluation of system integrity and operability, reinspection of welds previously made, and vision examinations, the subject violation is closed.

8.0 ENTRANCE AND EXIT MEETING

Members of the licensee's management, engineering and staff were informed of the scope and the purpose of this inspection at the entrance meeting that took place on April 20 and April 27, 1992. The findings of the inspection were presented to and discussed with members of the licensee's management at the conclusion of the inspection on April 24 and April 30, 1992. A list of attendees at the exit meetings is appended to this report as Attachment I.

ATTACHMENT I

Duquesne Light Company

G. D. Alberti, ISI Coordinator
F. Curl, Manager, Nuclear Construction
J. F. Finke, Sr. Engineer, ISI
J. J. Giocondi, NDE Supervisor
K. E. Halliday, Manager, Nuclear Engineering
T. Huninski, Metallurgical Engineer
G. Kammerdeiner, Director, Materials Engineer
F. J. Lipchick, Sr. Licensing Supervisor
K. L. Ostrowski, Operations Manager, Unit 1
M. A. Pergar, Director, Quality Services
B. F. Sepelak, Licensing Engineer
D. E. Spoerry, General Manager, Nuclear Operation
N. R. Tonet, Manager, Nuclear Safety
T. White, Welding Engineer

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