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REGION I

Report No. 50-336/92-13

Docket No. 50-336

License No. DPR-65

Licensee: Northeast Nuclear Energy Company
P.O. Box 270
Hartford, connecticut 0614-0270

Facility Name: Millstone - Unit 2

Inspection At: Waterford, Connecticut

Inspector: J. Carrasco 4/27/92
J. F. Carrasco, Reactor Engineer, date
Materials Section, EB, DRS

Approved by: E H Gray 4/29/92
Edwin H.Gray, Chief, Materials Section date
EB, DRS

Inspection Summary: Inspection on March 23-27, 1992

Areas Inspected: A safety inspection was conducted to determine the status of activities related to the Steam Generator (S/G) replacement for unit 2 of the Millstone Nuclear Station. The inspection included a review of the Quality Services Department's (QSD) activities, ASME Code Section XI preservice nondestructive examination and testing, cutting and fitup, and mockup training observation.

Results: Based on the present inspection, it was concluded that the licensee's QSD has good control over the activities affecting quality in replacement of the steam generators. This was evident in the control of steam generator subassemblies fabrication and site receipt inspections. In the ASME Code Section XI preservice nondestructive examination and testing, the inspector found that the licensee's contractors have performed beyond the code requirements. During this work, the licensee's engineering and inservice inspection department had adequate involvement in overviewing and coordinating the implementation of the preservice inspections and testing. Review of the measurement procedure to be used in the cutting and fitting of the steam generators (S/Gs) and associated piping connections, indicated a need for the licensee to have written instructions clearly describing the measurement method readily retrievable at the site.

1.0 Replacement of Steam Generators at Millstone Unit 2 (37700)

1.1 Background

Millstone Unit 2 of Northeast Utilities (the licensee) is preparing to replace its steam generators during the 1992 outage at Millstone Unit 2. The licensee has made this decision to improve the steam generator's reliability and minimize primary to secondary side leakage. The United States Nuclear Regulatory Commission (USNRC), Region I, has planned to conduct a series of inspections throughout the implementation of this project to monitor the licensee's activities from a safety point of view.

1.2 Quality Assurance Activities (prior to site receipt of the steam generator subassemblies)

At Northeast Utilities, the quality assurance and quality control organizations are consolidated into one organization, the Quality Service Department (QSD). Out of this organization, a number of individuals were selected to be part of a quality service team organized exclusively to participate in the Steam Generator Replacement Project (SGRP) for Millstone Unit 2.

This SGRP organization is located at the site. It is self-contained and self-sufficient, with direct access to the licensee's senior management. The SGRP Quality Service Organization, began an assessment of Babcock & Wilcox Canada's (BWC) quality assurance program prior to awarding the contract. The licensee provided a full time Resident Inspector to represent QSD at BWC to observe all phases of the steam generator lower subassemblies (SGSA's) fabrication. The lower assemblies consist of the steam generator tubes, associated internal supports and the pressure vessel shell from the transition cone down.

For approximately three years the licensee's resident inspector and other QSD personnel observed almost all the phases of design, fabrication, and testing of the SGSA's. In addition to the original quality program audit that was performed, a detailed design audit was performed near the end of the contract to validate the Design Engineering activities that had taken place.

Most of the phases of the design and manufacturing process were observed including forming, machining, material marking, identification, assembly, welding, non-destructive examination (NDE), heat treatment, leak testing, hydrostatic testing, cleaning, and packing. In addition to the licensee's surveillance, the USNRC vendor surveillance branch inspectors audited the BWC quality assurance program and portions of SGSA's fabrication work at

BWC. Several non-conformance items were identified, but these were properly documented and dispositioned before allowing the shipment of the SGSA's. Upon arrival at the Millstone site the licensee's QSD performed a receiving inspection of the SGSA's.

1.3 Quality Assurance Activities at the Site

The inspector reviewed the licensee's Quality Services Department Procedure QSD-3.08, Revision 6, entitled "Performance of Receipt Inspection Activities." This procedure establishes the minimum requirements for the performance and documentation of receipt inspection activities. The objective of this review was to ascertain whether the licensee has developed and implemented a QA program relating to the control of receipt, storage and handling of site receipt materials. The inspector interviewed the QC inspector responsible for shipment and storage of the replacement lower assemblies and found the procedure and its implementation are in compliance with industry standards outlined on ANSI N45.2.2.-1972 and the provisions outlined in the USNRC Regulatory Guide 1.38.

The inspector reviewed and verified that the licensee's procedure QSD-3.08 and its implementation of inspection activities conducted upon receipt of the SGSA's were in accordance with ANSI N45.2.2. Section 4.11 of procedure QSD-3.08 specifies a minimum check of the quantity received, part number, general condition of the items, damage incurred, and other pertinent documentation.

In accordance with section 6.3 of procedure QSD-3.08 the SGSA's were inspected by the licensee for any visible damage, identification, and verification that the material identified on the material release has been received, along with documentation, evidence of related inspections, completion testing required by the purchasing documents, and that the proper pressure reading on the gauge of the SGSA's nitrogen blanket used to protect the tubing was as specified.

The inspector walked-down the stored SGSA's with the cognizant QSD engineer and verified that the inspection requirements outlined in the procedure QSD-3.08 were satisfactorily fulfilled and that the SGSA's were properly stored protected and secured.

1.4 Chronological Overview of the QSD's Coverage of B&W of Canada (BWC) Activities

12/86	QA began its activities with approval of the Northeast Utilities Service Company (NUSCO) specification for the design and fabrication of their SGSA's No. SP-ME-522, Revision 0.
08/87	Reorganization and consolidation of NUSCO's QA/QC to QSD.
02/88	Issue purchase order 865300 to BWC
02/88	(NUSCO)'S QSD performed a pre-award audit of BWC
11/88	NUSCO'S QSD witnessed a demonstration of BWC for ASME certification
02/89	NUSCO hired a full-time Resident Inspector to follow-up and witness approximately 450 pre-established quality control hold points
04/87	NUSCO'S QSD witnessed the fabrication of the tube sheet metal in Kobe Steel of Japan
09/89	NUSCO'S QSD witnessed the fabrication of the tubes in Valinox of France
as req'd	NUSCO'S NDE level III witness specific NDE activities in BWC
01/91-02/91	NUSCO'S QSD began to review the vendor (BWC) supplied documentation. At this point two additional QSD inspectors were sent to Canada to assist the resident inspector.
02/91-04/91	NUSCO's resident inspector witnessed of the Hydrostatic Test
03/91-04/91	NUSCO'S QSD increased their review effort of the vendor documentation. At this point four additional QSD inspectors were sent to Canada to assist in the vendor documentation review.

03/91	NUSCO'S QSD started the design review activities of BWC with one QSD auditor and two subcontracted auditors.
06/91	NUSCO resident inspector released the SGSA # 1
06/91	NUSCO resident inspector released the SGSA # 2
06/91-11/91	NUSCO resident inspector released the internals of the S/G drum.

Based on the review of the QSD's organization, responsibilities and its involvement in the SGRPs with respect to the fabrication and receipt inspections of the SGSA's, the inspector concluded that the QSD is performing an adequate and acceptable role in assuring the safety and the quality of S/G replacement activities.

1.5 ASME Code Section XI Preservice Nondestructive Examination and Testing

Upon receiving the SGSA's, NUSCO Engineering, in coordination with NUSCO Inservice Inspection (ISI) personnel, overviewed the NDE contractor in performance of NDE volumetric (ultrasonic examinations UT) in accordance with the ASME Code section XI, subsection IWB-2000 requirements for class I components, table IWB-2500-1 examination categories and subsection IWC-2000 requirements for class 2 components.

ASME Section XI (table IWC-2500-1, Category C-A) requires that one S/G have a preservice or inservice inspection of selected vessel welds. The inspector found that NUSCO has performed ultrasonic examinations (UT) on all the secondary butt welds for both SGSA's.

Table IWC-2500-1 of the ASME Code, Section XI requires volumetric examination to be performed on shell circumferential welds at gross structural discontinuities. NUSCO performed volumetric examination (UT) on 100% of the shell circumferential welds. These inspections were performed in the site storage facility. The licensee has planned further ASME Section XI volumetric examinations which shall be performed after the installation hydrostatic test on one steam generator.

In addition to the above, ASME Section XI volumetric tests outlined in sub-sections IWB and IWC were performed with indications exceeding 20% of distance-amplitude-correction (DAC). At the present, ASME Section XI requires the reporting of indications exceeding 50% DAC. This means that the licensee has performed its UT with 30% more sensitivity than the code requirements for the detection of discontinuities.

For the S/G tubing, ASME Code table IWB-2500-1 calls, for volumetric examination to be governed by the specific plant Technical specifications. In this particular case, the licensee eddy current tested 100% of the tubes. No major findings were detected as a result of the eddy current test.

Based on the specifics described above, the inspector found that the licensee has performed examinations beyond the code requirements. Therefore, the pre-service inspection of the SGSA's was acceptable.

1.6 Cutting and Fitup Activities

Dimensional Background Information for Fitup

In 1969, dimensions were obtained through the use of traditional surveying techniques to establish the as-built condition of the steam generators at the Combustion Engineering (CE) manufacturing facility in Chattanooga Tennessee.

In the Winter of 1989, Babcock and Wilcox Canada contracted CEP Engineering to verify the S/G As-Built information and to obtain dimensional information at the proposed transition cone cut elevation. To accomplish this As-Built verification, traditional surveying and mechanical templating were used.

In the Summer of 1990, the licensee's lead contractor responsible for the installation of the SGRP contracted NNI to perform photogrammetric survey of the new S/Gs at the BWC's manufacturing facility. This was followed by a photogrammetric survey of the old S/Gs and their associated piping at the Millstone site.

During the actual S/G replacement, the licensee's lead contractor will use NNI to locate the weld preparation machines to obtain proper fitup between the new S/Gs and current piping using theodolites.

The inspector focused his review on the methods and processes used to obtain dimensions for the fit-up of the new S/Gs and their associated piping. For this purpose, special attention was given to industrial photogrammetry. The

licensee explained this method, which is defined as the science of obtaining information about physical objectives through processes of recording, measuring, and interpreting photographic images. This recording of photographic images is accomplished with three tools: a camera, film, and targets.

The licensee added that the camera used is similar to a transit or theodolite in that it allows one to determine the equivalent of horizontal and vertical angles to specific points of interest. The camera, however, differs from its counterparts in that the directions to all points of interest are recorded simultaneously with a single "click" of the shutter, and these directions are calculated in the laboratory away from the site. Although, this is an acceptable general explanation of the principles of photogrammetry, the licensee was not able to explain the general principle of how this photogrammetry was used for obtaining measurements and establishing points of reference to be used in cutting and fitting of the S/Gs. The inspector requested a specific written procedure and/or instructions, describing step by step the specialized contractor's plan of action in performing the measurements using photogrammetry prior to, during, and after the replacement.

The inspector concluded that the licensee has done substantial preparation to assure the determination of adequate measurements to be used in the cutting and fitting of the steam generators (S/Gs) and associated pipe connections. Although the licensee has selected an experienced and highly specialized firm to perform these critical measurements, the inspector noted that the written instructions controlling this work were not available on site at the time of this inspection. The inspector requested that the licensee establish the need for having these written instructions clearly describing the measurement method readily retrievable at the site.

1.7 Mockup Training Observation

The inspector, along with the licensee's cognizant engineer, walked down the project mockup and training facility to observe the demonstration of the tool to be used to cut the steam drum assembly from the lower assembly above the centerline of the existing transition cone girth weld. During the demonstration, no adverse conditions were identified. This mechanical cutting tool appears to be effective.

1.8 Conclusion

Based on the inspection results, the inspector concluded that the licensee has good control over the activities involved in the steam generators replacement affecting quality through a dedicated steam generator replacement project (SGRP) staff and overview by its Quality Services Department. This was evident in the control of the fabrication of the SGSA's and site receipt inspections. In terms of the ASME Code Section XI preservice nondestructive examination and testing, the inspector found that the licensee's contractors performed these examinations beyond the code requirements. During this work, the licensee's engineering and inservice inspection department had adequate involvement in overviewing and coordinating the implementation of the preservice inspections and testing. In regard to measurements to be used in the cutting and fitting of the steam generators (S/Gs) and associated piping connections, the inspector noted a need for the licensee to have written instructions clearly describing the measurement method readily retrievable at the site.

2.0 Management Meetings

Licensee management was informed of the scope and purpose of the inspection at the beginning of the inspection. The findings of the inspection were discussed with the licensee representatives during the course of the inspection and presented to the licensee management at the March 27, 1992 exit meeting. See attachment 1 for attendance.

ATTACHMENT 1

Persons Contacted

NORTHEAST UTILITIES

* R. Necci, Project Manager
* J. Resetar, Engineering Supervisor
* S. Orefice, Project Engineer
* F. Libby, Quality Control Services Supervisor
* B. Strizzi, Quality Control Senior Engineer
  J. Rhodes, Senior Mechanical Engineer
  F. Kocon, Senior Civil Engineer
  A. Silvia, Senior Welding Engineer

UNITED STATES NUCLEAR REGULATORY COMMISSION

* A. Asars, Resident Inspector
  D.Dempsey, Resident Inspector

* Denotes those present at the 03-27-92 exit meeting.