

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-220/89-28
50-410/89-24

Docket No. 50-220
50-410

License No. DPR-63
NPF-69

Licensee: Niagara Mohawk Power Corporation

Facility Name: Nine Mile Point Nuclear Station Units 1&2

Inspection At: Scriba, New York and Syracuse, New York

Inspection Conducted: October 23-27, 1989 and December 1 through
December 31, 1989

Inspectors: H. J. Kaplan
H. J. Kaplan, Senior Reactor Engineer,
Materials & Processes Section, EB

1/19/90
date

for S. Chaudhary
S. Chaudhary, Senior Reactor Engineer,
Materials & Processes Section, EB

1/29/90
date

Approved by: J. R. Strosnider
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Inspection Summary: Inspection on October 23-27, 1989 and December 1 through December 31, 1989 (Report Nos. 50-220/89-28 and 50-410/89-24)

Areas Inspected: An announced inspection was conducted to review several open items from Unit 1 including items involving the torus wall corrosion monitoring program and the structural integrity evaluation of pipe supports. Also, a new item regarding the failure of electromatic relief valve bellows was reviewed.

Results:

The following open items were closed: Item 88-09-03, regarding ISI examinations not completed during the first ten year inspection interval; Item 87-11-02, regarding reactor vessel weld inspections; and item 88-09-01, regarding procedures for making wall thickness measurements. Item 89-03-01, regarding certification of NDE personnel was reviewed for both Unit 1 and Unit 2 and remains open.

The inspector reviewed the licensee's pipe support structural integrity evaluation program and determined that, with the exception of some minor work, the licensee had repaired or modified pipe supports to meet design safety margins. On this basis item 50-89-19 was closed.

The inspector reviewed the licensee's report "Assessment of Torus Wall Thickness" (MPR-1152), dated September 1989, and concluded that the plant could be safely operated one more fuel cycle but that surveillances of the torus should continue at intervals not greater than six months as previously committed to by the licensee. These inspections should continue until appropriate actions have been taken to assure long term integrity of the containment torus.



DETAILS

1.0 PERSONS CONTACTED

Niagara Mohawk Power Corporation

- R. W. Hammelman, ISI Coordinator
- M. A. Dooles, Supervisor Nuclear Compliance
- P. E. Francisco, Test Manager Licensing
- R. F. Oleck, Project Manager
- I. Weakley, Audit Coordinator
- D. Chieu, Development Program Manager
- * L. M. McNeer, Project Manager

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- H. J. Kaplan, Senior Reactor Engineer
- S. Chaudhary, Senior Reactor Engineer

* Not present at Exit Meeting.

2.0 REVIEW OF PREVIOUS INSPECTION FINDINGS

2.1 50-220/88-09-03 - Examination Not Completed During the First Ten-Year Inspection Interval

Subsequent to the end of the 1986 refueling outage, which was the last scheduled outage in the first ten-year inspection interval, the licensee reported that a number of required examinations were not completed. As a result, the licensee performed a detailed review of the ISI program to ascertain the inspection deficiencies and to identify appropriate corrective actions. This was reviewed previously in NRC Region I inspection 50-220/89-09. The status of the licensee's ISI effort during this NRC inspection as documented in MD-88571, is 87% complete and covers approximately 3165 items. Completion of this program should satisfy the ISI requirements for the first ten year interval and the first period of the second ten year interval inspection periods. This item is closed.

2.2 50-220/87-11-02 - Feasibility Study for ISI of Reactor Pressure Vessel (RPV) Beltline Welds

With regard to the ISI inspection of the reactor vessel beltline weld, the licensee provided documentation that showed that a commitment had been made to install a robotic ultrasonic system for the 1992 outage. Two systems offered by Southwest Research and Westinghouse/TRC of Sweden which are designed for remote inspection are presently being evaluated. The initial phase will require a feasibility study and proof-of-principle demonstration. It is noted that examination of reactor vessel beltline welds in BWRs will be addressed generically in 10 CFR 50.55a. This item is closed.



2.3 50-410/89-03-01 - Certification of NDE Personnel

This item involved a finding concerning SNT-TC-1A requirements regarding the type of examination employed for certification of NDE personnel. The licensee employed an "open book test" instead of a "closed book test". The licensee is presently evaluating SNT-TC-1A's response to another licensee's inquiries regarding this issue. It appears that the licensee will be required to take some corrective action to conform to the "closed book" requirements of SNT-TC-1A. This item remains open.

2.4 50-220/88-09-01 - Torus Wall Thickness Measurements

This item involved the inspector's observation that the wall thickness measurements which were taken to monitor pipe wall thinning as part of the erosion-corrosion program and wall thinning in the torus due to corrosion were not consistently reported or properly evaluated. To correct this deficiency, the licensee developed procedure 3-N2.1-M22.4, Rev. 0 - "NP-1 Wall Thickness Measurements Plan", dated April 3, 1989, which was used in conjunction with UT Examination Procedure UT-6-06, Rev. 3 for measurements of the torus made in August 1989. The inspector reviewed the subject procedures and found them to be explicit in terms of providing consistent and valid data for use in monitoring the wall thickness as affected by corrosion and the impact on maintaining minimum design wall thickness attendant with reasonable safety factors. (See Section 3.1) This item is closed.

2.5 IR-50-89-19 Structural Integrity Evaluation of Pipe Supports

The inspector reviewed the status of the structural integrity assessment program. The technical adequacy and acceptability of the program had been reviewed by the NRC in a previous inspection (IR 50-220/89-19). This inspection focused on the program status and acceptability of the resolution of identified problems. The inspector reviewed documentation and held discussions with the licensee's engineering and management personnel to determine the status of the program.

Findings

Based on the above reviews and discussions, the inspector determined that with some minor exceptions, the structural integrity evaluation program was complete. The licensee has inspected all large bore pipe supports (100%) in the plant in the safety related systems, and the supports have been evaluated to assure originally required design safety margins are satisfied. Any concerns identified in this evaluation were resolved by more detailed analyses, repair or modification of supports to meet the original design margins. The licensee's evaluations of these supports are documented in three reports: ISI Pipe Supports, #02-1120-1453; Other Supports, #02-1120-1464; and, Small Bore Pipe Supports, #02-1120-1430. The inspector reviewed the above reports to assess the adequacy of evaluations and related resolutions of support problems, to determine if the evaluations were sufficiently detailed and accurate, and to verify that repairs and modifications of supports were adequate to assure design safety margins.



Conclusions

The licensee has adequately evaluated and repaired or modified pipe supports, if necessary, to meet the design safety margins. With minor exceptions, the work is complete. No deficiencies were identified. This item is closed.

3.0 OTHER ISSUES

3.1 Torus Wall Thinning

The inspector reviewed a recent report providing an assessment of the torus by MPR in September 1989 regarding its thickness as related to minimum design and calculated corrosion rate. The assessment which was performed by MPR and documented in MPR-1152 was based on ultrasonic measurements taken from the O.D. and visual examination of the I.D. surface at the waterline level.

Findings

The report concluded that even though it was difficult to trend the corrosion rate with certainty because of the inconsistencies and the scatter associated with the ultrasonic wall thickness data taken over the years by different ISI organizations, the use of a conservative corrosion rate of .002 inches per year coupled with the visual observations of the I.D. surface safely demonstrates sufficient thickness for at least one further operating cycle. On the basis of .002 inches per year corrosion rate, the report concluded that the minimum required wall thickness would not be reached for 2.5 years. The inspector reviewed photographs and plastic replicas of the I.D. surface and verified that the corrosion below the waterline appeared to be relatively uniform with shallow dimples (pits), whereas above the waterline the corrosion appeared to be greater, with larger dimples than observed below the waterline. The condition below the waterline is considered to be representative of the condition near the bottom dead center of the torus where the calculated stresses are the highest, and coincidentally where the thinnest wall thickness measurements were found (Bay #17). The current wall thickness in Bay #17 near the bottom center was .452 inches which is .005 inches above the .447 inch minimum wall thickness. The .452 inch value was based on an average of sixty-five thickness measurements. Only one individual determination (.448 inch) in Bay #17 fell below the .447 inch minimum wall thickness value after being reduced by the calculated corrosion rate of .002 inches per year. One other individual determination in Bay #10, after being reduced by the corrosion factor, fell below the .447 inch minimum wall thickness. The licensee reported that a recent review of these individual determinations by Teledyne Engineering Services indicated that they would not affect the integrity of the torus based on local stress criteria. The licensee indicated that they are considering installation of 360° circumferential stiffening rings during the next refueling outage to reduce the torus shell stresses. In addition they are evaluating several methods, including coatings, metal spray and cathodic protection to retard or prevent further corrosion of the torus.



Conclusion

Based on review of the licensee's examinations and analyses, and examination of the I.D. surface replicas it was concluded that the plant could be operated safely for one more fuel cycle. It is noted that the licensee has committed to periodic torus wall thickness examinations and that the licensee's Procedure 3-N2.1-M22.4 presently requires thickness measurements to be taken every six months commencing April 30, 1989. It is also noted that the torus is inerted during operation.

3.3 Electromatic Relief Valve Bellows

The inspector visually examined six type 321 stainless steel electromatic relief valve bellows recently removed because of defects found during an inspection. The bellows are located on down stream side of the electromatic relief valves to account for thermal expansion in discharge line to the suppression pool. The relief valves and bellows are located in the drywell and are designed to be activated in the event of an accident to control reactor vessel pressure. The defects were of two types: (a) cracking or separations, coupled with corrosion at the weld juncture between the carbon steel flange and the stainless steel convolutions, and (b) fine cracks on the convolution surfaces that appeared to be due to stress corrosion cracking. The inspector reviewed the licensee's root cause analysis which concluded that the failure was due to fatigue, brought on or assisted by mechanical and corrosion factors. The bellows were found to lack adequate flexibility as well as being misaligned during installation. The weld between the flange and the convolution because of its bimetallic nature was very susceptible to corrosion due to evaporation and concentration of impurities that resulted from leaking valve seats. The replacement bellows were being redesigned to improve the mechanical deficiencies and eliminate the corrosion problem. The new design eliminated the weld between the flanges and convolutions, and changed to more corrosion resistant materials (Inconel 690 convolution and 304 stainless flange). Three of the six bellows will be inspected and cleaned each fuel cycle. The licensee reported that they will perform a metallurgical investigation of one of the failed bellows to confirm the apparent deficiencies.

4.0 EXIT MEETING

An exit interview was held on October 27, 1989 with members of the licensee's staff noted in Paragraph 1. The inspector discussed the scope and findings of the inspection. No violations or deficiencies were identified. At no time during the inspection was written material provided to the licensee by the inspector.

