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U.S. Nuclear Regulatory Commission
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Washington, D. C. 20555

Perry Nuclear Power Plant
Docket No. 50-440
Response to Notice of
Violation 50-440/90020-01

Gentlemen:

This letter acknowledges receipt of the Notice of Violation contained within Inspection Report 50-440/90020, dated December 14, 1990. This report identified areas examined by Messrs. P. Hiland, P. Pelke, A. Hsia, D. Schrum, F. Maura, R. Musser, and G.O'Dwyer during their inspection conducted from September 20 through November 16, 1990, of activities at the Perry Nuclear Power Plant, Unit 1.

Our response to Notice of Violation 50-440/90020-01 is attached. Please call should you have any additional questions.

Sincerely,

Michael D. Lyster

MDL:SC:njc

Attachment

cc: NRC Project Manager
NRC Resident Office
R.C. Knop - USNRC, Region III

IE01

50-440/90020-01
Restatement of Violation

10 CFR Part 50, Appendix B, Criteria XVI requires, in part, that in the case of significant conditions adverse to quality, measures shall be taken to assure that the cause of the condition is determined and corrective action taken to preclude repetition.

Contrary to the above, since July 1987 the licensee's corrective measures have not been adequate to assure that the causes of excessively leaking main steam isolation valves (MSIVs) were determined and that corrective action was taken to preclude repetition. As a result, in September 1990, for the third consecutive outage (1987, 1989, 1990), the four main steam lines exceeded their maximum allowable leakage rate by the largest margin to date.

This is a Severity Level IV violation (Supplement I) (50-440/90020-01).

Background

We concur that the corrective actions taken in the past have not succeeded in enabling the main steam line (MSL) penetrations to pass local leak rate testing. The methods utilized in the past primarily consisted of reworking and rebuilding the valves in a manner similar to that used to restore any safety related valve. Leak rate test failures continued to occur however, for several different reasons including valve design, oxide layer buildup on the valve seats, failure to adequately direct valve manipulations during shutdown activities and inaccuracies associated with the leak rate testing methodology. Corrective actions for each of these problems are discussed below.

The apparent increase in leakage rates each outage is somewhat misleading. The testing equipment used to obtain these readings was changed between the 1987 and 1989 outages. The equipment used in 1989 was able to quantify leakage 10 times greater than that used in 1987; therefore, reported values in 1989 were larger. Pressure decay methods were used to obtain the as-found data in 1990 and leakage values were calculated from these measurements adding additional uncertainty to the calculations. Although the accuracy of some test data may not support a conclusion that the leakage is getting worse, we do agree that the leakage was excessive, and we have corrected that condition.

Corrective Actions Taken and Results Achieved

The corrective actions taken to date include valve repair and rebuilding as described in Perry Nuclear Power Plant Licensee Event Report (LER) 90-025-01, dated November 23, 1990. Extra effort was made to restore the six Main Steam Isolation Valves that required disassembly to their original condition.

Repairs on the six valves included replacing the poppet on one valve and replacing the stems on five valves. The seats on two of the MSIV's were completely removed and replaced, resulting in as-left leakage being the lowest ever achieved for these valves. The guide ribs on three of the valves were rebuilt and the seating surfaces on all of the valves were cleaned and/or lapped as appropriate. The pilot seat and stem contact areas were examined on all six valves and three of them were reworked.

While replacing the seats on the two MSIV's discussed above, the areas below the seats were counterbored on both valves in preparation for potential future modifications. In addition to these repairs, all of the springs from one MSIV were tested to verify their spring constants. They all performed satisfactorily As stated in your Inspection Report, internal measurements were taken of all critical dimensions on the six valves that were disassembled including radial clearances between the valve bore and the disc/piston assembly (with the exception of the "A" outboard MSIV). Additionally, a new, more accurate type of machine was used to perform seat repair during the second refueling outage. This machine was chosen because other plants have reported better success with it than with the machines previously used.

In order to respond to all aspects of main steam line penetration leakage the Main Steam Line Penetration Leakage Task Force was formed in November, 1990, following the recent valve repairs. The charter for this multi-disciplined group is to increase the reliability of the MSL penetrations to ensure repeatable and acceptable LLRT results. The task force will evaluate all aspects of the penetration leakage problems, including design, operation and testing methodology of the MSIV's and other boundary valves.

In addition to these task force activities, the BWR Owners Group is forming an MSIV Maintenance Committee. The tasks to be addressed by this Committee include internal valve maintenance inspection, maintenance procedure library development, actuator maintenance, packing leakage reduction and EQ evaluation of consumable parts. We intend to support this effort and to actively participate on the Committee.

Corrective Actions to Avoid Further Violation

The corrective actions to be taken to avoid further violation correspond to the four problem areas discussed above:

Oxide Layer Buildup

The potential for oxide layer build-up on valve seating surfaces, and its effect on valve leak tightness have been discussed extensively within the industry. It is believed that periodic stroking of the MSIV's aids in maintaining the cleanliness of the seating surfaces, thereby minimizing frictional effects during valve closure. As described in LER 90-025-01, procedures are being revised to require the quarterly cycling of these valves during the next operating cycle. For the longer term, the design modifications planned for the MSIV's should be sufficient to overcome the frictional effects of the oxide layer, eliminating the necessity for continued valve stroking.

Control of Closing Conditions

During this previous outage, a controlled fast closure of all MSIV's was not performed prior to the LLRT. Although it was intended to fast close all of the MSIV's while hot and to not disturb their position until testing was completed, operational conditions and communication problems resulted in only two of the MSIV's being fast closed and six of the MSIV's being reopened and closed again during the cooldown. It is believed that the failure to obtain and preserve the post-accident conditions for the MSIV's (i.e., fast stroke under normal operating temperatures) contributed to the inconsistent data obtained during the LLRT's. The Main Steam Line Penetration Leakage Task Force is evaluating methods for controlling valve closure during shutdown and cooldown and recommendations from this task force will be implemented as appropriate prior to the next refueling outage.

Testing Methodology

The testing methodology is also being evaluated by the task force. It is anticipated that any recommendations resulting from task force efforts will be implemented prior to the next LLRT such that improvements to the testing methodology will eliminate several of the testing inaccuracies and the valves will have their best opportunity for successfully passing the LLRT.

Design

Other plants have achieved successful LLRT results with our present valve design and our own data suggests that this design can be made to work. Two valves required no rework this outage and 2 other valves experienced leakage only because of burrs on the pilot poppet seat. Although we believe the present design can successfully pass future LLRTs, the modifications described in LER 90-025-01 are being purchased and planned to further enhance valve performance. The modifications include a poppet anti-rotation device, an improved nose guide poppet and a cover modification for the top seat of the poppet to minimize vibration of the poppet when the MSIV is open. Although previously described corrective actions are expected to significantly improve valve performance, these modifications will be installed on any valves requiring rework for leakage problems during future outages. In addition to the MSIV's, the other valves within the MSL penetrations (which may be major contributors to overall penetration leakage) are being evaluated by the Main Steam Line Penetration Leakage Task Force to determine design or operational changes that can be made to improve their leak tightness.

Date of Full Compliance

As a result of the work performed during the last refueling outage, all MSL penetrations were determined to be in full compliance with Technical Specification requirements by leak rate testing between November 1 and November 12, 1990.

Previous valve performance and test failures have been thoroughly evaluated to identify the causes of the valve failures. It is anticipated that the corrective actions taken to date, the periodic cycling of the valves, control of the valve closing conditions and testing improvements will be sufficient to preclude valve leak rate failures during the third refueling outage. This event was fully documented and full compliance with 10CFR50, Appendix B Criterion XVI was achieved with the submittal of LER 90-025-01, dated November 23, 1990.

In your cover letter you requested that our response on this subject describe the corrective actions that have been taken to ensure that the MSIV's remain within their Technical Specification leakage rate limits throughout the entire operating cycle. The valve refurbishment performed this past outage along with the quarterly valve cycling and the anticipated recommendations from our task force on closing sequence and testing methodology are expected to yield results within Technical Specification limits during the next performance of the LLRTs. In the longer term, we believe that the MSIV modifications being planned, along with other possible design change recommendations from our task force, will eliminate the conditions which are conducive to our valve leakage problems.

NJC/CODED/4324