

U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
REGION IV

Report No. 50-313/77-19

Docket No. 50-313

License No. DPR-51

Licensee: Arkansas Power and Light Company
P. O. Box 551
Little Rock, Arkansas 72203

Facility Name: Arkansas Nuclear One, Unit 1

Inspection At: Arkansas Nuclear One Site, Russellville, Arkansas

Inspection Conducted: October 26-28, 1977

Inspector:

T. F. Westerman
T. F. Westerman, Reactor Inspector

11-9-77
Date

Approved By:

G. L. Madsen
G. L. Madsen, Chief, Reactor Operations and
Nuclear Support Branch

11/9/77
Date

Inspection Summary

Inspection on October 26-28, 1977 (Report No. 50-313/77-19)

Areas Inspected: Special, announced inspection in followup of allegations relative to water hammer in the main steam line. Information relative to this matter had been identified during a USGAO site audit of September 19-23, 1977. This inspection involved 25 inspector-hours on-site by one (1) NRC inspector.

Results: No items of noncompliance or deviations were identified.

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DETAILS

1. Persons Contacted

Arkansas Power & Light Company

- *J. Anderson, Jr., Plant Superintendent
- *G. Miller, Assistant Plant Superintendent
- *B. Terwilliger, Supervisor Plant Operations
- T. Cogburn, Nuclear Engineer
- *L. Humphrey, Quality Assurance Engineer
- *L. Alexander, Quality Control Engineer
- S. Strasner, Quality Control Inspector
- D. Hamblen, Quality Control Engineer
- *J. McWilliams, Planning and Scheduling
- R. Capehart, Reactor Operator

USGAO

- *T. Miller, USGAO Consultant
- *J. Hatcher, USGAO, Washington, D.C.

*Attended Exit Interview

2. Inspection Basis

The inspection was based on information which had been brought to the attention of USGAO during their site audit of September 19-23, 1977 by several individuals. The context of this information was as follows:

There was an alleged incident involving water hammer caused by a rapid shutdown and cooldown in the period of January through March 1977. The rapid cooldown may have involved the injection of cold water. It was further alleged that the shock resulted in damage which required extensive repairs and that the main steamline was left in a misaligned condition. The feed through area and the vicinity of the main steam isolation valves were cited as areas where damage had occurred. Hanger damage was alleged to have occurred into the containment.

3. Visual Inspection

The initial inspection effort by the inspector, in the accompaniment of USGAO and licensee personnel, was to conduct a visual inspection of the main steam line from the containment penetration area out to the main turbine stop valves.

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During this part of the inspection, the inspector noted the following:

- a. There were signs of recent repair and modification in an area under the ICW - Coolers (Elevation R343.6) where the main steam lines pass into the turbine building. On the "A" main steam line at wall opening MK 35-6, there was evidence that the opening had been modified by the removal of concrete, regrouting, and modification of the impact plates running through the opening. There was evidence of the modification of the impact plates in wall opening MK 35-5. There was apparent misalignment and/or shifting of "A" main steam line in the vicinity.
 - b. There was repair evident to hangers and snubbers out in the turbine building. There was evidence of anchor bolt replacement, concrete repair, and anchor plate modification and/or repair.
 - c. There was no evidence of damage, recent repair, or modification in the vicinity of the main steam line isolation valves and/or the area of containment penetration. This is the only portion of the main steam line outside of the containment that is "Q" listed (Safety Related Seismic Class I Pipe). There was some evidence that an earlier modification had been made to lower the saddle for a MS line; however, there was no documentation to support that this had been a recent modification.
 - d. There was a nut missing on a periphery support anchor bolt and two anchors which extended out of the concrete in the vicinity of the main steam line penetration into the containment. This support was not associated with the main steam line. This condition was brought to the attention of the licensee and RIV will follow up on this item at a subsequent inspection.
4. Review of Main Steam Line Maintenance Records Related to the January - February - March 1977 Refueling Outage

The following specifics were identified during the inspector's review:

- a. The initial identification of a Main Steam (MS) hanger problem was made on December 30, 1976 (Plant Trouble Report 529). It was reported that MS pipe hanger from "A" Once Through Steam Generator (OTSG) to #4 throttle valve is "broken and the pipe is not being supported."

The inspector was unable to determine the chronological sequence in which the remaining damage to the main steam line supports was identified. There was, however, detailed records of the repair and/or modifications that had occurred.

b. The hanger work was performed by the licensee's contractor personnel in accordance with Work Request Permits (WRP's) 3932-R-1 and 3946-R-1. Modifications were performed in accordance with Design Change Requests (DCR's) 508, 508A and 508B. A summary of the work which was performed is as follows:

- Hanger MS 135 - Size 17, Type A hanger was replaced with Size 18, Type B and a stiffner was added to the support plate.
- Hanger MS 132 - Size 56, Type A hanger was replaced with Size 63, Type C.
- Hanger MS 84 - Stiffner added to support plate.
- Hydraulic Snubber HS 86 - Replaced base plate that pulled loose, stiffner added to base plated, concrete repaired and anchor bolts replaced.
- Hydraulic Snubber H 587 - Stiffner added to base plate and anchor bolts replaced.
- Hydraulic Snubber HS 85 - Concrete repaired and anchor bolts replaced.
- Hydraulic Snubber HS 81 - One anchor bolt replaced.
- Hydraulic Snubber HS 76 - 3 of 15 anchor bolts replaced

The inspector did note that DCR 508 (2/28/77) stated the following reason for the modifications which were made:

"Large displacements have occurred on the main steam and surrounding lines due to support failures. Failure and/or support movement has been identified with HS 85, 86, 87 and MS 89. It is believed that the failure of one or two supports or hangers caused by movement of the main steam lines led to the failure of other supports and hangers on the main steam line and branching lines."

c. In addition to the snubber/hangers identified in the Details 4.b of this report, there were contractor field inspection reports which documented anchor bolt inspection of the following snubber/hangers:

HS 83
HS 7
HS 79
HS 6
HS 78
HS 84

The anchor bolts for these snubbers/hangers were found to be in conformance with the contractor specification C 2305.

- d. There was also repair work performed during this same outage (January - March 1977) which relates to MS line alignment. This work was done in accordance with WRP 3937-R-1 by the licensee's contractor. Modifications were performed in accordance with DCR 521 (3/25/77). A summary of the work which was performed is as follows:
- . Hanger MS 91 was extended out about two inches to the east to allow the hanger to be under the saddle on the line and allow the line to move 1-3/4 inches to the west.
 - . Hanger MS 92 was extended out about two inches to allow the hanger to be under the saddle on the line and to allow the line to move 1-3/4 inches to the west. The hanger itself was damaged and was replaced by another hanger of the same size.
 - . The cold settings were increased on MS 87 and 86 to hold steam line EBD-3-6 off of the fire lines.
 - . Two elevation surveys were conducted on the MS lines.
 - . Penetration MK 35-6 was reformed to allow the MS line clearances as described per DCR 521. Insulation was removed, the penetration was jack-hammered to allow clearance on the bottom, and new impact plates installed which were connected to the concrete with four 3/4" X 6" phillips wedge anchor bolts. The plate area was grouted underneath to support the compressive forces.
 - . Penetration MK 35-5 required some work to allow the MS line clearances as described per DCR 521. The work involved cutting the bottom impact block thinner to allow for the proper clearance.
- e. In addition to the In-service Inspection (ISI) performed during the outage, there was additional Ultrasonic Inspection performed by the licensee's contractor of suspect high stress welds out in the turbine building. This inspection was performed in accordance with the licensee's current ISI procedures. The contractor findings were as follows:

. Contractor Letter of April 2, 1977

Welds EBD-1-7 and EBD-A1-140. Recordable indications only reported, welds were acceptable.

. Contractor Letter of March 8, 1977

Weld 81, 82, 85, EBD-1-10 and EBD-1-11. Recordable indications only reported, welds were acceptable.

The results of these inspections do not indicate that there was any suspect damage to the MS line.

- f. The inspector also found that as requested by Job Order (2/5/77), there was a 100% visual inspection in accordance with licensee procedure 1304.84 of all MS line hydraulic snubbers. Except for 86 and 87 (work in progress), there were no inoperable MS line snubbers either inside or outside of the containment identified.
- g. The inspector did not find any record of repair or modification within the boundary of the containment MS isolation valves during the January - March 1977 refueling outage.
- h. Engineering's review of the MS line displacement is still in progress. The licensee was informed that RIV will continue to follow up on this matter.

5. Review of Plant Operating Records

The inspector reviewed the plant records relating to the January 27, 1977 plant cooldown (Cooldown #30). This included the cooldown curves plotted by the licensee. The inspector reviewed the MS Recorder PR 26 34 chart for the period of December 26, 1976 through January 1977. During this period, only one significant perturbation in steam pressure occurred on January 10, 1977. The perturbation was also reflected in the nuclear power recorder NR 0514 and the Gross MW electrical recorder. The cause was identified as a false indication of MS header pressure due to freezing of the sensing line to the Integrated Control System. The line had physically froze due to the colder than normal winter. The MS pressure (PR 2634) during the initial portion of the January 27, 1977 cooldown indicated no abnormality down to 600 psig (the lower range of the recorder). The rate of cooldown, as shown by the licensee's record, was within the cooldown limits in the Facility Technical Specifications, figure 2.1.1-2-2. The shift supervisor's log for the period of January 27 - February 1, 1977 indicated no abnormalities occurred during the cooldown.

6. June 15, 1976 Water Hammer Main Steam Line

In follow up to the records which indicated there had been repair and modification to the MS line in the turbine building due to apparent MS line movement, the inspector questioned the licensee with regard to possible water hammer in the MS line.

The inspector was informed that there had been a water hammer back on June 15, 1976. This had occurred during a plant heatup with the primary plant temperature at 415°F. The licensee stated that the MS containment isolation valves had not been opened as early in the plant heatup as had been the previous practice. These are large 36 inch valves which have an internal bypass that opens when the main control switch is placed in the open position. There is a five second delay before the main valve goes open. The licensee stated that in an attempt to warm up the MS line, the MS Containment Isolation switch was being cycled open and closed in an approximate two second cycle. This allowed the internal bypass to open and close without opening the main valve. The "A" MS Containment Isolation Valve apparently cycled open and shut during this process which admitted a slug of hot steam into the then partially warmed "A" MS line. The licensee stated that the attempt to warm the MS line had been in progress approximately five hours before the water hammer occurred. The licensee stated that there had been no formal inspection of the MS line following the incident. The inspector was also informed that the MS line was subsequently warmed using steam from the auxiliary boiler. Temporary lines were rigged from the auxiliary steam system to the MS line. Following the warming of the MS line in this fashion, the MS isolation valves were opened and the plant heatup continued. The information in the June 15, 1977 Shift Supervisor's Log indicated that the heatup was discontinued at 0620 and the "A" MS stop valve had opened at 1610 and the "B" MS stop valve was opened at 1630. There was no apparent log entry identifying that a water hammer had occurred.

The inspector did express concern to the licensee that the water hammer had not been logged. The licensee did state that Plant Procedure 1102.02 would be reviewed and revised accordingly to provide timely opening of the MS stop valves. The cycling of the MS stop valves was initially identified by the inspector as an apparent item of noncompliance, since a temporary change to 1102.02 had not been issued as prescribed by the Facility Technical Specifications. It was subsequently concluded by the inspector during a phone call to the plant on October 31, 1977 that cycling of the MS stop valves was the normal mechanism to equalize around this valve and therefore this issue is considered closed. From the standpoint of reportability, the inspector has concurred with the licensee that the water hammer is not reportable as a Licensee Event Report since it did not involve the safety related portion of the MS line.

However, in response to a September 2, 1977 NRR letter to AP&L which requested information from each licensee relating to water hammer, the licensee was informed that this incident was considered reportable to NRR.

7. Exit Interview

An exit interview was conducted on October 28, 1977 following completion of the inspection. At the interview, the inspector discussed the findings indicated in the preceding paragraphs. Specifics discussed included the following:

- a. In response to the alleged information described in the Details, paragraph 2, of this report, the inspector made the following statements:
 - (1) There had been an apparent water hammer in the MS line; however, this incident had occurred in June 1976 and not in January-March 1977 as alleged.
 - (2) The January 27, 1977 shutdown and cooldown appears, from the records reviewed, to have been orderly.
 - (3) There was evidence that there had been repairs to the MS line in the turbine building resulting from line movement.
 - (4) There was some apparent deformation and misalignment of the MS line in the feed through area in the turbine building (Elevation R 343.6).
 - (5) There was no evidence of recent repairs or damage in the vicinity of the MS Containment Isolation Valves and/or in the area of containment penetration.
 - (6) The record of inspection of hydraulic snubbers by the licensee during the January - March 1977 refueling outage within the containment, did indicate that there were not any inoperable MS line hydraulic snubbers detected.
- b. The licensee acknowledged that Plant Procedure 1102.02 would be reviewed and revised accordingly to clarify the proper sequence for opening the MS stop valves during heatup.
- c. The cycling of the MS stop valves was identified as an item of noncompliance; however, in a subsequent telephone call to Mr. Miller on October 31, 1977, it was concluded that the cycling of the MS stop internal bypass was a normal practice when equalizing around these valves becomes necessary.

- d. The licensee was informed that RIV would followup in the following areas:
 - (1) RIV will make a visual inspection of the MS line within the containment during the upcoming refueling outage.
 - (2) The results of the engineering evaluation in progress relating to the MS line movement.
 - (3) Corrective action taken with regard to the missing anchor bolt nut and extended anchors in the area of the MS line containment penetration. These anchors are not associated with the MS line.

- e. Concern was expressed with the finding that the June 15, 1976 water hammer had not been recorded in the Shift Supervisor's Log.

- f. The inspector stated that the reportability of the water hammer would be discussed in-house. The NRR September 2, 1977 letter to AP&L relating to the reporting of water hammer was subsequently brought to the licensee's attention during the subsequent October 31, 1977 telephone call to Mr. Miller.

- g. The inspector did conclude that no evidence of problems within the boundary of the MS containment isolation valves had been identified.