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NewYorkPower Authority

William A. Josiger
Resident Manager

October 12, 1988
IP3-88-061
JAS-88-113B

License No. 50-286
Docket No. DPR-64

Mr. William T. Russell
Regional Administrator
U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406

Subject: NRC Bulletin No. 88-08
Thermal Stresses In Piping Connected To
Reactor Coolant Systems

References:
1. NRC Bulletin No. 88-08: Thermal Stresses In Piping Connected To Reactor Coolant Systems, dated June 22, 1988.
2. NRC Bulletin No. 88-08, Supplement 1, dated June 24, 1988.

Dear Mr. Russell:

Reference (1) requested reactor licensees to review their reactor coolant systems (RCS) to identify any connected, unisolable piping that could be subjected to temperature distributions which would result in unacceptable thermal stresses. If such piping were identified, licensees were requested to ensure that the piping will not be subjected to unacceptable thermal stresses. Reference (2) provided amplifying information concerning this request.

Attachment I provides the results of the review requested by Reference (1). This review has determined that there is one unisolable section of piping connected to the RCS that may have been subjected to thermal stresses as described in the subject bulletin. For this section of piping, action items 2 and 3 of Reference (1) will be completed by the end of the refueling outage.

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Should you or your staff have any further questions regarding this matter, please contact Mr. M. F. Peckham of my staff.

Sincerely,

W. A. Josiger
Resident Manager
Indian Point 3
Nuclear Power Plant

SUBSCRIBED AND SWORN TO
BEFORE ME THIS 12 DAY
OF October, 1988.

Lorrie A. Hafner

LORRIE A. HAFNER
Notary Public, State of New York
No. 4926710, Dutchess County
Term Expires May 2, 1990

WAJ:MFP:lh

Enclosure

cc: Document Control Desk (original)
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ATTACHMENT 1

Response to NRC Bulletin No. 88-08

"Thermal Stresses In Piping Connected To Reactor Coolant Systems"

New York Power Authority
Indian Point 3 Nuclear Power Plant
Docket No. 50-286

Response to NRC Bulletin 88-08
NYPA/IP-3 Docket No. 50-286

"Potential Thermal Stress Fatigue Failures of
Piping Connected to the Reactor Coolant System"

Bulletin 88-08 addresses potential thermal stress problems associated with thermal cycling and stratification in unisolable sections of lines connected to the RCS. These problems include RCS pressure boundary failures of the type in violation of General Design Criterion 14 of Appendix A to 10CFR50.

Action Item 1

Review specific systems interacting directly with the Reactor Coolant System (RCS) to determine whether unisolable sections of piping connected to the RCS can be subjected to stresses caused by temperature oscillations or stratification induced by leaking valves, and that were not evaluated in the original design analysis of the piping.

Response

All systems interfacing with the RCS were reviewed for the configurations and conditions described in the bulletin. Twenty-three (23) lines were identified as being directly connected to the RCS loops, including piping in the Chemical and Volume Control System, the Safety Injection System, and the Sampling System. The Sampling and Safety Injection System lines were deemed to be excluded from bulletin applicability due to their significantly lower operating pressures than the normal operating pressure of the RCS (2235 psig). For example, the maximum pressure normally expected to be developed in the Safety Injection System is approximately 1500 psig, the discharge head of the SI Pumps. The higher RCS pressure would preclude leakage of relatively cold water past associated system isolation or check valves, and thus the thermal stress conditions responsible for the failures at Farley and Tihange would not be produced.

After further review, five lines connected to the RCS (#61, #62, #64, #80, and #96) were identified as operating at pressures potentially higher than the normal RCS pressure. Lines #61 and #62 are the normal pressurizer spray lines, which emerge from RCS cold legs #33 and #34, respectively, join to form one line (designated #61), and then flow into the pressurizer. RCP #33 and #34 provide the motive force for these flowpaths. Valves PCV-455A and PCV-455B, the pressurizer spray valves, are normally not required for RCS pressure/temperature control at plant power operation; this control is maintained by electric heater banks within the pressurizer, and by a relatively small, continuous by-pass flow (through valves RCS-V-524 and RCS-V-525) around the spray valves. Any leakage through the main valves will be at the full power RCS cold leg temperature of approximately 540°F. Lines #61 and #62, and the spray nozzle, as part of original plant design, have been previously analyzed for thermal stresses induced by temperature variations and oscillations associated with normal spray operations. Leakage past PCV-455A and B will therefore not create an abnormal thermal environment in the piping and nozzle (i.e., would not produce thermal stresses outside of the original analysis results).

Lines #96 and #80 are, respectively, the normal and alternate charging flowpaths; line #96 injects into loop #31 cold leg and line #80 injects into loop #32 hot leg. Both lines pass through the Regenerative Heat Exchanger, where the charging water temperature is raised to 480°F - 500°F. To minimize the thermal differential effects on the RCS, the normal charging flowpath (line #96), into a cold leg, is utilized almost exclusively at Indian Point 3. Charging and letdown are normally operated on a continuous basis. For these reasons, the normal charging interface with the RCS will not experience the detrimental thermal conditions described in the bulletin. The alternate charging line, though not utilized, possesses a piping configuration which will not create cyclical thermal variations and/or stratifications at the RCS juncture. Thus, this flowpath will also not undergo the type of stresses reported in the Bulletin.

Line #64, the auxiliary pressurizer spray header, enters line #61 about thirteen feet upstream of the pressurizer injection point, and a foot downstream of the line #61 - line #62 interconnection. Its source is the RCS charging system immediately downstream of the Regenerative Heat Exchanger. The auxiliary spray header possesses an isolation valve (CH-212) and a check valve (CH-211) in series. These valves are designed to prevent charging flow into the main spray line (#61) when auxiliary spray is not desired.

Periodic and cyclic leakage through CH-212 into line #61 can hypothetically produce thermal stress problems at the line#64/#61 connection in the following manner: water in the length of line #64 between the Regenerative Heat Exchanger and CH-212 could cool down over a period of time from the Heat Exchanger outlet temperature to Containment ambient temperature (about 110°F), due to the long run of piping involved and the lack of flow in this line. The configuration of the auxiliary spray header, with several "cold trap" areas, may also facilitate the stagnant water cooling process. Leakage of this cool water through CH-212 could induce cyclical opening and closing of CH-211, with the subsequent production of alternating hot and cold water conditions (and possible thermal stratification) at the auxiliary/main spray connection area. These thermal phenomena may induce static and cyclic stresses at this location.

Action Item 2

For any unisolable sections of piping connected to the RCS that may have been, or may presently be, subjected to excessive thermal stresses, examine nondestructively the welds, heat-affected zones and high stress locations, (including geometric discontinuities such as reducers, elbows, etc.) in that piping to provide assurance that there are no existing flaws.

Response

The Authority maintains that due to Indian Point's design, configuration and mode of operation, adverse thermal stress conditions of the type described in the Bulletin may potentially occur only at the auxiliary/main spray interface. This line shall be nondestructively examined in accordance with the requirements of Bulletin 88-08 during the upcoming 6/7 Refueling Outage. The Authority shall also conduct during this outage nondestructive examinations of the normal and alternate charging lines as per the normal ASME Section XI Inservice Inspection Program. These lines were not initially scheduled to be Section XI inspected during this outage, but have been added to assure a conservative response to the general concerns contained within Bulletin 88-08. NDE will consist of surface and volumetric testing (MT, PT, UT, RT) as necessary or appropriate.

Action Item 3

Plan and implement a program to provide continuing assurance that unisolable sections of all piping connected to the RCS will not be subjected to combined cyclic and static thermal stresses that could cause fatigue failure during the remaining life of the plant. Three methods by which this assurance of future system integrity may be provided are the following: one, redesign and/or modification of potentially affected piping; two, placement of temperature sensing instrumentation at appropriate locations in the potentially affected piping, and maintaining fluid temperatures (and overall temperature profiles) within safe, analyzed limits; three, instrumenting block valves and check valves in the potentially affected lines to ensure that leakage across these valves is detected in an expeditious manner.

Response

The Authority will plan and implement a program to monitor and/or modify the lines #64/#61 interface area, to provide assurance that this location will not be subjected to combined cyclic and static thermal stresses that could cause fatigue failure. The results of the examinations described in the response to Bulletin Action Item 2, will be employed in determining the type and extent of the required program. This program shall be implemented prior to the end of the 6/7 Refueling Outage.

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