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REPLY TO:
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September 25, 1981

United States Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Office of Nuclear Reactor Regulation
Mr. D.C. Eisenhut, Director
Division of Licensing

References: (a) License No. DPR-28 (Docket No. 50-271)
(b) Letter, USNRC to VYNPC, dated July 29, 1981
(c) NUREG 0619
(d) Inside NRC, dated August 24, 1981, page 7

Dear Sir:

Subject: NUREG 0619, Feedwater Spargers

The purpose of this communication is to bring to your attention once again the chronic problem of mandated generic NRC "fixes" that dismiss specific plant experience and are devoid of analysis relative to real costs, actual benefits, and radiation exposure in terms of ALARA principles. In particular, we invite your attention to Reference (b) which requires our commitment to the NRC "acceptable" solution regarding feedwater spargers. Vermont Yankee finds it difficult to accept the required project program, which may have been appropriate to address the problems encountered with our original sparger design, but which is entirely inconsistent with data and experience at Vermont Yankee with the present spargers. In fact, industry-wide experience with spargers similar to those currently installed at Vermont Yankee does not support the NRC's position. Enclosure (1) provides a detailed discussion of the data which supports our position.

Reference (c) alleges to address comments submitted by Vermont Yankee on the first draft of NUREG 0619 by commenting that "...the interference fit would loosen with time, resulting in leakage and crack initiation..." and "...interference fit spargers result in larger amounts of radiation exposure..." Neither of these dismissals are necessarily relevant to the point. Enclosure (1) points out that the interference fit sparger/thermal sleeve design at Vermont is working very well; during the first three years following installation no cracking was observed. (This design was installed in 1976 and last inspected in 1979.) These findings are the result of LP examinations of all four feedwater nozzles from vessel I.D. to approximately five inches into the bore concentrating on the high stress regions. This experience is consistent with results obtained from Northern States Power's Monticello plant and others.

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The staff's justification regarding reduced radiation exposure is purely fallacious. Reference (d) indicates radiation exposure in BWR's increased by 55 percent last year. Replacement work on spargers is partly responsible for this and will be a major contributor to this trend in the future. The sparger replacement required by your staff will result in approximately two (2) times more radiation exposure than a comprehensive nozzle monitoring program for the life of the plant (425 man-rem at installation compared to 220 man-rem over the next 32 years). This estimate is still non-conservative since the relatively untried modification being sponsored by the staff will also require a monitoring program, incurring additional exposure. Considering this aspect, the staff's replacement scheme is closer to three (3) times more expensive in terms of personnel exposure, yet has still not been demonstrated to be superior to the Vermont Yankee proposal.

Another most disturbing aspect of the NUREG is the creation of an arbitrary completion deadline for resolution of the staff's concerns. As stated previously, these concerns may have been valid regarding the original sparger installation; however, all of our data indicates that the installation of new spargers at Vermont Yankee in 1976 has already resolved this issue. Unfortunately, we are now faced with a new deadline to resolve an old problem which Vermont Yankee has already resolved. This appears to be a classic example of misapplication of a general, uniform solution to a real world consisting of discrete, different plants. We have tried to discuss this matter with the NRC staff and have experienced little satisfaction, apparently because our facts were inconsistent with conclusions already reached.

The sparger replacement demanded by your staff is a major effort fraught with difficulties and unproven in terms of benefit. We have pointed out our intention to monitor the feedwater nozzle areas carefully in a surveillance program. We are prepared to install a leakage monitoring system during the 1981 refueling outage to enable us to monitor for increased bypass leakage flow. We intend to pursue design information and obtain the accumulated experience of others to assess the performance of the new design spargers so that we are thoroughly conversant with the modification. We expect to procure the equipment and hardware necessary on a timely basis and, should some future inspection reveal the need, we are prepared to move forward with corrective measures that are deemed appropriate, including total replacement of all spargers if necessary.

We feel that this is a reasoned, conservative approach to any future sparger problem and if you so desire, we are prepared to meet with you to discuss our technical arguments.

Very truly yours,

VERMONT YANKEE NUCLEAR POWER CORPORATION

E W Jackson

E.W. Jackson
Manager of Operations

EWJ/dm

VERMONT YANKEE RESPONSE TO NUREG-0619
REQUIREMENT ON FEEDWATER SPARGER REPLACEMENT

I Information requested by Staff per telecon of April 16, 1981.

a. Interference Fit Info - Per Attachment A.

b. Leakage Monitor System - Description in Attachment B.

It is Vermont Yankee's intention to perform an in-vessel liquid penetrant examination this outage prior to installation of the leak detection system. If nozzle cracking is not present, the implication is that little or no leakage is occurring or leakage started only recently and fatigue damage to the nozzle is sight.

Nozzle cracking can re-initiate in one of two ways. One, there may have existed a very high bypass leakage rate ($>$2.0 gpm) which began only shortly before the outage inspection and has not produced a sufficient number of thermal cycles to cause cracking. The proposed leak detection system can easily monitor this amount of leakage and plans can be made to replace the sparger at the next refueling outage. Two, some relatively constant flow bypass leakage has existed for a period of time, but the flow is very small and the number of cycles insufficient to cause cracking. It is this scenario which the NRC staff believes will lead to a mistaken feeling of confidence in the interference fit. However, GE's extensive testing program has established that leakage past an interference fit thermal sleeve will increase at about 0.35 gpm/year once leakage begins, due to seal degradation. This trend can be detected by the proposed system in ample time to evaluate the effect on the nozzle and plan for corrective action well before nozzle degradation becomes severe enough to cause a safety problem.

In either case, the leak detection system provides the capability to monitor leakage trends in such a way that a baseline PT examination which reveals no indications will be assumed to mean that no bypass leakage is present.

c. Vermont Yankee Ultrasonic inspection criteria - Attachment C.

II. Other pertinent information for Staff's consideration.

a. The interference fit spargers were installed in 1976. PT inspections were performed on the inner blend radius in 1977 and 1979. No indications were found. The likelihood of indications in the inaccessible bore region is very remote (See Attachment D). The liquid penetrant tests of the feedwater nozzles performed in 1977 and 1979 extended about 2 to 3 inches past the end of the blend radius into the bore. Overall, the LP exam extends about 4.5 to 5.5 inches from the vessel ID into the bore primarily on the top and bottom of the nozzles. These are the most highly stressed regions of the nozzle interior as documented in Teledyne Report TR-2187(a) and GE-NEDE-21821-02, August 1979, Figures 4-133, 4-134, and 4-135.

b. Performance of the liquid penecrant exam in this manner provides a very high level of confidence that the most highly stressed regions around the blend radius/bore are covered, and also provides the additional benefit of keeping personnel radiation exposure well below exposure received by removing spargers, doing the PT exam, and reinserting spargers.

One of the Staff's concerns with using the interference fit sparger in the long term was the relatively frequent liquid penetrant inspection schedule required and the resulting personnel radiation exposure. Radiation data for several plants who have installed new spargers indicate personnnel exposure of 340 to 425 man-rem for the total project.

At Vermont Yankee, average exposure for the two most recent PT exams of the inner blend radius was 15 man-rem. If 16 more of these PT exams are performed (every two years for 32 years), personnel exposure will total only 220 man-rems over the design life of the plant. This is about 50% lower than the exposure received installing new spargers.

This number of inspections will probably be reduced as the Staff gains more confidence in the leak detection system which will be installed at the 1981 outage.

Regarding the use of Ultrasonic Inspection, it is not Vermont Yankee's intention to forego in-vessel PT exams in the immediate future and rely solely on Ultrasonic Inspection (UT) to demonstrate nozzle adequacy. We intend to perform PT exams at the cycle intervals contained in NUREG-0619, and supplement these with UT in an attempt to gain better correlation and more confidence in the UT techniques. Further, it is hoped that as we gain more confidence in the type of bypass leak detection system to be installed at Vermont Yankee and several other operating BWRs, the period between in-vessel PT exams could be lengthened. But this would be done only after the dependability of the system is firmly established.

c. Recent information from other operating plants indicates that the new sparger thermal sleeve designs may be crud traps for corrosion products. A contact reading of about 40R/Hr has been recorded on the outside of the feedwater nozzles. This condition did not exist before clad removal and installation of the new thermal sleeve. Obviously this condition can cause a problem with ISI of the feedwater nozzles. These plants all have piston ring type sparger thermal sleeves. While the staff maintains that some alternate design than those already in use can be developed, the sparger/thermal sleeve currently installed at Vermont Yankee is not a crud trap, radiation levels near it are not increasing, and ISI in the vicinity of the nozzle outside diameter has not been affected. Any new design which surely will involve piston rings or numerous interference fits to develop the desired triple sleeve feature, will most likely increase the potential for crud formation and for interference with the noraml in-service inspection program.

d. Vermont Yankee's experience with the original loose fit thermal sleeve is also better than most plants. In fact, per Figure 2-1 of GE NEDO-21821 the maximum crack depth at Vermont Yankee is less than any other BWR which did not employ partial fixes (original interference fit, welded sparger, or high ferrite cladding). Operating procedures which minimize feedwater thermal cycling have been utilized since plant start up, e.g., use of a low flow feedwater controller and preheating feedwater to above 100°F by recirculation prior to start up. In addition, Vermont Yankee will review it's procedures and revise them as needed to further minimize feedwater thermal cycling.

For the first five (5) years of operation Vermont Yankee had 60 start up-shutdown cycles which resulted in a maximum crack depth in one location of 0.3125" with a thermal sleeve of known leakage. Since mature plant operation was estalished, many fewer of the crack propagating start up-shutdown cycles occur. Since the 1979 refueling, where no nozzle cracking was observed, only eleven start up-shutdown cycles have occurred (about 6/year). This is typical of the last five years of Vermont Yankee's operation. Considering that the staff's technical criteria for PT examinations is every 30 start up-shutdown cycles, Vermont Yankee could operate safely for another three (3) years without having to inspect nozzles, however, by NUREG-0619 we must replace our interference fit sparger within two years.

III. Considering the data presented in paragraph I and the following positive action utilized by Vermont Yankee in the past and to be taken in the immediate future:

a. Operating Procedures which have proven effective in reducing feedwater thermal cycling.

b. A very reduced number of start up-shutdown cycles than that which drove the initial cracks and can drive future cracks.

c. Installation of a bypass leakage detection system.

d. Annual UT examinations of the nozzle blend radius and bore, and, as as required PT examinations of the nozzle blend radius

and considering the negative aspects of sparger replacement,

e. Very high personnel radiation exposure during installation.

f. The possibility of the new spargers being highly radioactive crud traps for corrosion products.

it is Vermont Yankee's position that continued operation with interference fit spargers is justified.

ATTACHMENT A

INTERFERENCE FIT DATA

The minimum as-built interference fit for each nozzle based on dial-a-bore measurements of the leakage land and measurement of the thermal sleeve outside diameter are as follows.

NOZZLE	INTERFERENCE (in.)
45°	.0121
135°	.0120
225°	.0130
315°	.0120