VERMONT YANKEE NUCLEAR POWER CORPORATION

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B.3.2.1

REPLY TO:
ENGINEERING OFFICE
TURNPIKE ROAD
WESTBORO, MASSACHUSETTS 01581
TELEPHONE 617-366-9011

WVY 79-79

July 5, 1979

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

Attention: Office of Nuclear Reactor Regulation

References: (a) License No. DPR-28 (Docket No. 50-271)
(b) "Interim Technical Report on BWR Feedwater and Control Rod Drive Return Line Nozzle Cracking," NUREG-0312 dated July 1977
(c) General Electric Report NEDE 21480
(d) Vermont Yankee Letter to NRC WVY 77-72 dated August 15, 1977
(e) Vermont Yankee Letter to NRC WVY 78-4 dated January 20, 1978

Dear Sir:

Subject: Feedwater and CRD Return Line Nozzle Inspection

As required by Reference (b), Vermont Yankee is submitting information regarding our feedwater and CRD return line nozzle inspection plans for the September 1979 refueling outage.

Feedwater Nozzles

During the 1976 refueling outage the feedwater spargers were removed and the nozzle regions inspected. After four years of operation and approximately 60 startup/shutdown cycles, the largest crack found was 5/16 of an inch deep. All cracks were removed by grinding and new interference fit Inconel thermal sleeve spargers were installed.

The accessible portions of the nozzles, with the spargers in place, were again liquid penetrant (LP) inspected during the 1977 refueling outage. The results of that inspection revealed that after an additional 11 startup/shutdown cycles no additional cracking occurred.

Since the 1977 inspection, Vermont Yankee has experienced an additional 14 startup/shutdown cycles.

The General Electric Company has performed extensive analytical and experimental studies, Reference (c), in order to identify the initiation mechanism and growth characteristics of feedwater nozzle cracking. The conclusion of that study indicates that crack initiation is caused by local high cycle thermal fatigue, while crack growth is a function of vessel temperature and pressure cycles, i.e., startup/shutdown cycles. The reasoning behind selecting the interval for LP inspection on previously inspected plants is based on General Electric's fracture mechanic analysis. The results show that if the crack tip is left in the root of a grind cavity, or if a new crack reinitiates, it will take approximately 20 startup/shutdown cycles for the crack growth rate to behave as though the original crack had never been removed.

This analysis was the basis for your recommendations contained in Reference (b) which requires inspection at the first scheduled refueling outage after 20 but prior to 40 startup/shutdown cycles following the last LP examination. Vermont Yankee agrees with this inspection criteria because it is based on analyses, field data, and sound engineering judgment. We do, however, take exception with the arbitrary recommendation contained in Reference (b) requiring inspection every other refueling outage. This is not based on analyses or field experience and would require unnecessary in-vessel inspection with the consequence of unnecessary radiation exposure. Since the Vermont Yankee plant has experienced only 14 cycles since the last inspection and does not expect to reach 40 cycles before the scheduled refueling outage in 1980, inspection this outage is not necessary.

However, based on the projected work schedule for the 1980 outage, it is advantageous for us to inspect this outage. Therefore, at the present time we are planning on inspecting the feedwater nozzles this outage. An LP examination will be conducted with the feedwater spargers in place using the same procedures that were employed during the last inspection. For a complete description of that inspection and its results refer to References (d) and (e).

In addition we plan on ultrasonically testing the nozzle inner radius region if LP inspection is performed. Vermont Yankee will try to establish a correlation which will eliminate the need for future internal inspection of the nozzle regions.

If for some unforeseen reason feedwater nozzle inspection this refueling outage becomes incompatible with the present schedule, we will forego the inspection based on our discussion stated herein.

CRD Return Line Nozzle

During the 1977 refueling outage the thermal sleeve was removed from the CRD return line nozzle to expose the blend radius and bore for inspection. An LP inspection was performed and crack-like indications were found on the initial penetrant test. All indications were removed by grinding and removal verified by a second LP inspection. All grind out cavities were less than the clad thickness of 3/16 of an inch.

As the thermal sleeve was being reinstalled, a visual examination revealed several crack-like indications on the thermal sleeve. A replacement sleeve identical in design to the original was installed in the CRD nozzle bore. A subsequent analysis confirmed the existence of cracks on the sleeve. The probable cause was concluded to be thermal fatigue.

The studies performed by General Electric indicate that the CRD return line nozzle has the same thermal fatigue problem that the feedwater nozzles have experienced. Based on these studies and extensive field data, Vermont Yankee is in agreement with General Electric that rerouting the return flow will correct the situation and eliminate the need for further inspections.

Vermont Yankee performed several tests at the plant during the 1977 refueling outage to verify that rerouting the return flow will not adversely effect the operation of the plant. Based on this data, Vermont Yankee is planning on cutting the nozzle extension off at the safe end and capping the nozzle. The return flow will be rerouted to the Reactor Water Cleanup System. The thermal sleeve will be removed and the nozzle region inspected and any cracks removed.

The rerouting and capping is presently planned for this outage. However, if unforeseen circumstances arise which prevent us from performing the total modification and inspecting the nozzle region this outage, we will, as a minimum, shut off flow to the nozzle and reroute. In addition, we will commit to visually inspecting the thermal sleeve with a television camera. The remaining portion of the modification would then be completed during the 1980 refueling outage.

In conclusion:

1. Vermont Yankee plans on inspecting the feedwater nozzle

region this refueling outage using the same procedures that were used during the 1977 inspection. In addition external UT will be compared to the LP results. However, justification for postponing this inspection, if necessary, until the 1980 refueling outage, is warranted based on our discussion stated herein.

2. Vermont Yankee will cut and cap the CRD return line nozzle. Inspection and rerouting is also planned for this outage. A contingency plan of inspection of the thermal sleeve and rerouting the return flow will be instituted as a minimum.

3. Vermont Yankee will inform the NRC of all results of the inspection verbally as soon as they become available and in writing after the refueling outage.

If any questions arise, please contact Mr. T. M. Cizauskas at our Engineering Office at 25 Research Drive, Westborough, Massachusetts (617-366-4911 extension 2839).

Very truly yours,

VERMONT YANKEE NUCLEAR POWER CORPORATION

Robert H. Groce

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Licensing Engineer

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