VERMONT YANKEE
NUCLEAR POWER CORPORATION

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FVY 85-02

REPLY TO:
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TELEPHONE 617-872-8100

January 14, 1985

U.S. Nuclear Regulatory Commission
Office of Inspection & Enforcement
Region I
631 Park Avenue
King of Prussia, PA 19406

Attention: Richard W. Starostecki, Director
Division of Project and Resident Programs

References: a) License No. DPR-28 (Docket No. 50-271)
b) Letter, USNRC to VYNPC, dated 12/6/84, and Inspection Report No. 84-21, Appendix A (Notice of Violation)

Dear Sir:

Subject: Response to Inspection Report 84-21

This letter is written in response to Reference b), which indicates that certain of our activities were not conducted in full compliance with Nuclear Regulatory requirements. The alleged Level IV violations were identified as a result of an inspection conducted by your Mr. W.J. Raymond during the period of September 19-October 31, 1984.

Information is submitted as follows in answer to the alleged violations contained in the Appendix to your letter.

Item I.A Technical Specification 6.5.A requires that detailed, written procedures governing safe reactor operations be prepared, implemented and followed. Procedure OP 1201, Assembly of the Reactor Drywell Systems, Revision 9, was written pursuant to the above to provide Maintenance Department personnel with the instructions necessary to assemble the reactor system, inclusive of the vessel internals, in a configuration consistent with that assumed for the plant safety analyses. OP 1201 specified, in part, the steps required to bolt the separator/shroud head assembly to the core shroud. The intent of OP 1201 is that the shroud head bolts be tightened firmly against the shroud lugs to properly secure the separator/shroud head assembly in place as part of the vessel assembly sequence.

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Contrary to the above, during vessel assembly activities in accordance with OP 1201 on July 28, 1984, the shroud head bolts were not tightened securely against the shroud lugs, which resulted in the separator/shroud head assembly being improperly secured to the core shroud. The assembly subsequently lifted off the shroud when core flow exceeded 42 million pounds per hour during power operations at 95% full power. The failure to properly secure the separator/shroud head assembly resulted in reactor operation in an unanalyzed condition with an internals configuration different than that assumed for the safety analysis.

This is a Severity Level IV Violation (Supplement I.D.)

RESPONSE:

As stated in the Notice of Violation, the failure to properly bolt the separator/shroud head assembly to the core shroud was caused by inadequacies in Procedure OP 1201, "Assembly of the Reactor and Drywell Systems", and inadequate training of the maintenance personnel involved. Although the action steps of the procedures provided sufficient direction to the maintenance personnel (as is evident by proper installation on ten previous occasions), the procedure lacked sufficient checks to ensure that the intent of the steps was accomplished.

The power/flow anomaly was first noted on the morning of September 11, 1984, when only 95% power was achieved with 100% core flow being registered. This anomaly prompted immediate investigation into the identification and elimination of probable causes for the anomaly noted.

Initial investigation centered upon possible instrumentation error, or errors in computerized calculations. Comparisons were made with the previous plant data history and backup calculations indicated that computerized calculations were being correctly performed. At this point, it was believed that the power loss was real, and not an instrumentation or calculational error.

We next investigated possible reactivity effects which could result in lowered core power. Control rod positions were checked and no anomalies were noted. Primary coolant boron concentration was found, as expected, to be <100 ppb. Core Xenon concentration was checked and determined to be at a minimum value. The only remaining potential cause for this power anomaly was identified as an anomaly affecting a reactivity coefficient.

Factors influencing power coefficients were then reviewed from available logged and on-line data. It was noted that recirc water drive temperature was very slightly higher than might have been expected for the power being produced. A number of correlations were investigated, with the most significant appearing to be a comparison of feedwater enthalpy and recirc flow enthalpy. Coincident with the onset of the power/flow anomaly, a step increase in recirc flow enthalpy (or temperature) occurred. Attention was then concentrated on the vessel annular area and possible causes of the observed temperature increase.

During this period, Vermont Yankee management was directly involved in the investigation into possible causes for this observed anomaly. Upon tentative identification on September 13 that, at approximately 41 Mlbs/hr core flow, a step change in recirc flow temperature occurred, Vermont Yankee management augmented existing expertise with assistance from Yankee Atomic Electric Company and General Electric Company. Both organizations responded with onsite support personnel plus home office backup to assist Vermont Yankee in identifying and assessing this observed anomaly.

Both in-vessel and vessel external causes were investigated in detail. It was concluded that the most probable causes were in-vessel. It was noted through review of existing data, that the increase in recirc flow temperature, compared to historical "normal" values, was first noted at 41 Mlbs/hr core flow, continued through approximately 44 Mlbs/hr core flow, and subsequently returned to a near historical normal rate of change above 44 Mlbs/hr core flow. Other data from this same operating cycle was reviewed, and it was observed that indications existed of a recirc flow temperature change commencing at 41 Mlbs/hr. This observed dependence indicated to Vermont Yankee management that this anomaly was both transient in nature, tied directly to the dynamic core flow, bounded at increasing core flow values, and repeatable. This was confirmed during a power reduction for turbine surveillance testing on September 16, when special provisions were made for data collection.

Two possible underlying causes were being pursued by joint Vermont Yankee/General Electric/Yankee Atomic Electric Company task groups. The first was concerned with possible water level effects in the separator region and the second with possible shroud lifting. Concurrently, General Electric calculated, and Yankee Atomic Electric Company confirmed, that the differential pressure required to lift the shroud corresponded with the 41 Mlbs/hr flow associated with onset of the recirc flow temperature rise.

At this point, Vermont Yankee management had concluded that there was a possibility that the shroud assembly was not tightly bolted down and appropriate notifications were provided to the NRC at 11:30 a.m. on

September 16, 1984. Discussions were held with General Electric regarding the implications of such an eventuality. General Electric concluded that adequate horizontal support existed from the two alignment pins irrespective of whether the shroud was tightly bolted down. Vertical constraints, however, were dependent upon engagement of the T-bars. Vermont Yankee management interviewed the maintenance personnel who performed the shroud reassembly. All personnel were independently sure that reassembly was performed correctly, and that the T-bars were engaged. Accordingly, Vermont Yankee management concluded that the core was adequately restrained and that the operation of the Vermont Yankee facility was both safe and bounded by existing analyses. For prudence, Vermont Yankee management had limited reactor flow below the value where onset of this anomaly was observed and verified repeatable.

Having concluded that the most probable cause of the anomaly was the shroud lifting, a decision was made on September 17 to shut the plant down using normal shutdown procedures. While making preparations to shut down on September 17-18, Vermont Yankee continued its investigation, performing a series of water level adjustments to determine any possible correlation to the power/flow anomaly; none of relevance to the problem were noted. This effectively eliminated all postulated causes of the anomaly except shroud uplift.

When the unit was shut down, vessel disassembly was performed in accordance with a one-time in-vessel inspection procedure OP 1200.01. This procedure sequenced disassembly and detailed inspection procedures to ensure all possible causes for the power/flow anomaly would be investigated, including the possibility that the shroud was not tightened. To ensure that the best possible staffing was provided for these inspections, Vermont Yankee management requested General Electric's assistance in providing underwater camera operators and two individuals knowledgeable in core internals, plus liaison personnel to coordinate with GE's technical experts in San Jose.

As the disassembly and inspection proceeded, on September 21, it was confirmed that all 36 separator bolts were loose, anywhere from 1/4 to 3/4 inch. We were confident that we had identified the problem at this point, however, we decided to proceed with a detailed inspection program to ensure both that no other problems existed and that no damage had been done.

Upon ascertaining the apparent cause of the problem, and ascertaining that no damage was done, Vermont Yankee management directed that the reactor be reassembled and started up. Extra data was taken during the power ascension following startup, which demonstrated the anomaly had been corrected and power/flow values agreed with historical data.

Following identification of the cause of the observed anomaly and as an immediate corrective action, OP 1201 was revised to accomplish the following:

a) Require that a familiarization briefing be conducted with applicable maintenance personnel on the operation and characteristics of the shroud head bolts and wrench. This briefing also includes hands on manipulation of spare bolts.

b) Provide more detailed bolt tightening instructions including torquing requirements.

c) Provide instructions for TV camera inspections to: 1) determine hold-down bolt tightness from exposed threads; 2) randomly verify T-bolt engagements; 3) ensure proper engagement of tensioning nut keepers; and 4) randomly verify head joint seating.

This revision provided sufficient independent verification to ensure that the shroud head is properly installed prior to plant operation.

In view of the circumstances of this violation, Vermont Yankee will evaluate OP 1200 and OP 1201 to determine whether any additional independent verifications are necessary to ensure the proper completion of other phases of the reactor disassembly/reassembly. Any procedure revisions determined to be necessary will be made prior to next reactor disassembly. Additionally, as an ongoing process, reviews will be conducted of similar maintenance procedures to ensure sufficient checks exist to properly verify preparation for, and completion of, related activities.

With regard to your concern for sufficient management controls, we strongly reject your assertion that "Vermont Yankee management acted neither prudently nor conservatively...." During the entire course of this occurrence, from indication that an anomaly existed through rejection of hypothetical causes to identification of a tentatively identified cause, Vermont Yankee management effectively and prudently analyzed the situation.

The testing performed on September 16, 1984 did not conclude that an improperly secured separator/shroud head was the cause of the observed anomaly. What was concluded was that the phenomena was reversible by lowering core flow, that while this would support the improperly secured separator/shroud head scenario, it was not conclusive and the prudent/conservative plan of action while the investigation continued was to limit plant operation to 95% FP and 40 million pounds per hour total core flow. Work continued on assessing other potential scenarios until September 17, when Vermont Yankee management believed the most probable cause for the power/flow anomaly was identified and directed that the plant be shut down and the reactor vessel internals examined.

In assessing the situation that existed, it should be recognized that the problem was by no means directly observable. Plant management had, with the assistance of YAEC's Nuclear Services Division and the General Electric Company, identified a number of possible causes of the observed phenomena and each of the possibilities was being assessed and pursued on a systematic basis. Although some of these hypothetical possibilities included unanalayzed conditions, they were only possibilities, not fact, and not necessarily safety concerns. Further, as Vermont Yankee's investigation progressed and hypothetical possibilities were identified as probable causes of the observed anomaly, Vermont Yankee management did evaluate the safety significance of the probable cause.

We believe that the actions taken by Vermont Yankee management during the identification, investigation and resolution of this problem are totally consistent with the overall Vermont Yankee philosophy. At no time will Vermont Yankee management permit plant safety to be knowingly compromised to support the demands of power production. In this instance, an anomaly was observed which was transient and repeatable. Vermont Yankee pursued identification of possible causes, while simultaneously assuring, to the satisfaction of Vermont Yankee management, that continued operation was prudent, posed no safety concern, and was bounded by existing analyses supporting continued plant operation. Vermont Yankee would, of course, shut down the unit in any event where continued operation of the unit is identified as being unsafe. Such was not the case here.

Vermont Yankee management believes that, absent overriding safety concerns, in cases where a problem is not readily identifiable, and further investigation at power is necessary to identify the actual causes, premature shutdown of the unit may be unwarranted and could hamper eventual successful resolution of the problem. In this specific instance, hypothetical scenarios were reduced to potential causes concurrent with analysis of the possible safety impact of the potential cause. Vermont Yankee continues to feel the prudent course of action in such cases to be 1) investigate and eliminate to the extent possible, all postulated causes for the observed occurrence prior to shutting down the unit to take corrective action; subordinate, of course, to Vermont Yankee management's adherence to the overall philosophy that the Vermont Yankee plant will never knowingly be operated in an unsafe condition; 2) perform investigations and inspections to ensure that the problem was correctly identified; and 3) perform appropriate physical and administrative remedial action prior to restart of the unit.

We trust this fully addresses and alleviates any posible concern you may have regarding Vermont Yankee management practices and philosophy regarding the safe operation of the Vermont Yankee plant.

Item II.A

10CFR 20.201 requires the licensee to perform surveys as necessary to assure compliance with the regulations in 10CFR Part 20 and that are reasonsable under the circumstances to evaluate the extent of the radiation hazard that may be present.

Contrary to the above, at some indeterminate time prior to October 23, 1984, adequate radiation surveys were apparently not performed for two items prior to release from the radiation controlled area within the plant to an unrestricted area within the licensee's owner controlled area as follows:

1. for a box of asbetos waste containing 20 uCi of Co-60, and with "hot spot" dose rates of 30 mRem/hr on contact with a bag inside the box and 3 rRem/hr on contact with the outside surface of the box.

2. for a piece of scrap wood with gross contamination levels on its surface of about 50,000 dpm, and removable contamination of about 12,000 dpm per 100 sq-cm.

Such a survey would have been necessary to assure compliance with 10CFR Part 20 and would have been reasonable to evaluate the extent of the radiation hazard.

This is a Severity Level IV Violation (Supplement IV.D.)

RESPONSE:

Immediately upon discovery, the radioactive materials discussed the in the Notice of Violation were moved into Vermont Yankee's Radiation Control Area for temporary storage until they could be properly disposed. At this time, detailed surveys of the articles mentioned were performed as well as requisite labeling/posting.

The ensuing investigation of this incident concluded that these materials were removed from the Radiation Control Area (RCA) at some time prior to January of 1984. During the latter part of 1983 internal reviews indicated a need for the improvement of established controls of radioactive materials. Procedures were revised accordingly to stipulate more detailed and stringent monitoring requirements. Training on these revised procedures was provided to all plant personnel at that time.

Subsequent to the discovery of the materials discussed in the Notice of Violation, a survey was performed of all materials in storage within the owner controlled area and outside of the protected area. The results of this survey are accurately reflected in I&E Inspection Report 84-21. A detailed survey of the plant restricted area is presented conducted on a yearly basis.

It is our belief that this violation is a result of past practices that have been corrected by the actions described above.

Item II.B 10CFR 20.203(f) requires that each container having more than 1 uCi of Co-60 (licensed material) be conspicuously posted with a sign bearing the radiation symbol and with the words CAUTION - RADIOACTIVE MATERIAL. 10CFR20.203(e) requires that each area in which quantities in excess of 10 uCi of Co-60 are stored be conspicuously posted with a warning sign reading CAUTION - RADIOACTIVE MATERIAL.

Contrary to the above, for an indeterminate period from about 1982 until October 23, 1984, a box of asbestos waste containing about 20 uCi of Co-60 was stored in an unrestricted area north of the 115 KV switchyard and neither the box nor the area was labelled or posted as required.

This is a Severity Level IV Violation (Supplement IV.D)

RESPONSE:

This violation is a direct consequence of the above violation of 10CFR 20.201. The corrective action stated above will ensure that radiation is detected so that proper labeling and posting can be accomplished.

Item II.C 10CFR 20.207 requires that licensed material stored in an unrestricted area be secured from unauthorized removal from the place of storage, or under constant surveillance and immediate control of the licensee.

Contrary to the above, for an indeterminate time prior to October 23, 1984, miscellaneous plant equipment and waste items contaminated with licensed material, including a box of asbestos waste containing 20 uCi of Co-60, were stored in an unrestricted area north of the 115 KV switchyard within the licensee's owner controlled area. Some items in the storage area were not known to be contaminated; however, known contaminated, tagged materials were also in storage in the area at times. The materials were not secured from unauthorized removal, or otherwise kept under constant surveillance or immediate licensee control.

This is a Severity Level IV Violation (Supplement IV.D)

RESPONSE:

All radioactive material was removed from the owner controlled area and stored within the protected area. Prior to any future storage of radioactive material in the owner controlled area, Vermont Yankee will review the requirements of 10CFR 20.207 and insure that adequate procedures and facilities are provided to maintain compliance with the rule.

We trust that the above information is satisfactory; however, should you have any questons or desire further information please contact us.

Very truly yours,

VERMONT YANKEE NUCLEAR POWER CORPORATION

Warren P. Murphy
Vice President and
Manager of Operations

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