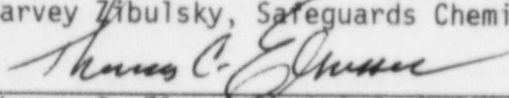


U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 86-25
Docket No. 50-271 License No. DPR-28
Licensee: Vermont Yankee Nuclear Power Corporation
RD 5, Box 169, Ferry Road
Brattleboro, Vermont 05301
Facility: Vermont Yankee Nuclear Power Station
Location: Vernon, Vermont
Dates: November 4 - December 31, 1986
Inspectors: William J. Raymond, Senior Resident Inspector
Thomas B. Silko, Resident Inspector
Clay Warren, Resident Inspector, Shoreham
Harvey Zibulsky, Safeguards Chemist
Approved by:  1/30/87
Thomas C. Elsasser, Chief, Reactor Projects Section 3C Date

Inspection Summary: Inspection on November 4 - December 31, 1986 (Report No. 50-271/86-25)

Areas Inspected: Routine, unannounced inspection on day time and backshifts by the resident inspectors of: actions on previous inspection findings; plant physical security; routine power operations and operating activities; surveillance testing; maintenance activities; the analysis results of split non-radioactive chemistry samples; and, the response to IE Bulletin 85-03. The inspection involved 243 hours.

Results: One violation was identified in 7 areas inspected. The violation concerned the failure to conduct technical specification inservice testing per IWP-3230 of the 1980 ASME Section XI Code (Section 5.2). A second potential violation, not cited, concerned the failure to complete local leak rate testing of a cleanup system valve, V12-68, following maintenance (Section 8.0). NRC review of routine plant operating status identified no conditions adverse to safety as a result of a failure to perform the leak rate testing. Further licensee and NRC reviews are warranted to assure resolution of potential concerns related to the minimum flow requirements for the RHR and core spray pumps (Section 5.4). Delays in the procurement of parts for inspection of residual heat removal pump wear rings have deferred the start of this work until March 1987 (Section 3.7).

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DETAILS

1. Persons Contacted

Interviews and discussions were conducted with members of the licensee staff and management during the report period to obtain information pertinent to the areas inspected. Inspection findings were discussed periodically with the management and supervisory personnel listed below.

Mr. J. Edelhauser, Senior Project Engineer
Mr. G. Johnson, Operations Supervisor
Mr. D. LaBarge, Senior Operations Engineer
Mr. B. Leach, Chemistry & Health Physics Supervisor
Mr. R. Lopriore, Maintenance Supervisor
Mr. J. Pelletier, Plant Manager
Mr. D. Reid, Operations Superintendent

Messrs. R. Bernero, V. Rooney and W. Raymond attended a meeting of the Vermont State Nuclear Advisory Panel (VSNAP) on November 18, 1986 in Montpelier, Vermont to discuss the status of the NRC staff review of the Mark I Containment Safety Study completed by the licensee. The status of NRC plans to address containment safety issues with the rest of the Mark I users was also discussed. The issue of containment venting, one of five items to be addressed in a proposed generic letter, will be addressed separately in a future meeting of the VSNAP.

2. Summary of Facility Activities

The plant continued routine operations at full power during the reporting period. A partial scale emergency plan exercise was conducted on December 3, 1986, with partial participation by the states of Vermont, New Hampshire and Massachusetts. The resident inspector participated in the evaluation of the licensee's emergency response capabilities, and the results of the NRC inspection of the drill are provided in Inspection Report 86-26.

3. Status of Previous Inspection Findings

3.1 (Closed) Follow Item 84-21-03: Status of Actions for TAP Item II.K.3.57. This item was last reviewed in Inspection Report 86-22. The licensee provided in the new symptom based emergency procedures adequate cautions to the operator regarding manual ADS operation. This item is closed.

3.2 (Closed) Unresolved Item 84-21-04: Control of Procedures. This item concerned the review, issuance and control of station procedures per the requirements of AP 0831. This matter was covered during the reviews completed as part of Inspection Report 85-06, and programmatic deficiencies were identified (reference 85-06-01). The licensee's corrective actions were reviewed and found acceptable in Inspection Report 85-22. No further deficiencies concerning the issuance and control of station procedures has been identified during subsequent routine inspections. This item is closed.

- 3.3 (Closed) Follow Item 85-36-03: Mode Switch Replacement. This item was reviewed and the actions taken were found to be acceptable in Inspection Report 86-10, Attachment 1, Section S. It is noted that the Inspection Report 86-10 contains a typographical error in the reference to inspection item 85-26-03, instead of the appropriate item, 85-36-03. This item is closed.
- 3.4 (Closed) Follow Item 85-40-01: Control of Worker Time in High Radiation Areas. This item was also reviewed by a Health Physics Specialist during Inspection 86-24. The control of workers in high radiation areas was reviewed by resident and region-based inspectors during inspection tours in the drywell, and no inadequacies were identified.
- NRC inspection of this item is documented specifically in Inspection Reports 85-39, 85-40, 86-01 and 86-03. Though not specifically referenced in the inspection reports, drywell work activities were also reviewed in Inspection Reports 86-04, 86-08 and 86-10. The control of worker time in high radiation areas was also reviewed at random times on these inspections during either drywell tours or through the use of the CCTV system installed to monitor drywell activities. No instances were identified in which workers spent slack time in the drywell. Workers interviewed were aware of dose rates at the assigned work location, and positioned themselves in lower dose rate areas as permitted by the work activity. No inadequacies were identified. This item is closed.
- 3.5 (Closed) Follow Item 85-20-06: HPCI and RCIC Surveillance Test Procedures. The inspector reviewed Revision 15 of OP 4120 for the HPCI system, and Revision 17 of OP 4121 for the RCIC system, to verify that adequate instructions have been included to preclude the possibility of over-pressurizing the low pressure suction piping. Both procedures now include instructions that caution the operator to ensure one of the two discharge valves in each system is closed during the conduct of valve operability surveillances. This item is closed.
- 3.6 (Closed) Follow Item 85-38-01: Comparison of Licensee Analytical Results to BNL Results of Water Samples. On completion of the analyses of water samples by the licensee and Brookhaven National Laboratory, an evaluation was to be made. The analyses were completed and a comparison evaluation was performed, as summarized in Section 6.0 below. This item is closed.
- 3.7 (Open) Unresolved Item 85-40-09: RHR Pump Performance and Inspections. This item was last reviewed in Inspection Report 86-15. The inspector met with licensee representatives to review the vibration analysis results obtained for the 4 RHR pumps on a monthly basis by a contractor, ARC Associates. The licensee stated that the measurements made through November, 1986 showed no adverse trends in the vibration components or the overall performance of the pumps.

As stated in a letter to the NRC dated July 11, 1986, the licensee planned to overhaul all four pumps starting in December 1986. During subsequent discussions with licensee representatives, the inspector determined that, as a result of delays in obtaining NRC approval of requested changes to the technical specifications, as well as material delivery schedule problems, these plans were deferred to start during the week of January 12, 1987. The repair effort for each pump will take about 1 week. The licensee received a change to the technical specifications from NRC:NRR (Amendment No. 97 dated December 4, 1986) that will allow continued reactor operation for up to 14 days with one RHR pump inoperable. The technical specification change also provided a one-time exemption from the requirements to complete alternate testing of redundant components while a RHR pump is out of service.

The inspector reviewed the licensee's plans to complete operability testing of each RHR pump following repairs, which include the replacement of the original pump impellers having shrink fit wear rings with new impellers having integral wear rings. Matching wear rings on the pump casing will be fabricated with a material less susceptible to the cracking failure. Post maintenance testing will include a full flow verification test in the torus to torus mode of operation. The technical specifications (4.5.A.1.b) require pump operability be demonstrated by delivering 7450 +/- 150 gpm in the vessel to vessel flow mode. The vessel to vessel mode cannot be tested with the plant at power, but will be tested as part of the routine surveillance program at the next shutdown. The licensee developed acceptance criteria for the testing in the torus to torus mode such that if the test criteria were met, then satisfaction of the technical specification requirements would be assured.

The inspector reviewed the bases for the newly defined acceptance criteria, which were documented in a calculation dated October 29, 1986. The new acceptance criteria were derived in calculations that in turn were based on calculations and system flow tests completed as part of PDCR 76-04, which provided the basis for the present technical specification 4.5.A.1.b flow limits following the installation of an orifice at the discharge of each pump in 1976. The licensee used the system friction factors derived during the 1976 flow tests to determine the minimum acceptable total dynamic head (TDH) requirements for the pumps when operated at 6500 gpm in the torus to torus mode that will assure the technical specification limits are met. The test acceptance criteria will be to demonstrate that the repaired pumps individually will deliver 6500 gpm at a minimum TDH of 470 feet. No inadequacies were identified.

The licensee informed the inspector on December 8, 1986 that the pump vendor had identified a problem during manufacture of the new impellers. Three of the four impellers were found during the machine process to have excessive porosity in the metal, which required that the material be sent back to the foundry for rework. The total impact of the fabrication

problem on the vendors delivery schedule was not known as of December 31, 1986, and the impact on the repair schedule was under evaluation by the licensee.

The inspector had no further comment on this area at the close of the inspection. Subsequent to the end of the inspection period, the licensee informed the NRC by letter FVY 87-12, dated January 19, 1987, that the delivery schedule for shipment of replacement impellers was revised to mid-February 1987, and, therefore, inspection of the first pump would begin the first week of March 1987. This item will be reviewed further on subsequent inspections.

- 3.8 (Closed) Follow Item 85-25-09: Schedule for CRD Modifications. The inspector determined during the recirculation pipe replacement outage that the floor space requirements on the Reactor Building 252 ft. elevation for pipe replacement activities would not allow enough floor space to concurrently modify the CRD insert/withdraw line supports.

The licensee's revised schedule for completing the modifications was provided in letter FVY 85-81 dated September 12, 1985, which called for completing the modifications within 5 months following the startup from the 1986 refueling outage. The licensee's revised schedule was accepted by NRC:NRR by letter dated December 9, 1985. During a meeting with the Maintenance Supervisor on November 19, 1986, the licensee stated that the targeted completion date for the modifications of December 4, 1986 would be missed by about a week, but that the modifications would be completed no later than mid-December, 1986.

The inspector noted that the licensee subsequently completed the modifications of the insert/withdraw line supports in December, 1986 per his commitment. This item is closed.

- 3.9 (Closed) Unresolved Item 85-08-02: CRD Hydraulic Control Unit (HCU) Seismic Supports. The licensee completed modifications per ECN 8 of EDCR 80-53 during this report period (reference 3.8 above) which upgraded the seismic supports for the hydraulic control unit insert and withdraw lines. The inspector reviewed work activities in progress during the inspection period to modify 32 insert/withdraw line supports outside the drywell. The modifications consisted of replacing all or portions of the unistrut frames with structural tubing, and increasing the anchor bolt and baseplate sizes. No inadequacies were identified.

The inspector noted further that the licensee's analytical capabilities to complete seismic analyses and design upgrades were recently reviewed by the NRC staff relative to base plate modifications (Inspection 86-12) and masonry wall modifications (Inspection 86-17). Overall, the licensee's analytical capabilities were found acceptable. This item is closed.

- 3.10 (Closed) Follow Item 83-17-11: Resolution of Hydraulic Control Unit Discrepancies. The inspector reviewed the licensee's evaluations and actions regarding the frequency response of the HCUs summarized in memoranda dated August 19, 1983 (MAG 452/83), September 27, 1983 (VYS 10/83), and March 21, 1984 (File 3.0 - RD Pagodin to RJ Wancjyk). The licensee provided information in his September 27, 1983 memorandum to adequately address the questions raised in IR 83-17.

Specifically, the licensee identified that (i) the difference between the seismic shaker test and the VY installation was that two HCUs were mounted back-to-back for the seismic test, whereas the units at the plant were mounted free standing; and, (ii) the natural frequency of the HCUs was less than 2 hertz, which did not correspond to the 5.5 hertz natural frequency of the Reactor Building. The licensee also provided an adequate explanation of the sequence of reviews that led to the discovery of the HCU discrepancy. The licensee did not possess an official copy of the vendor's seismic test report. Based on the above, no inadequacies were identified.

The licensee completed modifications in January, 1985 per EDCR 83-31 that added additional structural tube steel supports between the HCUs to stiffen the units and restore the rigidity of the structure to a level commensurate with the FSAR assumptions (i.e., greater than 20 hertz). This item is closed.

- 3.11 (Closed) Follow Item 83-02-01: Resolution of Outstanding Issues Regarding Scram Discharge Volume Supports. This item was last reviewed in Inspection 83-17. Satisfactory closeout of issues open from EDCR 82-17 was documented in Inspection 83-17, paragraph 2.f. The item remained open pending resolution of the difference between the actual HCU frequency response and that assumed in the FSAR.

By letter dated June 6, 1983, the licensee described the identified HCU discrepancies to NRC:NRR and provided his justification for continued operation pending resolution of the discrepancies. The justification was based on the CRD structure seismic improvements, and on the NRC staff evaluations contained in NUREG 0803.

The licensee completed modifications per EDCR 83-31 (as described in section 3.10 above) to resolve the HCU rigidity issue. Based on the above, this item is closed.

- 3.12 (Closed) Unresolved Item 85-14-03: Pump Testing per ASME Code Section XI. This item was open pending inspector review of licensee testing practices for conformance with the requirements of Section IWP-3000 of the code, and specifically in regard to the use of the 96 hour test data evaluation period in IWP-3220. Licensee testing practices were found to be inconsistent with the staff position on the code requirements, as discussed in section 5.2 below. Resolution of this issue will be tracked through Inspection Item 86-25-01. Item 85-14-03 is considered closed administratively.

4.0 Observations of Physical Security

Selected aspects of plant physical security were reviewed during regular and backshift hours to verify that controls were in accordance with the security plan and approved procedures. This review included the following security measures: guard staffing; verification of physical barrier integrity in the protected and vital areas; verification that isolation zones were maintained; and implementation of access controls, including identification, authorization, badging, escorting, personnel and vehicle searches.

4.1 Security Events

During maintenance of the plant security computer system on November 6, 1986, the licensee lost the Central Alarm Station (CAS) and Secondary Alarm Station (SAS) computer consoles and the on-line computer. The event was reported via the Emergency Notification System and a written report was submitted (Physical Security Event Report 86-06) per the time requirements specified by 10 CFR 73.71(c). The inspector reviewed the circumstances involved in the event; compensatory actions taken; corrective actions taken during the maintenance period; and, the content of the Physical Security Event Report. No inadequacies were identified.

On December 30, 1986, a moderate loss of physical security effectiveness occurred due to a hardware failure within the security computer console. The event was reported via the Emergency Notification System at 5:00 p.m. on December 30, 1986, and a written report dated January 6, 1987, was submitted as Physical Security Event Report 87-07. The inspector reviewed the circumstances involved in the event, the compensatory actions taken, the corrective actions to prevent the hardware failure, and the content of the Physical Security event report. No inadequacies were identified.

5.0 Inspection Tours and Operational Status Reviews

Plant tours were conducted routinely to observe operating activities in progress and verify compliance with regulatory and administrative requirements. Tours of accessible plant areas included the control room, reactor building, cable spreading and switchgear rooms, diesel rooms, turbine building, intake structure and grounds within the protected area. Radiation controls were reviewed to verify access control barriers, postings, and posted radiation levels were appropriate. Plant Housekeeping conditions were verified to be in accordance with the requirements of AP 0042. Shift logs and records were reviewed to determine the status of plant conditions and changes in operational status. Inspection emphasis was placed on control room activities and the review of plant operational status and routine surveillance testing.

No inadequacies were identified. Events that received further review are discussed below.

5.1 Feedwater Leak Detection

The inspector reviewed the feedwater sparger leakage detection system and the monthly performance summary provided by the licensee in accordance with letter FVY 82-105. The licensee reported that, based on the leakage monitoring data reduced as of November 30, 1986, there was no deviations in excess of 0.10 from the steady state value of normalized thermocouple readings, and no failures in the 16 thermocouples initially installed on the 4 feedwater nozzles. No unacceptable conditions were identified.

5.2 Inoperable Equipment

Actions taken by the licensee during periods when equipment was inoperable were reviewed to verify that (i) facility technical specifications were met; (ii) alternate surveillance testing was completed satisfactorily; and, (iii) equipment was properly returned to service upon completion of repairs. The above reviews were completed for the following items: a main steam line radiation monitor on December 1, 1987; service water effluent monitor on December 2, 1986; and, B standby gas treatment system on December 1, 1987. No inadequacies were identified, except as noted below.

Inservice test (IST) data for the B core spray pump from testing at 9:00 a.m. on November 25, 1986 showed high vibration levels at 1 of 5 points monitored in the program. The vibration measured at pump location X2 (pump to motor shaft coupling) was 11.0 mils, which was above the "Required action" range of 8.0 mils as determined by ASME Code Section XI, 1980 Edition, Winter Addenda. (The vibration limits for the B pump established per Table IWP-3200-2 were Alert range - 6 to 8 mils; Required Action range - greater than 8 mils). The licensee did not declare the pump inoperable pending further review of the pump vibrations during an additional test on the 4-12 shift on November 25, 1986. The licensee based this action on his interpretation of the code which allows 96 hours to evaluate IST data. The licensee started the 96 hour clock when the data was identified to be in the "Required action" range and used the subsequent 96 hours to determine whether the pump was inoperable. The additional test run was used to validate the 9:00 a.m. results.

The inspector noted that even though the B core spray pump was not declared inoperable, full flow operability testing was completed during the period from Nov 24th to Nov 25th on the 4 RHR pumps and the 4 RHRSW pumps, and, valve operability demonstrations were completed for the RHR and RHRSW valves, as part of normally scheduled monthly surveillance. No valve operability testing was completed for the core spray system. The A core spray pump was run for vibration measurements on November 25th, but normal surveillance data to demonstrate pump operability was not taken. Based on the above, the inspector concluded that redundant safety systems were operable during the reviews of the B core spray pump operability.

Additional vibration data for the B core spray pump at 9:10 p.m. on November 25, 1986 showed all monitored points to be within the "normal" range, including X2 which was measured at 5 mils. Maintenance personnel and a contractor vibration specialist obtained pump data concurrent with the IST measurements. The data taken by Maintenance personnel, which were based on displacement and velocity measurements, did not indicate pump operability was a concern, and specifically that the vibrations at location X2 were acceptable. However, the data indicated that the pump mounting bolts required tightening. Additionally, measurements taken on the pump motor outboard (thrust) bearing, a monitoring point considered by the licensee to be outside the Section XI IST program, showed a displacement reading of 4 mils and a velocity reading of 0.55 inches per second. Evaluation of the maintenance data per the procedures in OP 0202 indicated the bearing was operating in the "rough" to "shutdown" range.

The licensee concluded, based on input from the vibration specialist in his report dated November 28, 1986, that the pump remained operable and capable of performing its intended safety functions. Licensee reviews of the pump status continued and a decision was made to tighten the pump mounting bolts. IST testing following the completion of this action on December 8, 1986, showed no improvement in the pump vibration data, and vibrations at location X2 remained in the "alert" range at 6.5 mils. Velocity data taken by maintenance personnel on the motor thrust bearing remained in the "rough" range. The vibration at position X2 was again measured in the "Alert" range at 6 mils on December 10, 1986.

Vendor and contractor assistance was obtained to continue an evaluation of pump performance, and to assess the adequacy of the vibration readings used in for the IST program. The results of this review indicated: the B core spray pump performance was acceptable to consider the subsystem operable; the IST vibration monitoring instruments used by Operations personnel provided accurate results, but the instruments were not optimal for field use - plans were initiated to obtain suitable replacements; and, a decision was made to schedule a pump outage early in 1987 to address the thrust bearing. Pump vibration measurements remained acceptable through the remainder of the reporting period, including at location X2, which was less than 6 mils during test runs on December 12 and 19, 1986. The pump test frequency was returned to the normal interval of once per month. As an additional measure to improve equipment performance evaluations, subsequent IST vibration measurements were taken by both Maintenance and Operations personnel concurrently.

The inspector reviewed the licensee's actions relative to the pump operability assessments and the IST program interpretations. The issues and followup items discussed below were identified.

- (1) The actions to resolve apparently conflicting vibration measurement data and assess core spray pump operability were acceptable. Subsequent licensee action to disassemble the B core spray pump motor and repair the thrust bearing will be reviewed on a subsequent routine inspection.
- (2) The licensee's interpretation and implementation of the Section XI requirements were reviewed and found to be inconsistent with NRC staff positions on the actions to be taken when IST data is found to fall within the "Required Action" range. The following NRC staff position was established based on a March 17, 1980 memorandum from NRC IE:HQ and the inspector's review of the 1980 version of Section XI.

When the IST vibration data is analyzed (within the 96 hour period as allowed for by IWP-3220) and found to fall within the "Alert" range of Table IWP-3100-2, the frequency of testing shall be doubled per IWP-3230(a) until the cause for the deviation has been determined and corrected. If the data deviation is determined to fall within the "Required Action" range, then the pump must be declared inoperable per IWP-3230(b) and not returned to service until the cause of the deviation has been corrected. Correction shall be either replacement or repair, or analysis to demonstrate the condition does not impair the operability of the pump. This analysis can include recalibration of instruments and test rerun as allowed by IWP-3230(d). The technical specification action statement period starts after the pump is determined to be inoperable per IWP-3230(b) and runs concurrently with additional actions to analyze and assess operability of the pump. There is no 96 hour period allowed for evaluation of component operability when data is determined to be in the "Required Action" range. The above position was discussed with Operations Superintendent on December 9, 1986, and with the Plant Manager on December 12, 1986.

The inspector determined that licensee actions relative to the B core spray pump were inconsistent with the above on the following specific occasions: (i) vibration at position X2 was determined to be in the "Required Action" range at 9 mils during testing on October 7, 1986. The pump was not declared inoperable and no action was taken to either determine the cause for the deviation or correct the condition. Plant personnel did start a 96 hour clock per IWP-3230 and a subsequent retest on October 10, 1986 showed the vibration at position X2 was in the "Alert" range. (ii) Bi-weekly measurements continued to show X2 vibrations in the "Alert" range, until the 11.0 mil measurement was made on November 25, 1986. As noted above, following the testing on November 25, 1986, the licensee did not declare the pump inoperable, but used the 96 hour period to continue an evaluation of the pump performance.

The failure to follow the requirements of IWP-3230(b) of the 1980 Section XI code is a violation of Technical Specification 4.6.E (VIO 86-25-01).

The above matters were discussed with licensee personnel responsible for the IST program on November 25, 1986. The licensee concurred that the actions following the testing on October 7, 1986 were unacceptable, and additional instructions were provided to personnel in a memorandum dated November 26, 1986 to initiate corrective actions using the MR process when pump vibration data is found in the "Alert" range. However, no consensus was reached with the licensee regarding how to use the 96 hour period in IWP 3230 and when to enter the technical specification action statement.

The inspector noted that the licensee has initiated reviews to determine whether testing practices should be revised to improve the IST program. The review will address improvements in vibration monitoring equipment, and the desirability of obtaining an NRC staff exemption from the Section XI requirements that will allow the use of velocity data in the assessment of pump operability. The inspector noted further that a review of the licensee's implementation of the Section XI program is scheduled for review by a Region I specialist in the near future. The acceptability of a program that does not include monitoring of pump motor performance will be reviewed further by the inspector at that time.

5.3 Radwaste Shipment

The licensee made a controlled route shipment on November 11, 1986, using a GE-1500 shipping container with 62,593 curies of Co-60 in the form of stellite balls. The stellite balls were removed from control rods previously discharged from the reactor that were in storage in the spent fuel pool. The materials were shipped in a Type B container with a Transport Index of 0.2. The acceptability of the package for all transport conditions including accidents was documented in Certificate of Compliance #5939. The carrier was the Tri-State Motor Transite Company and the material was sent to a GE facility in Pleasanton, California.

The shipment was made per the controls established in licensee procedure OP 0504, inclusive of DI 86-39. The shipment documentation and vehicle were reviewed by the inspector on November 14, 1986 for conformance with the following requirements: conformance with the decay heat limits, curie content, and the general requirements of Certificate of Compliance #5939, approved by the NRC staff on May 1, 1985, as amended on May 6, 1985; compliance with the posting and dose limit requirements of 10 CFR 71 and 49 CFR 173; conformance with the general requirements of the application for approval of the lifting device for the control of heavy over spent fuel, as approved by the NRC staff in an SER dated September 16, 1985; conformance with the requirements of 10 CFR 71.34 for quality assurance measures. Representatives from the State of Vermont were onsite to review the shipment and to escort the truck along its controlled route. No inadequacies were identified.

The inspector noted that the licensee did not provide a formal notification to the NRC in advance of the shipment. The licensee stated he believed the requirements of 10 CFR 71.97 did not apply to the shipment since the material was not radwaste. The inspector reviewed the criteria in 10 CFR 71.97 and discussed the item with the Region I staff. The inspector determined that the licensee's position was correct and no formal notifications were required. No inadequacies were identified.

5.4 RHR Minimum Flow Requirements

The licensee informed the inspector on November 24, 1986 that an engineering evaluation was initiated to assess information received from the RHR pump vendor which indicated that the minimum flow requirements established since plant startup may not be adequate for all pump operating modes.

In a letter dated November 13, 1986 from a field service supervisor for the Bingham-Willamette company, the vendor for the Bingham 16x18x26 CVIC pumps recommended that continuous minimum flow for the pumps be established at 2700 gpm, or about 38% of the pump design flow of 7200 gpm. Continuous operation is considered as more than 2 hours in any 24 hours of operation. For intermittent operation (anything less than 2 in 24 hours), the minimum flow can be reduced to 2075 gpm. At VY, the 4 RHR pumps are paired in two trains, with the pumps in each train sharing a common minimum flow recirculation line back to the torus. The four recirculation lines are 3 inches in diameter, but contain orifices to limit flow to about 350 gpm.

The licensee stated that the present recirculation line orifice sizing was determined by the plant AE based solely on the pump flow required to avoid cavitation caused by pump heat input that would cause the water temperature to increase. The pump vendor apparently has since determined that additional factors must be considered in determining the minimum flow requirements, including pump inlet & outlet recirculation flow patterns that will occur at lower system flow modes. Recirculation flow patterns can occur and result in component damage even if the gross NPSH requirements are satisfied at the inlet of the pump. The vendor's current recommendation, established in an internal technical bulletin (#45) dated September 17, 1979, sets the RHR minimum flow requirements at 2700 gpm to account for the other factors. In a similar letter dated November 21, 1986, the vendor recommended a continuous minimum flow of 1500 gpm (versus about 350 gpm) for the Bingham 12X16X14-1/2 CVDS core spray pumps. A minimum flow of 1350 gpm was recommended for intermittent operation.

The licensee stated that the 350 gpm recirculation lines should not have had an adverse impact on the pumps because the pumps are not operated using the minimum flow valves when run for either shutdown cooling purposes or for monthly surveillance testing. During these modes of operation, the RHR system is operated with either a torus to torus or the vessel to vessel flow path, with flow rates in excess of the 2700 gpm

minimum value. However, further evaluation was required to determine whether pump operability would be adversely affected in a mode where the pumps started in response to a high drywell pressure condition, but did not inject due to elevated vessel pressure and level conditions, as could occur for some postulated small break LOCA scenarios.

The resident inspector reviewed the licensee's engineering evaluation for this item attached to a PRO dated December 6, 1986. The licensee concluded that even when the vendor information is considered, the present minimum flow modes established by ROs 10-104A-D do not cause inoperability for the RHR pumps since:

- (i) There has been no accumulated time in the minimum flow regime due to monthly testing; and,
- (ii) For the small break LOCA scenario, the longest time estimate that the plant would be configured in the minimum flow mode is 4 to 5 hours, and in no case more than 10 hours. This period of operation was considered by the licensee to be small when compared to the 29,200 hours derived from the vendor's definition of "2 hours in any 24 hour period", extrapolated over a 40 year pump service life.

Based on the above, the licensee concluded that this item was not reported under 10 CFR 50.73. However, the licensee concluded that the matter was potentially reportable under 10 CFR Part 21 and actions were initiated to have the item reviewed by YNSD for Part 21 requirements.

The inspector discussed the following concerns regarding the engineering evaluation with the Plant Manager and the Engineering Support Supervisor on December 12, 1986. The inspector identified no information that would result in a different conclusion from the licensee's regarding RHR pump operability, since from qualitative considerations, if the 5% minimum flow values were adequately selected to avoid cavitation from pump heat input, then the concerns raised from recirculation flow phenomena should not create an immediately operability problem for short term operation. However, the licensee's conclusions were not fully supported by the information available in the PRO. The inspector requested the licensee to consider the following specific items:

- (1) The inspector noted based on a review of the current version of the surveillance test procedure for the RHR system, OP 4124, that the pump under test could be operated for a short time (approx. 1-2 minutes) on the minimum flow bypass valve during the performance of steps 7 through 10. The cumulative pump operating time at the minimum flow condition over 15 years of monthly surveillance and alternate system operability testing could be on the order of several hours.

- (2) It is clear from the vendor's recent information that the pumps will operate for 29,000 hours (or more) without deleterious effects from recirculation flow currents if RHR minimum flow is maintained greater than 2700 gpm. However, the converse was not adequately addressed. Specifically, the engineering evaluation did not address (i) the minimum flow limit established by the vendor for "intermittent" operation; (ii) how long the pump could operate with the deleterious flow components that would be present at 350 gpm; or, (iii) whether the RHR pumps would withstand the vibrations attendant with 10 hours of running at 5% flow, and still be available for extended operation (30 days or more) in the shutdown cooling mode following a LOCA.
- (3) The PRO did not address the vendor information relative to the core spray pumps. While it is recognized that the resolution of the questions relative to the RHR pump have obvious applicability to the core spray pumps, the lack of consideration of the core spray pumps was notable. Special consideration of the core spray pumps is warranted to quantify the hours of pump operation in the low flow mode.
- (4) The inspector requested the licensee to consider the feasibility and benefit of testing the RHR pumps in the minimum flow condition, in conjunction with the upcoming pump outage to replace the impellers, to gather further information in the assessment of pump performance with the present bypass flow orifices.

This item is unresolved pending completion of licensee actions to (i) address the above issues, and (ii) complete his evaluation of reportability under 10 CFR Part 21, and subsequent review by the NRC (UNR 85-25-02).

5.5 Part 21 Report - Limitorque Operators

The licensee notified the resident inspector on November 5, 1986 that his engineering evaluation of the Limitorque MOV failure reported in LER 86-12 determined that the matter was reportable under 10 CFR Part 21.

As described in LER 86-12, a limitorque valve operator in the reactor recirculation system failed when the spring pack assembly became hydraulically locked due to a combination of a new, less viscous grease (Mobil EP-0) that was used to overhaul the valve during the outage, and due to the lack of a "grease-relief" modification that the limitorque manufacturer had included on his product line for MOVs manufactured after 1975. At VY, the grease relief modification was installed on 40 valves overhauled during the outage. The licensee concluded that completion of the above action precluded a significant concern at VY. For further corrective action at VY, the YAEC engineering organization recommended that grease relief modifications be installed in other plant MOVs manufactured before 1975 during subsequent service intervals for the valves.

Prompt action is not required since the valves do not have the less viscous grease and due to the successful operating history. The resident inspector will follow the licensee's actions.

The licensee concluded that the item should be reported under Part 21 for the benefit of other limiter users since a design deficiency that reduces valve reliability could potentially present a significant hazard at another facility.

5.6 Safety System Review

The residual heat removal, residual heat removal service water, high pressure coolant injection, core spray, standby liquid control, standby gas treatment and reactor core isolation cooling systems were reviewed to verify the systems were properly aligned and fully operational in the standby mode. The review included: (1) verification that accessible, major flow path valves were correctly positioned; (2) verification that power supplies were properly aligned; and, (3) visual inspection of major components for leakage, proper lubrication, cooling water supply, and general condition. No inadequacies were identified.

5.7 Environmental Qualification of Certain Electrical Splices

NRC:NRR notified the licensee on December 5, 1986 of a potentially generic deficiency that was identified by Commonwealth Edison CO. concerning the failure during environmental qualification testing of AMP, PIDG nylon insulated butt splices. The inspector discussed the results of the licensee's review of this item with the Technical Services Superintendent on December 8, 1986. The licensee determined that no AMP, PIDG Insulated Butt splices are used in any applications requiring environmental qualification per 10 CFR 50.49, and thus, the potential deficiency was not applicable to VY. No inadequacies were identified.

5.8 Review of Potential Reportable Occurrences

The inspector reviewed potential reportable occurrence reports (PROs) 86-41, 86-42, 86-55 through 86-60, and 86-63 to verify the licensee appropriately dispositioned the events described in each one, and reported as licensee event reports those events that met the requirements of 10 CFR 50.73. The inspector also reviewed the PRO dated November 21, 1986 concerning the minimum flow requirements for the RHR pumps, which is discussed further in section 5.4 above. No inadequacies were identified.

5.9 Control of Safety Related Components

The inspector noted the licensee made a temporary change (DI 86-27) to AP 0025 on December 5, 1986, which changed the instructions to the shift supervisor regarding the control of safety related systems. The inspector noted that prior to the change, AP 0025 required that alternate system

testing be completed prior to the removal of system or components for preventive maintenance. Alternate system testing was no longer a requirement, but left to the discretion of the shift supervisor, so long as actions are completed to "ensure alternate equipment is functioning properly".

The inspector reviewed the basis for original requirements of AP 0025 and verified the licensee's procedures remained consistent with previous commitments made in response to NRC requirements. Specifically, the inspector verified that the controls were consistent with the NRC staff position issued in IE Bulletin 79-08, VY response letters WVY 79-89 and 79-49, and the NRC SER dated December 31, 1979. The position established in these references allowed for the use of testing or inspection to assure operability of unaffected components.

However, the inspector questioned whether the revised version of AP 0025, absent additional clarifying criteria, was sufficient to assure that shift personnel would consistently complete the minimum acceptable checks to verify alternate system operability. The inspector's concerns were discussed with the Operations Supervisor and Superintendent on December 9, 1986. The licensee reviewed the item with shift personnel and concluded that additional amplifying criteria were necessary to assure uniform implementation of the instructions. This information was provided in a memorandum to the shift supervisors dated December 30, 1986, which was included in the night orders.

The inspector had no further comment on this item at the present time. The control of safety related systems per AP 0025 will be reviewed further on subsequent routine inspections.

5.10 Emergency Procedure Review

During a review of OP 3126 on November 25, 1986 concerning operator actions to shutdown the plant from outside the main control room, the inspector noted that the instruction for "Operator 4" in Appendix I were not consistent with the instructions in Step 5.a of the procedure. Specifically, Appendix I failed to instruct the operator to assure the 4KV supply breaker for an associated service water pump was in the closed position prior to starting the A diesel generator. This matter was discussed with the Operations Engineer, who noted the comment for incorporation in the next procedure revision of OP 3126.

The inspector had no further comments in this area.

5.11 Electrical System Safety Class Labeling

During a review of electrical control wiring in Drawing G191301 Sheet 860 on November 19, 1986, the inspector noted that the 24 VDC ECCS cables were labeled Safety Class II (SII), but were associated with instrumentation cabinet 25-25B, which contained designated Division I components.

This item was reviewed with I&C personnel and the Maintenance Superintendent. The inspector verified that the physical separation of safety class electrical circuits was appropriate, but that a potentially confusing situation existed in the cross labeling and nomenclature for safety class I/II circuits. The inspector noted that the confusing labeling represented a potential source for error during the conduct of routine maintenance activities, but that activities would be conducted properly so long as the CWD prints are followed exactly.

The licensee stated that this item would be reviewed in light of the inspector's concerns to determine whether changes to circuit labeling is warranted. This item is unresolved pending completion of the licensee's actions and subsequent review by the NRC (UNR 86-25-03).

6.0 Vermont Yankee Split Samples

The licensee's program for analyzing plant chemistry samples was reviewed during Inspection 85-38 and split samples were taken at that time for analysis by the NRC's contractor, Brookhaven National Laboratory (BNL). The results of the split sample analyses were discussed with the licensee and are reported below.

	<u>BNL</u>	<u>VY</u>
Boron	--	20,597
Iron (ppb)	\$100	ND
Copper (1) (ppb)	155	24
(2) (ppb)	240	--
SiO ₂ (2) ppb)	11,600	6,230

The boron analysis was not conducted by BNL, due to precipitate in the sample. This analysis will be reviewed during the next routine split sample comparison. The silica and copper analyses are questionable. The licensee was recalculating the silica, and the copper analysis will be resolved on a subsequent inspection.

7.0 Surveillance Testing

The inspector reviewed portions of the surveillance tests listed below to verify that testing was performed in accordance with administrative requirements. The review included consideration of the following: procedures technically adequate; testing performed by qualified personnel; test data demonstrated conformance with technical specification requirements; test data anomalies appropriately resolved; surveillance schedules met; test results reviewed and approved by supervisory personnel; and, proper restoration of systems to service.

- OP 4315, Main Steam Line Monitor Scram/Isolation Functional test and Calibration, completed on December 2, 1986
- OPF 4115.01 Primary Containment Surveillance, November 2, 1986

No inadequacies were identified.

8.0 Maintenance Activities

The maintenance request log was reviewed to determine the scope and nature of work done on safety related equipment. The review confirmed: the repair of safety related equipment received priority attention; technical specification limiting conditions for operation were met while components were out of service; performance of alternate safety related systems was not impaired; and, the maintenance activity did not create an unreviewed safety question.

Maintenance activity associated with the following was reviewed to verify (where applicable) procedure compliance and equipment return to service, including operability testing.

- MR 86-2262 Repair Steam Leak on V12-68
- MR 86-2294 Investigate B Core Spray Pump Vibrations

The inspector had no further comments in this area, except as noted below. The licensee's actions on the B core spray pump are discussed further in section 5.2 above.

Licensee actions to isolate and repair minor steam leaks in the reactor water cleanup system (RWCU) were reviewed on a previous inspection (reference Inspections 86-18 and 86-22). The inspector observed portions of the work activities per MR 86-2262 performed on November 1, 1986 to repair V68, and completed followup discussions on November 7, 1986 with the workers responsible for the job.

The inspector determined that the repair involved removing the stem and disk from the valve, an action that was beyond the scope of repair originally planned for the MR and unknown to maintenance supervisory personnel. Local leak rate testing per 10 CFR 50 Appendix J was not performed following repair. Post maintenance testing was limited to an operational hydrostatic test to verify integrity of the pressure retaining boundary, and stroke time testing. The inspector identified his findings to licensee management on November 7, 1986 and expressed his concerns that a local leak rate test be completed to comply with the technical specifications. The licensee acknowledged the inspectors comments and initiated actions to review the maintenance activity and to complete a Type C test. The inspector reviewed the results of a Type C leak rate test completed for V68 on November 12, 1986 per Department Instruction 86-25 for OP 4030, and identified no inadequacies. The as found valve leakage was 0.082 lbm/hr, which was much less than the allowable leakage rate of 0.522 lbm/hr.

Failure to complete a local leak rate test of V68 following maintenance that disturbed the designated safety class 3 isolation boundary was contrary to the requirements of Technical Specification 4.7.b.2. However, the failure to complete a leak rate test of V68 had no safety significance due to the system design that includes other upstream isolation valves between V68 and both the primary coolant system and the containment boundary. See Section 5.9 of Inspection 86-18 for further NRC review of the RWCU system design. The licensee's proposed local leak rate test program presently under NRC staff review (reference WVY 80-132, FVY 81-13 and NRC staff SER dated August 19, 1983) removes V68 from the Appendix J program. The licensee stated that V68 was initially included in Table 4.7.b.2 due to an initial system design that provided for RWCU return directly to the reactor vessel. The licensee stated he intends to initiate actions to expedite deletion of V68 from the technical specifications separate from the amendment request to revise the Appendix J program.

The failure to complete required post-maintenance operability testing due to work outside the intended scope of repairs appeared to be an isolated case. The licensee completed a review of the work activity and determined the cause of the violation was personnel error, in that the workers went beyond the intended scope of work by removing the valve internals, and then failed to recognize the significance of the actions relative to operability testing. Based on the above considerations, the inspector determined that no further response from the licensee appears warranted at this time and, for the reasons described above, a Notice of Violation will not be issued. The performance of maintenance activities within the defined scope will be reviewed further during subsequent routine inspections.

The licensee reported the event as required in LER 86-16 and concluded, as noted above, that the cause of the deficiency was personnel error. The LER noted further that actions will be completed to review criteria in maintenance procedures to determine whether additional clarification of work scope is required. This item is unresolved pending completion of licensee actions, and subsequent NRC review of the followup actions specified in LER 86-16. The item is also open pending further NRC review of the adequacy of the instructions in AP 0021 and 6023 to control unplanned maintenance (UNR 86-25-04).

9.0 IE Bulletin 85-03 Response

The licensee responded to IE Bulletin 85-03 by letter FVY 86-45 dated May 14, 1986, which was submitted in accordance with the response time required by the bulletin. The licensee's response to address concerns regarding the operability of motor operated valves (MOVs) was assigned to NRC:HQ for review.

The inspector informed the Plant Manager during this inspection that the preliminary NRC staff review determined that the response was not totally adequate because it did not present sufficient details of the plan of action to address the bulletin issues. Examples of areas where additional information is necessary for the NRC staff to complete its reviews include: discussion of how valve differential pressures were determined; an explanation of how

MOV switch settings were determined; and an explanation of how testing will confirm switch settings are adequate, particularly if the testing is not conducted for the full differential pressures the valves could experience. The inspector noted further that the licensee expected to complete his corrective actions to address the bulletin issues by the end of the 1988 (cycle 14) refueling outage, which is scheduled to occur in the Fall of 1988. The bulletin required that corrective actions be completed by November 15, 1987.

Following a discussion of these items with the NRC:HQ staff, the inspector determined that no further licensee actions to address the above issues are required at the present time. The NRC staff will address the additional information required to complete the review of the IE Bulletin 85-03 response in subsequent correspondences.

10.0 Errata

The licensee informed the inspector of an error on Page 7 of Inspection Report 86-20, Section 4.1, paragraph 2. The corrected paragraph should read "The AO and Shift Engineer (STA) Training are the only non-licensed staff training programs that are INPO accredited". The licensee expects to have the other six non-licensed training programs (electrical maintenance, mechanical maintenance, chemistry, health physics, instrumentation & control, and technical staff & supervisory) INPO accredited by the Fall of 1987.

11.0 Management Meetings

Preliminary inspection findings were discussed with licensee management periodically during the inspection. A summary of findings for the report period was also discussed at the conclusion of the inspection and prior to report issuance.