

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

Region I

Report No. 50-271/80-02
 Docket No. 50-271
 License No. DPR-28 Priority - Category C
 Licensee: Vermont Yankee Nuclear Power Corporation
77 Grove Street
Rutland, Vermont 05701
 Facility Name: Vermont Yankee Nuclear Power Plant
 Inspection at: Vernon, Vermont
 Inspection conducted: February 5-8, 1980
 Inspectors: *W. Raymond* *for* *3/27/80*
W. Raymond, Reactor Inspector date signed
 _____ date signed
 _____ date signed
 Approved by: *T. F. Martin* *for* *3/27/80*
T. F. Martin, Chief, Reactor Projects date signed
Section No. 3, RO&NS Branch

Inspection Summary:

Routine Inspection February 5-8, 1980 (Report No. 50-271/80-02)
Areas Inspected: Routine, unannounced inspection by a region based inspector of Licensee Actions for IEB 80-01; plant modifications resulting from NUREG 0578; Plant Operations; Emergency Procedure conformance to NEDO-24708 - Small Break LOCA Operator Guidelines; and submitted LER information. The inspection involved 16 inspector-hours onsite.

Results: No items of noncompliance were identified.

DETAILS

1. Persons Contacted

- *Mr. R. Burke, Supervisor - Engineering and Technical Support
- Mr. P. Donnally, I&C Supervisor
- *Mr. D. Girroir, Engineering Assistant
- *Mr. W. Murphy, Assistant Plant Superintendent
- Mr. W. Witmer, Construction Supervisor

The inspector also interviewed members of the Operations, Health Physics and General Office staff during the inspection.

*denotes those present at the exit interview

2. IEB 80-01, SRV Accumulator Check Valves

a. Discussion

Inspection and Enforcement Bulletin (IEB) 80-01, dated January 11, 1980, requested certain actions be taken by BWR facilities to verify the operability of pneumatic supply systems used for Automatic Depressurization System (ADS) operability. Following review of the VY specific design, the licensee reported the following information and proposed actions in letters to the NRC dated January 18 and January 25, 1980:

- . the installed check valves (four total) which isolate the ADS accumulators from the station instrument air (IA) system have seat material made of stainless steel with a stellite facing;
- . the ADS accumulator system has not been periodically leak tested;
- . engineering review of station IA supply from the ADS valve operator out to the air system isolation valve outside of primary containment confirmed the supply lines to be seismically qualified. Further, the air supply lines were found to be seismically qualified out to the air receiver tanks, located in the Turbine Building. The Turbine Building, however, is not a seismic class I structure;

- . based on the lack of data regarding the leak tightness of the ADS accumulator check valves, the check valves would be leak tested, and repairs/replacement would be effected as necessary; and,
- . during the interim period, until the integrity of the accumulator system could be proven, the seismically qualified, Containment Instrument Air System would be used to supply the SRV accumulators. The Containment Instrument Air system is separate from the station instrument air system and is powered from 480 volt MCC9B, which is powered by an emergency diesel generator during a loss of normal power. Minor modifications to make the Containment Instrument Air System suitable for the present application were required and included (i) provide a compressor suction path from the reactor buildup atmosphere by removing a section of suction piping downstream of the containment isolation valves and blank flange the out-of-service suction line; (ii) disable the compressor suction line valve closed interlock and the primary containment isolation interlock to allow the compressor motor to remain energized at all times; and, (iii) install additional hangers at one point along the air supply lines to assure seismic qualifications of the system. The Containment Instrument Air System was brought on-line on January 25, 1980.

The plant entered a cold shutdown condition on January 31, 1980 for modifications required by NUREG 0578 commitments. Leak testing of the SRV accumulator system was accomplished during the outage. The inspector reviewed the leak rate test procedure, including the test method, development of leakage rate acceptance criteria, and test results, along with other administrative controls established to assure availability of supplied air to the accumulator system and to complete the aforementioned modifications. References used for this review are listed below:

- . Installation Procedure for PDCR 80-2, Safety Relief Valve Accumulator Check Valve Replacement, dated 2/1/80
- . Installation Procedure for PDCR 80-2, Safety Relief Valve Accumulator Check Valve Replacement, Revision 1, dated 2/4/80.
- . licensee memorandum S. Vekasy to W. Murphy, dated 2/1/80, SRV Accumulator Leakage Criteria.
- . licensee memorandum, S. Vekasy to R. Burke, dated 2/3/80, Leakage limits for SRV Accumulators

- . licensee memorandum, D. Pullen to R. Burke, dated 1/15/80, IE Bulletin 80-01.
- . GE letter VYG-2601 dated 5/7/70, accumulator specifications
- . Ebasco Services, Inc. Purchase Order 7/13/70, accumulators
- . Tarket Rock Corporation Test Report 1007 dated 9/23/70, test results for SRV lift versus accumulator pressure
- . FSAR Section 14.6 and Figure 14.6-10
- . PDCR 80-02 (Job No. 80-04), SRV Accumulator Check Valve Replacement
- . Liquid Penetrant Inspection Report for PDCR 80-02 and MR 80-122, 2/3/80 - 13 total reports.
- . Weld Data Sheets for PDCR 80-02 for 13 weld joints, 2/5/80
- . Material Issued Sheets 2VD049, dated 2/2/80 and 2V0045 dated 2/1/80.
- . VY Maintenance Request 80-00122, dated 2/2/80, including a Housekeeping Zones Control Form
- . Night Orders Book entry for 1/25/80 covering: status of Contained Air System; PAR 80-03, Containment Air Compressor Suction Modifications; and operator actions in the event the containment Air System is taken out of service.

b. Check Valve Leak Testing and Replacement

The initial test of the SRV accumulator supply header was completed on 2/2/80. For each of the four SRV supply headers, a leakage test boundary was established from the SRV solenoid operator, through the accumulator and upstream check valve, to a union in the supply piping between the check valve and the upstream header isolation valve. The piping union was opened to provide a vent path past the check valve seat after the accumulator was pressurized to the initial value required by procedure. A pressure gauge was installed on the accumulator for the testing to monitor pressure drop over the prescribed test period. The test boundary described above, assured that any leakage identified during the test was associated with the individual SRV accumulator header.

Using the above procedure, leakage past the check valve seats were found to be unacceptable during testing on 2/2/80. Starting with the accumulators pressurized to about 100 psig (normal header pressure), two of four headers depressurized to about 70 psig in less than 30 minutes. As a result, all installed check valves were replaced with new, soft seated (Nupro) check valves. The new valves were leak tested prior to installation (bench tested) and found able to maintain test pressure with less than a 1 psi loss over a 24 hour period.

Following installation of new check valves, leak testing was again conducted on 2/3/80, using the test method described above. Following isolation of leaks through header fittings, the individual header leak rates were found to be in excess of values expected based on the check valve bench tests. Further, investigation by the licensee identified that the solenoid valves which actuate the SRV operators, were also leaking past the solenoid seats to containment atmosphere. Separate leak tests conducted on these hard seated valves identified pressure drops as high as 15 psi/hr. All four solenoid valves were replaced using existing (identical) spares and a leak test on each header was again performed to provide the followup results:

| <u>ADS Header</u> | <u>Pressure Decay</u> |
|-------------------|-----------------------|
| A | 4 psi/hr |
| B | 8 psi/hr |
| C | 10 psi/hr |
| D | 3 psi/hr |

The final test results were less than the acceptance criteria value of 12 psi/hr and deemed acceptable to assure ADS valve operability over the range and conditions of anticipated transients requiring ADS actuations, assuming normal air supply to the valves had been lost. Air supply piping and systems were returned to normal configurations, with the Containment Air System in a standby status. Present plant procedures provide for a timely swap over to the Containment Air System in the event the Station Instrument Air Supply becomes unavailable.

c. Leak Test Acceptance Criteria

The licensee developed accumulator air supply leakage acceptance limits based on ADS operability criteria and the followup considerations:

- . accumulator volume: the VY accumulators are sized at 0.189 ft³, which is slightly larger than the nominal size of 0.134 ft³ assumed in the GE specifications and as used in pre-startup ADS valve testing;
- . an initial test pressure of 100 psig, based on minimum header pressure maintained by the air supply systems
- . a minimum SRV seat differential pressure of 28 psid required to actuate the valve. This value was confirmed by Target Rock test data.
- . an anticipated drywell pressure of 27 psig following a small break loss of coolant accident. The 27 psig value corresponds to the plateau pressure that follows the drywell peak pressure in the FSAR analysis of containment pressure response following a large break LOCA. The 27 psig pressure plateau is calculated to exit for 1000 seconds (16 min) before operator action initiates containment cooling to lower drywell pressure.
- . a defined ADS operability time period of 3 hours following the start of the accident. This 3 hour period includes a 30 minute period assumed for operator response to high drywell pressure, and a 120 minute period within which a controlled plant cooldown is accomplished from 540°F to 320°F (T_{sat} for 100 psi).
- . a minimum of 5 ADS valve actuations are required against atmospheric containment pressure, or equivalently, 2 ADS valve operations are required against an assumed containment accident pressure of 27 psig.

From the above, it then follows that a minimum of 55 psig (27 psig + 28 psid) must be the applied pressure by the ADS accumulators for one valve operation. Using a curve fit of the Target Rock initial test data for the SRVs, accumulator pressure must be at least 62.5 psig for the second valve operation. Thus, 64 psig (rounding up) is taken as the minimum acceptable accumulator pressure to achieve two ADS operations. Starting from an initial pressure of 100 psig, the accumulators must still be pressurized to at least 64 psig at the end of a three hour test period, or, accumulator pressure decay cannot exceed 12 psi/hour. This leakage value provides a conservative limit to air supply header to assure the ADS system will remain operable over the required period.

d. Conclusions

The inspector identified no inadequacies in the modifications and test results completed by the licensee in response to IEB 80-01. The inspector noted that continued surveillance of the ADS air supply should be completed to assure continued operation within the prescribed leakage limits. The licensee stated that periodic testing of the air supply header will be added to and completed in accordance with ADS operability testing. This item is considered open pending incorporation of an ADS accumulator air supply leak test in the licensee's periodic test program (50-271/80-02-01).

3. NUREG 0578 Commitments - Plant Modifications

The plant shutdown on January 31, 1980 in compliance with the NRC Show Cause Order dated 1/2/80 to complete certain plant modifications in accordance with commitments made under NUREG 0578. The inspector reviewed the modification work packages and observed newly installed equipment for: (i) changes to the primary containment isolation system (PCIS) RESET logic; and (ii) acoustical monitor/ position indicators for the SVs.

a. PCIS RESET Logic

Changes to PCIS reset logic were completed under EDCR 79-35, Primary Containment Isolation System Modifications. The purpose of the design change was to modify PSIS reset logic so as to prevent any inadvertent containment isolation valve opening, following closure by a condition requiring containment

isolation, by requiring that the control operator first place all individual isolation valves in the CLOSED position before a permissive to reset PCIS logic is given. This was accomplished by wiring a closed contact on each effected control switch in series with a relay in the reset permissive logic. Two PCIS Reset switches are located on CRP 9-5 and have associated with them 6 relays and 6 groups of isolation valves. One switch controls isolation groups C and D; the second switch controls groups A, B, E and F. Under the PCIS logic change, all control switches for valves in any one group must go to the CLOSED position before a PCIS visit permissive is given for any group governed by the reset switch. All containment isolation valve control switches are located either on the main control board, CRP 9-47 and CRP 9-26.

The following was reviewed by the inspector:

- . EDCR 79-35, Primary Containment Isolation System Modification, approved 1/26/80
- . Minutes for PORC 80-02, 1/18/80 and documentation that no unreviewed safety question is associated with the modification
- . Operations/Plant Review Form for EDCR 79-35, 1/24/80
- . Installation Procedure for EDCR 79-35, 1/31/80 which included post installation testing of the change in PCIS logic
- . newly installed "Reset Protect" lights on CRP 9-5 which when energized indicates that PCIS reset is allowable
- . Control Wiring Diagrams B-191301, multiple sheets, 12/7/79
- . Changes to the following plant procedures which document the PCIS logic change:

| | |
|---------|----------|
| OP 2115 | DI 80-08 |
| OP 2118 | DI 80-09 |
| OP 3103 | DI 80-11 |
| OP 2152 | DI 80-10 |
| OP 3100 | DI 80-12 |

The inspector had no further comments in this area.

b. SV Acoustic Monitors

The inspector reviewed the following items associated with a new position indication system installed on the steam safety valves.

- . EDCR 79-46, Safety Valve Acoustic Accelerometers, 2/1/80
PORC Minutes 80-02, 2/1/80
- . Operations/Plant Review Form for EDCR 79-46, 2/1/80
- . Purchase Order 13661, 11/30/79, Base Two Channel Valve Monitoring System
- . EES Memo VYFC-057 dated 2/5/80 documenting seismic inspection of SV-70A and SV-70B accelerometer condits.
- . Installation and Test Procedure for the Valve Monitoring System 2/1/80
- . System Integration Test B-010-02 for the VMS, 1/28/80
- . Installation and Checkout Procedure C-010-02 for the VMS, 2/3/80 and 2/6/80
- . procedure changes for:

| | |
|---------|----------|
| OP 3117 | DI 80-14 |
| OP 2113 | DI 80-13 |
- . newly installed equipment, valve position indicators and annunciator alarms located in the control room.

Two separate acoustic accelerometer channels were installed for the safety valves, which use accelerometer transducers clamped to the tailpipe. An environmentally qualified cable connects each transducer to a drywell wall mounted, NEMA 4 enclosed change amplifier. The signals are then transmitted to the control room using existing (spare incore detector) cables. Signal readouts and controls are mounted in the existing vibration and loose parts monitor located in the control room.

An analog meter for valve percent open display is provided along with channel alarm lights. The signals are also displayed above CRP 9-4 on the main control board. The principle of operation on the valve position monitors is based on flow generated noise when the SRVs lift. Flow generated noise is proportional to the amount the valve is open. The signal strength is used then to approximate percent valve open as read on the CB displays, with band pass filters used to eliminate extraneous background noise. Initial testing of the channels included impact tests to measure channel response and calibrate the monitoring channels to safety valve response characteristics.

Except as noted below, the inspector had no further comments on this item. Installation and testing of the valve monitoring system was complete with the exception of the availability of the following documentation:

- . seismic qualification for components inside containment
- . channel environmental qualification
- . design conformance to IEEE-323-74
- . ECM providing seismic stiffening of the vibration and loose parts monitoring cabinet

Testing and analysis of the above areas is in progress by YAEC and will be provided for NRC review on a subsequent inspection. This item is considered open pending NRC review of the qualification data. (50-271/80-02-02).

4. Plant Operations Review

The inspector reviewed the status of plant operations for conformance with Technical Specification requirements and conducted an inspection tour of accessible plant areas on February 7, 1980. The inspector witnessed portions of OP 4302, RPS Weekly Functional Test on APRM channels E and B, in progress during the tour. The inspector verified that the APRM high power trip setpoints were within specification at the 106% and 118% setpoints. Proper valve lineups were verified based on main control board indications for the RCIC, HPCI, CS and RHR systems. Plant system alarms annunciated in the overhead panel were reviewed and those not normal for existing plant conditions were discussed with control operators. The operators were knowledgeable of the alarms and their causes. None were deemed significant in regard to continued plant operation. Except as noted below, the inspector had no further comments in this area.

The inspector noted that no alarm response procedure was available in the control room for alarm window 5-C, alarm panel AZ on CRP 9-3. The licensee stated that an alarm response procedure is being prepared as part of EDCR 79-46 for the new SV monitoring system. The inspector stated that this item was unresolved pending issuance of the subject procedure (50-271/80-02-03).

5. Emergency Procedures - SBLOCA Guidelines

The inspector reviewed emergency procedures OP 3116 and OP 3124 to verify that changes have been incorporated in conformance with small break LOCA guidelines developed in conjunction with the GE Owners Group and approved by the NRC staff. The following references were used in the review:

- . OP 3116, Loss of Reactor Coolant, Rev. 10, 12/31/79
- . OP 3124, Loss of Reactor Coolant Outside Primary Containment, Rev. 2, 12/31/79.
- . NEDO-24708, Rev.1, SBLOCA Operator Guidelines
- . VY letter to NRC, Modifications to NEDO-24708 Small Break Operator Guidelines, 10/23/79
- . D. Eiserhut letter to all Operating Power Plants, Followup Actions Resulting from the NRC Staff Reviews Regarding the TMI 2 Accident, 9/13/79
- . H. Denton letter to all Operating Power Plants, Discussion of Lessons Learned Short Term Requirements, 10/30/79

The review verified that OP 3116 and OP 3124 were in conformance with NEDO-24708 guidelines in the areas of: Symptoms; Operator Immediate Actions; Subsequent Actions; and Precautions. Additionally, the inspector verified that the procedures used clear, concise terminology and direct the operator to diverse, redundant instrumentation readouts to be used in assessing plant conditions during an emergency. Further, plant system limits and precautions were found to be located in the procedure consistent with actions directed by the procedures.

The inspector had no further comments in this area at the present. NRC review of SBLOCA procedures, their workability, operator training and familiarity with the guidelines will continue on subsequent NRC inspections.

6. LER Completion

The inspector discussed the completion of LER forms submitted by VY for reported events. The licensee routinely uses supplemental sheets to provide detailed summaries for the "Event Description" and "Cause and Corrective Action" sections of the report form. The inspector stated that detailed summaries presented as attachments to the form were acceptable, but that the appropriate sections on the form should also be used to facilitate coding the LER information by the NRC. The licensee acknowledged the inspectors comments and stated that future LERs would have the entire LER form filled out.

7. Unresolved Items

Unresolved items are those items for which further information is required to determine whether the items are acceptable or items of noncompliance. An unresolved item is discussed in paragraph 4 of this report.

8. Exit Interview

A management meeting was held with licensee personnel (denoted in paragraph 1) at the conclusion of the inspection on February 8, 1980. The purpose, scope and finding of the inspection were discussed as they appear in the details of this report.