U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report: 50-271/92-19 License: DPR-28

Licensee: Vermont Yankee Nuclear Power Corporation
RD. 5, Box 169
Brattleboro, Vermont 05301

Facility: Vermont Nuclear Power Station

Dates: September 1-4, 1992

Location: Brattleboro and Vernon, Vermont

Inspectors: C. G. Amato, Emergency Preparedness Specialist (Lead Inspector)
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Approved: Ele C. McCabe 12/18/92
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Facilities Radiological Safety and Safeguards Branch
Division of Radiation Safety and Safeguards

Scope

Emergency Preparedness (EP) program and the September 2, 1992 partial-participation EP exercise.

Results

The licensee demonstrated the ability to implement the Emergency Plan and Emergency Plan Implementing Procedures so as to protect public health and safety. Strengths were identified in Simulator Control Room selection of the reactor shutdown process and in Emergency Operations Facility performance. A weakness was noted in Operations Support Center over-simulation of repair activities and repair personnel non-adherence to relevant instructions and procedures.

DETAILS

1.0 Persons Contacted

The following Vermont Yankee Nuclear Power Corporation (VYNPC), or Yankee Atomic Electric Company (YAEC) staff members participated in the exercise exit meeting on September 3, 1992, or in a September 4, 1992 supplemental exit, or in a November 30, 1992 telephone exit.

J. Babbitt, Technical Training Instructor, VYNPC
G. Bristol, Community Relations Coordinator, VYNPC
T. Burda, Consulting Emergency Planner, Stone and Webster
A. Chesley, Simulator Supervisor, VYNPC
J. Hawxhurst, Senior Engineer, YAEC
S. Jefferson, Assistant to the Plant Manager, VYNPC
E. Lindamood, Radiation Protection Supervisor, VYNPC
W. Murphy, Senior Vice President, Operations, VYNPC
J. Morarity, Security Supervisor, VYNPC
R. Pagodin, Technical Services Supervisor, VYNPC
D. Porter, Technical Programs Manager, VYNPC
E. Porter, Emergency Preparedness Coordinator, VYNPC
D. Reid, Plant Manager, VYNPC
E. Salomon, Senior Engineer, YAEC
M. Schneider, Manager of Communications, VYNPC
J. Sinclair, Director of External Affairs, VYNPC
R. Sojka, Operations Support Manager, VYNPC
R. Wanczyk, Operations Support Supervisor, VYNPC
G. Weigand, President and Chief Executive Officer, VYNPC
D. Weyman, Senior Environmental Program Manager, VYNPC

The inspectors also interviewed and observed other licensee personnel.

2.0 Emergency Exercise

An announced, partial-participation emergency preparedness exercise was held at the Vermont Yankee Nuclear Power Station on September 2, 1992, from 8:00 a.m. to 1:00 p.m. The States of New Hampshire and Vermont and the Commonwealth of Massachusetts participated. There was extensive simulation of protective actions. Off-site emergency preparedness (EP) activities were not inspected.

2.1 Pre-exercise Activities

The exercise objectives were submitted to NRC Region I on June 4, 1992 and, as subsequently revised, were found appropriate. On July 3, 1992, the licensee submitted the complete scenario package to the NRC. Initial NRC review of the scenario noted that the simulated conditions only justified declaring an Unusual Event

and an Alert, and was thereby weak in providing opportunity for participants to develop, maintain and improve key skills as required by 10 CFR 50.47(b)(14). No specific violations of NRC requirements were identified in this instance. However, non-credible plant indications may leave evaluators unable to evaluate the adequacy of response in certain areas and also reduce the responding organization's ability to demonstrate their capabilities. That could increase the potential for a post-exercise determination that all major elements of the emergency plan had not been adequately tested. After telephone discussions with the licensee's EP staff, scenario revisions were made to simulate a Site Area Emergency. That was done by increasing containment radiation monitor readings by a factor of 1000 without the core being uncovered or clad damage sufficient to produce a gap fraction release giving rise to the containment monitor readings. Due to time considerations, further revisions to add realism were not made. The as-revised scenario was deemed adequate to meet minimum requirements for testing major portions of the Vermont Yankee Nuclear Power Station Emergency Plan and Implementing Procedures. It also provided the opportunity for the licensee to demonstrate areas previously identified by the NRC as in need of corrective action. However, the licensee was advised that a more realistic scenario is needed to meet NRC and FEMA standards for the 1993 full-participation, ingestion pathway emergency exercise.

NRC observers attended a licensee briefing on September 1, 1992. Changes to the scenario were discussed during the briefing. The licensee stated that certain emergency response activities would be simulated and that controllers would intercede in the exercise as necessary to prevent disrupting normal plant activities.

2.2 Exercise Scenario

The scenario included the following simulated events and conditions.

- Initial (8:00 a.m.) conditions: reactor operating at steady state power for six months; a control rod drive pump was tagged out for repairs and scheduled for return to service within three hours; off-gas radiation has been increasing; and the Vernon tie-line has been removed from service (return to service scheduled by early afternoon).

- The "B" control rod drive pump tripped; two hydraulic control units (HCUs) were inoperable in a 9x9 fuel array.

- An Unusual Event.

- A main steam line high radiation signal closed the main steam isolation valves.

- Reactor scram.

- Four control rods failed to insert.
- Primary system leak.
- Drywell pressure and radiation increase.
- High drywell pressure alarm initiated primary containment isolation of groups 2, 3, and 4 including the drywell sump.
- Emergency diesel-generator (EDG) "B" failed to start.
- One residual heat removal (RHR) pump did not start.
- High level alarms for drywell equipment and floor drain sumps.
- An Alert.
- Torus pressure above 4 psig and drywell radiation at 450 R/hr.
- Drywell radiation increased to 1000 R/hr.
- A Site Area Emergency.
- Loss of normal power on Bus 3.

The inspector compared the key events and players for the annual exercise scenario and for the preparatory licensee drill. While several aspects were common to both scenarios, the scenarios were found to be sufficiently different to provide an acceptable test for the annual exercise.

A review of the key personnel lists showed that three of four key managers played the same role during the exercise and preparatory drill. No associated violation of NRC requirements was identified, but rotation of drill/exercise players is an asset to developing the personnel defense-in-depth essential for successful accident management. The inspector asked the licensee to review this consideration.

2.3 Activities Observed

During the exercise, the NRC observed activation, augmentation and functioning of the Emergency Response Facilities and the Emergency Response Organization. The following were observed.

- Use of control room procedures.

- Detection, classification, and assessment of scenario events.
- Direction and coordination of the emergency response.
- Notification of licensee and Massachusetts, New Hampshire, and Vermont personnel; and communication of pertinent plant status information to Commonwealth and State personnel.
- Communications and information flow, and record keeping.
- Assessment and projection of off-site radiological dose and consideration of protective actions.
- Accident analysis.
- Accident mitigation.

3.0 Classification of Exercise Findings

Emergency preparedness exercise findings were classified as follows.

3.1 Exercise Strength: performance that provided a strong, positive indicator of ability to effectively cope with an emergency.

3.2 Exercise Weakness: performance that could have precluded effective response to an aspect of an emergency. (An exercise weakness does not, of itself, constitute overall response inadequacy.)

3.3 Area for Improvement: performance which did not have a significant negative impact on emergency plan/procedure implementation, but which should be evaluated by the licensee to determine if corrective action could improve performance.

4.0 Exercise Observations

The NRC team noted that the licensee's activation of the Emergency Response Organization, Emergency Response Facilities (ERFs), and use of these facilities were generally consistent with their Emergency Plan and Emergency Plan Implementing Procedures. NRC inspector observations and evaluations were made in the ERFs as described below.

4.1 Simulator Control Room

The following exercise strengths were identified.

- Selection of the plant shutdown process. High radiation in the drywell and two secondary containment areas indicated clad failure and a primary system leak into the drywell. Secondary containment radiation was near 1000 R/Hr. The Emergency Operations Facility (EOF) staff thought reactor vessel emergency depressurization was needed. The Simulator Control Room staff advised the EOF that plant conditions and secondary containment control procedures called for plant shutdown and not emergency depressurization. Operators correctly followed OE-3105, "Secondary Containment Control Procedure."

- Emergency Operating Procedure (EOP) use that resulted in keeping the core covered and maintaining containment isolation, effectively safeguarding the public against a radiation release.

The following expected actions were done well.

- Plant operators recognized the entry conditions for applicable Emergency Operating Procedures (EOPs) and Abnormal Operating Procedures (AOPs). The crew correctly performed all the required actions in the procedures. When plant conditions warranted, the crew updated the Technical Support Center (TSC) to inform them of additional Alert classification data.

- The Shift Supervisor (SS) briefed the crew on all significant plant condition changes that affected the event mitigation strategy. He prioritized and remained informed of all troubleshooting and repair of inoperable safety equipment. The crew's communications throughout the exercise were noteworthy.

The following areas were improved over previous performance.

- The communicator (chemistry technician) performed all off-site notifications within the required time. He was familiar with all communication equipment and used it with confidence.

- The Shift Engineer (SE) kept the Shift Supervisor updated on plant radiation trends and primary containment parameters. The SE also recognized the failure of the "B" emergency diesel to automatically start within seconds of the malfunction.

The following area for improvement was identified.

- The crew did not detect a failure of residual heat removal pump "B" to automatically start in an appropriate amount of time: about 16 minutes elapsed before the crew recognized the failure of this pump to automatically start.

No exercise weaknesses were identified.

4.2 Technical Support Center (TSC)

No exercise strengths, weaknesses, or areas for improvement were identified. The following expected actions were done well.

- The TSC was promptly staffed. The transfer of Plant Emergency Director responsibilities from the Shift Supervisor to the TSC Coordinator (TSCC) was effective. The TSCC frequently briefed the staff on conditions, priorities, and accident mitigation. Congestion and noise were kept to a minimum, except during the period prior to TSC activation. It was observed, however, that a department manager was the primary communicator with the Operations Support Center and that such assignment might impede fulfillment of departmental emergency responsibilities.

- The TSC staff demonstrated a conservative safety perspective. TSC directions to operators were sound and were carefully reviewed by the TSC staff prior to being communicated to the Control Room. Probing and detailed questions on component failures and equipment restoration were observed. Event classifications and emergency action levels were frequently reviewed to assess worst case scenarios, potential release pathways, and subsequent component failures and plant challenges. Frequent and detailed communications on equipment status and corrective actions were established with the Site Recovery Manager and the control room. The TSC Coordinator effectively delegated responsibilities, prioritized repair efforts, and made decisions based on engineering evaluations, plant procedures, and operational experience.

- The Engineering Support Group (ESG) provided accurate and technically sound evaluations to the TSC. Independent efforts, such as core damage assessment and primary system leak location, contributed to analyses of the event. However, an ESG recommendation regarding reactor vessel depressurization was not fully evaluated as to the overall effect on plant operation.

The following improved areas were identified.

- Areas improved since the last exercise included the use of status boards and the accountability of personnel. Accurate and timely plant parameter information was frequently updated on the status boards, but meteorological data was not observed. The use of the site access computer and prompt management involvement contributed to the timely resolution of a personnel accountability deficiency (see Detail 6.0).

4.3 Operations Support Center (OSC)

Operations Support Center performance was marred by excessive simulation of activities and by non-adherence to procedures and good practice (especially in regard to selection of replacement components). The following basic requirements were involved.

- There were specific licensee written and oral instructions to controllers and players that, to demonstrate capabilities as realistically as possible, simulation of response activities was to be avoided wherever possible.

- Paragraph C of Procedure AP 0021, Work Orders, Revision 20, required initiation of an Emergency Work Order (EWO) to accomplish emergency work and to document that such work on safety-related equipment was accomplished. No exception to AP 0021 was identified as being granted, and 10 CFR 50.54(x) was not invoked to authorize deviating from or exceeding requirements.

Specific examples of related problems follow.

- Operating Emergency Procedure OE-3107, Revision 1, Appendix H, Vent the Control Rod Drive Over Piston Volume, required two auxiliary operators (AOs) to obtain the "HCU venting tools" located in the "friction testing tool box" in the reactor building instrument and controls shop, along with sound powered phones for communications. A single AO proceeded directly to the area of the hydraulic control accumulators, and explained to the controller what he would do. When questioned about how he would hook up the vent hose to the withdraw riser block, the AO did not identify or refer to OE-3107 but replied that he would use the vent adapter in the tool box that was up in the tool cage.

- The Emergency Diesel Generator "B" air start air filter differential pressure was simulated high, and the filter was diagnosed as clogged. Repair work was initiated to obtain a new filter insert, remove the installed filter, and install the new filter. No work instructions or post-maintenance test steps

were prepared. Rather, a short verbal description was delivered to the controller by the on-scene mechanic concerning what he would do to accomplish the task.

- No tools or other materials (e.g., ladder to reach isolation valves) were used to repair the diesel air start filter. Similarly, although a spare breaker was available to perform required testing during the simulated work on the residual heat removal pump breaker, the spare was not used.

- An Auxiliary Operator, in order to repair the diesel air start filter, simulated shutting two air receiver isolation stop valves (supply to the air filter), and opening the vent/drain valve on the filter body to depressurize the filter. He then stated that he had been authorized by the Shift Supervisor to act as a "human tagout" for the repositioned valves (the NRC evaluators in the control room or TSC did not observe the granting of such permission). It was not possible to observe the supply valves and the vent/drain valve at the same time from the AO's location. Further, Procedure AP 0140, Vermont Yankee Local Control Switching Rules, Revision 16, did not provide for a "human tagout."

- Paragraph B of Procedure AP-0806, Issuance and Return of Material, Parts, and Components, Revision 7, required "all ... fields of the MPAC Stock Issue Request (SIR) entry screen" to be completed (Maintenance Planning and Control Computer). The electronically prepared Warehouse Issue Ticket (WIT) was then required before Stores personnel could issue any parts or material. These procedural requirements were not complied with to procure the replacement diesel air filter cartridge.

- Repair of the diesel air start filter required identification and procurement of the filter cartridge for the Dollinger air filter assembly. The repair team member who was responsible for this activity was unable to access and use the appropriate computer data base for approximately 35 minutes. As a consequence, a non-controlled, superseded data base (IPI database of the now defunct MAXIM computer program) was used to identify the safety-related component and initiate procurement from stores. The inability of the MPAC computer operator to find and identify the correct stock number of the diesel air start filter for an extended period indicated inadequate training of mechanical maintenance personnel in use of the MPAC computer.

- Residual heat removal (RHR) pump motor supply breaker trouble-shooting identified blown closing circuit fuses. Electrical technicians did not identify the correct replacement fuses (the information available was that the fuses were 15 amp, with no fuse type information), and decided to install "like for like" fuses. The electrical foreman, when questioned about that practice,

concluded he would obtain permission from the Shift Supervisor to obtain a set of non-safety, 4kV breaker closing circuitry fuses, and install them in the RHR breaker. The inspectors observed no obtaining of such permission, and no identification to emergency response management of the intention of using non-safety fuses in safety equipment. Further, review of electrical maintenance procedures found no guidance on correct selection of fuses. The "Fuse Listing," a controlled document (P.B. Corbett memo dtd 1/29/91, titled Controlled Fuse Document) did not specify the type of fuses for the RHR pump breaker. Since sufficient information was not available at the scene, this matter should have been referred to the TSC. (Note: NRC Region I Division of Reactor Safety Inspection No. 50-271/92-81 later identified fuse replacement provisions as a violation; correction of that violation is relevant to this aspect of OSC performance, but demonstration of proper fuse and other spare parts selection capability during the next NRC-observed emergency exercise remains appropriate.)

- The foreman responsible for trouble-shooting the RHR pump motor supply breaker ordered a test of the racked-out breaker after replacement of the closing circuitry fuses. The technicians simulated wheeling the 4KV breaker to the Breaker Test Source (PTS) area, and then described to the controller in vague terms how they would perform an operational test before breaker re-installation in its cubicle. No procedure was used to perform the operational test. When questioned about the absence of a test procedure, the electrical foreman stated that such testing was within the skill of the craft, and that the least experienced technician in the crew could perform the testing flawlessly. Procedure OP-5222, 4kV AC Circuit Breaker Inspection, Calibration, and Testing, Revision 11, Section 6.1.4., Breaker Preliminary Operational Checks, covered the tests ordered by the foreman. It contained three pages of cautions, notes, and steps requiring specific pushbutton manipulation not easily committed to memory. Those were not routinely performed steps, and the inspector concluded that the breaker test was not a routine craft activity that was likely to be properly be performed without procedure use.

  Collectively, the above items constitute a weakness in OSC conformance to instructions and procedures and a potential for inadequate plant configuration control in an emergency (IFI 50-271/92-19-01)

4.4 Emergency Operations Facility and Site Recovery Manager

The following exercise strengths were identified.

- An ad hoc meeting of senior executives in the Senior Vice President's office area led to declaration of an Unusual Event and a decision to activate

Emergency Response Facilities as soon as possible and place them in standby readiness to respond to any degrading plant conditions.

- There were frequent and detailed briefings of Commonwealth and State representatives in the EOF.

- Thorough review of conditions which might lead to failure of the three fission product barriers and a need for protective action.

- Very good analysis of the electrical problem and development of an excellent circuit diagram for the malfunctioning emergency diesel-generator and electric busses.

- The Resource Manager made extensive efforts to line up a diesel-generator, fuel supplies, a day tank, and hoses.

No exercises weaknesses were identified.

The following areas for improvement were identified.

- Noise control in the Site Recovery Manager's office. (Too many individuals were talking too loudly and at the same time.)

- Procedurally identifying the executive ad hoc committee and it's functions.

- The extent of training of the Site Recovery Manager and staff, and the EOF staff, in Emergency Operating Procedure analysis (licensee identified).

5.0 Knowledge and Performance of Duties (Training)

In order to determine if reactor operators were trained in the symptoms of and responses to Site Area Emergencies (SAEs) and General Emergencies (GEs), licensed operator requalification (LOR) training records were reviewed. Results of that record review for 1992 were as follows:

LOR Cycle 92.1: Each crew participated in two or three SAE scenarios.

LOR Cycle 92.2: Each crew participated in one SAE scenario.

LOR Cycle 92.3: Each crew participated in one GE scenario.

No training inadequacy was identified by the above review.

6.0 Emergency Preparedness and Security Interface

Section II.D.79 of Appendix B to 10 CFR 73 requires a security response to emergency situations other than security incidents. A new main guardhouse had been built and placed in operation. In addition, accountability has been "computerized." The Site Security Manager was interviewed with respect to accountability.

The inspector was informed that computerized accountability was used for the first time during this exercise. That accountability was accomplished in 30 minutes. However, this phase of the exercise was not observed by the inspectors.

7.0 Licensee Critique

The NRC inspection team attended the licensee's exercise critique on September 3, 1992. At that critique, the licensee's lead controllers and observers discussed observations of the exercise. The licensee's controllers noted unnecessary entry into the Emergency Operating Procedures, scenario weakness in controls over excessive simulation, a need for improved training in the Materials, Parts and Components data base, and a need for procedure revision to assure proper safety-related fuse selection. Also, the licensee noted the same OSC concerns identified in Detail 4.3 and initiated action to address these after the exit meeting.

8.0 Emergency Response Facility Habitability

Ability of the Control Room and Technical Support Center (TSC) to protect emergency responders from radiation was reviewed. That review identified reported dose values indicating shielding would limit Control Room staff radiation dose to the 10 CFR 50 Appendix A General Design Criterion 19 (GDC-19) value (five Rem whole body). However, no documentation was located indicating the ability of the TSC ventilation system to limit thyroid dose to the equivalent of the GDC-19 five Rem whole body dose or to the licensee-committed 30 Rem value. This matter was identified for further NRC staff consideration.

9.0 Exit Meeting

Following the licensee's self critique, the NRC team met with the licensee's representatives listed in Section 1 on September 3, 1992 and September 4, 1992. During these meetings, the NRC team leader summarized the inspection findings. Further discussions of the inspection findings were held by telephone with the licensee on December 1 and 15, 1992.

During the September 3 and 4 and December 1 discussions, the licensee was advised that the preliminary NRC conclusion was that exercise performance demonstrated the ability to implement Control Room procedures, the Emergency Plan, and the Emergency Plan Implementing Procedures in a manner that would adequately provide protective measures for the health and safety of the public.

The licensee acknowledged the inspection findings and stated the intention of reviewing them further and taking appropriate action.

On December 15, 1992, the findings of the preceding report sections were highlighted to the licensee by telephone.