

Mr. Donald A. Reid
Vice President, Operations
Vermont Yankee Nuclear Power Corporation
Ferry Road
Brattleboro, VT 05301

August 12, 1997

SUBJECT: VERMONT YANKEE NUCLEAR POWER STATION (TAC NOS. M95442 AND M95149)

Dear Mr. Reid:

The U.S. Nuclear Regulatory Commission (NRC) has issued the enclosed exemption from certain requirements of Sections III.G and III.L of Appendix R to 10 CFR Part 50 in response to your letter dated April 4, 1996, as supplemented by letters dated May 21, 1996, November 4, 1996, December 13, 1996, January 8, 1996 (sic [1997]), January 15, 1997, February 19, 1997, May 16, 1997, and August 7, 1997. The exemption, which is being forwarded to the Office of the Federal Register for publication, pertains to your proposal (1) to use the automatic depressurization system in conjunction with low-pressure injection systems as an alternative post-fire safe shutdown capability for certain fire zones and (2) to use the Vernon tie-line as an alternative to the onsite emergency diesel generator for certain fire events.

Brookhaven National Laboratory (BNL) provided technical assistance to the staff in this review. Our conclusions are contingent on the installation of additional fire detection capability, as you committed to in your submittal of January 15, 1997, and May 16, 1997. The enclosed safety evaluation, which incorporates BNL's technical evaluation report, documents the NRC staff's review of these issues.

Sincerely,

Original signed by

Kahtan N. Jabbour, Sr. Project Manager
Project Directorate I-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-271

Enclosures: 1. Exemption
2. Safety Evaluation

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of

VERMONT YANKEE NUCLEAR
 POWER CORPORATION

(Vermont Yankee Nuclear
 Power Station)

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Docket No. 50-271

EXEMPTION

I.

The Vermont Yankee Nuclear Power Corporation (VYNPC, the licensee) is the holder of Facility Operating License No. DPR-28, which authorizes operation of the Vermont Yankee Nuclear Power Station (the facility) at power levels no greater than 1593 megawatts thermal. The facility is a single-unit boiling-water reactor located at the licensee's site in Windham County, Vermont.

The License provides, among other things, that the Vermont Yankee Nuclear Power Station is subject to all rules, regulations, and orders of the Nuclear Regulatory Commission (the Commission) now or hereafter in effect.

II.

On November 19, 1980, the Commission published a revised Section 10 CFR 50.48 and a new Appendix R to 10 CFR Part 50 regarding fire protection features of nuclear power plants. The revised Section 50.48 and Appendix R became effective on February 17, 1981. Section III of Appendix R contains 15 subsections, lettered A through O, each of which specifies requirements for a particular aspect of the fire protection features at a nuclear power plant.

Sections III.G and III.L are the subject of the licensee's exemption request. Section III.G.3 specifies that fire detection and suppression be installed in areas using alternative safe shutdown. Low fire loadings and fire paths clear of combustibles in fire zones RB-1, RB-2, RB-3, and RB-4 diminish the importance of full fire detection and suppression capability in these fire zones. Section III.L.1.(c) requires that alternative and dedicated shutdown capability be able to achieve and maintain hot shutdown. Use of the automatic depressurization system (ADS), which is proposed by the licensee, requires cooling below hot shutdown temperatures, contrary to Section III.L.1.(c). Section III.L.2.b requires that coolant level be maintained above the top of the core, which is not possible with the licensee's proposed use of the ADS and low pressure injection systems (either core spray [CS] or low-pressure injection system) to achieve and maintain hot shutdown.

The licensee requested an exemption from these requirements to allow the use of the ADS in conjunction with low-pressure injection systems as a means of achieving post-fire safe-shutdown conditions in fire zones RB-1, RB-2, RB-3, and RB-4 when offsite power is not available.

Section III.L.3 requires that alternative shutdown capability accommodate conditions where offsite power is not available for 72 hours. Onsite power can be restored to service in 30 minutes. Two offsite power sources exist in addition to the Vernon tie-line, which can be placed in service in 10 minutes. Without the Vernon tie-line, which is actually off site, the plant cannot accommodate conditions in the first 30 minutes following loss of offsite power.

The licensee requested an exemption to allow the use of the Vernon tie-line as an alternative to the onsite emergency diesel generator for fire

events involving the control room, the cable spreading room, and fire zones RB-1, RB-2, RB-3, and RB-4 when offsite power is not available.

III.

By letter dated April 4, 1996, as supplemented by letters dated May 21, 1996, November 4, 1996, December 13, 1996, January 8, 1996 (sic [1997]), January 15, 1997, February 19, 1997, May 16, 1997, and August 7, 1997, VYNPC, the licensee for Vermont Yankee, requested exemptions from certain technical requirements of Section III.G and Section III.L of Appendix R to 10 CFR Part 50.

The licensee requested exemptions (1) from the technical requirements of Section III.G.1.a and Section III.L.2 of Appendix R to allow the use of the ADS in conjunction with low-pressure injection systems (either CS or low-pressure coolant injection [LPCI]) as a means of achieving post-fire safe shutdown conditions in reactor building fire zones RB-1, RB-2, RB-3, and RB-4; (2) from the technical requirements of Section III.L.3 of Appendix R to allow the use of the Vernon tie-line as an alternative to the onsite emergency diesel generator for fire events involving the control room, the cable spreading room, and fire zones RB-1, RB-2, RB-3, and RB-4 when offsite power is not available; and (3) from the technical requirements of Section III.G.3 of Appendix R to the extent that it requires that fire detection and fixed fire suppression be provided in areas for which an alternative safe-shutdown capability is provided for fire zones RB-1, RB-2, RB-3, and RB-4.

On the basis of the NRC staff's evaluation, and contingent on the installation of additional fire detection capability (as the licensee committed to in its submittal of January 15, 1997, and May 16, 1997), the staff concluded that the detection and suppression capabilities for fire zones

RB-1, RB-2, RB-3, and RB-4 are adequate to protect against fire hazards in the zones. The staff concluded further that a postulated fire in reactor building fire zones RB-1, RB-2, RB-3, and RB-4 would not prevent the operators from achieving and maintaining safe shutdown. Therefore, contingent on the installation of the additional fire detection capability in fire zone RB-4, the licensee should be granted an exemption from Section III.G.3 of Appendix R to 10 CFR Part 50 for reactor building fire zones RB-1, RB-2, RB-3, and RB-4.

On the bases of the technical evaluation contained in the appended Brookhaven National Laboratory (BNL) technical evaluation report (TER), and the NRC staff's evaluation of the Vermont Yankee fire protection capabilities, the staff concluded that the licensee's revised shutdown strategy for reactor building fire zones RB-1, RB-2, RB-3, and RB-4 (use of ADS with either LPCI or CS) and the redesignation of these fire zones as areas requiring an alternative shutdown capability provide an acceptable level of safe-shutdown protection. In addition, on the basis of the technical evaluation contained in the BNL TER, the staff concluded that the Vernon tie line provides an acceptable alternative to power from an onsite emergency diesel generator when normal sources of offsite power are not available for (1) a fire in the control room or the cable spreading room that forces control room evacuation and (2) a fire in reactor building fire zones RB-1, RB-2, RB-3, or RB-4 that requires the use of the alternative post-fire safe-shutdown strategy. Therefore, exemptions should be granted for Sections III.L.1.(c), III.L.2.b, and III.L.3 of Appendix R to 10 CFR Part 50.

IV.

Pursuant to 10 CFR 50.12(a)(2), the Commission will not consider granting an exemption unless special circumstances are present. Item (ii) of the

subject regulation includes special circumstances in which application of the subject regulation would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule.

The underlying purpose of Section III.G of Appendix R is to provide fire protection of equipment necessary for safe-shutdown capability. On the basis of the NRC staff's evaluation above and contingent on the installation of additional fire detection capability (as the licensee committed to in its submittals of January 15, 1997, and May 16, 1997), the staff concluded that the detection and suppression capabilities for fire zones RB-1, RB-2, RB-3, and RB-4 are adequate to protect against the fire hazards in the zones. The staff concluded further that a postulated fire in reactor building fire zones RB-1, RB-2, RB-3, or RB-4 would not prevent the operators from achieving and maintaining safe shutdown. Therefore, contingent on the installation of the additional fire detection capability in fire zone RB-4, the staff concludes that an exemption should be granted from Section III.G.3 of Appendix R to 10 CFR Part 50 for reactor building fire zones RB-1, RB-2, RB-3, and RB-4. Accordingly, the Commission has determined that pursuant to 10 CFR 50.12(a)(2)(ii), special circumstances exist for the licensee's requested exemption in that imposition of the literal requirements of the regulation in these particular circumstances is not necessary to achieve the underlying purpose of Appendix R to 10 CFR Part 50.

The underlying purpose of Section III.L of Appendix R is to provide alternative and dedicated shutdown capability necessary in areas in which the fire protection features cannot ensure safe-shutdown capability in the event of a fire in that area. On the bases of the technical evaluation contained in the appended BNL TER and the NRC staff evaluation of the Vermont Yankee fire

protection capabilities, the staff concluded that the licensee's revised shutdown strategy for reactor building fire zones RB-1, RB-2, RB-3, and RB-4 (use of ADS with either LPCI or CS) and the redesignation of these fire zones as areas requiring an alternative shutdown capability provide an acceptable level of safe-shutdown protection. In addition, on the basis of the technical evaluation contained in the appended BNL TER, the staff concluded that the Vernon tie-line provides an acceptable alternative to power from an onsite emergency diesel generator when normal sources of offsite power are not available for (1) a fire in the control room or the cable spreading room that forces control room evacuation and (2) for a fire in reactor building fire zones RB-1, RB-2, RB-3, and RB-4 that requires the use of the alternative post-fire safe-shutdown strategy. Therefore, the staff concludes that exemptions should be granted for Sections III.L.1.(c), III.L.2.b, and III.L.3 of Appendix R to 10 CFR Part 50. Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12(a)(2)(ii), special circumstances exist in that the proposed exemptions to III.L.1(c), III.L.2.b and III.L.3 satisfy the underlying purpose of Appendix R to 10 CFR Part 50 and that imposition of the literal requirements of the regulation in these particular circumstances is not necessary to achieve the underlying purpose of Appendix R to 10 CFR Part 50.

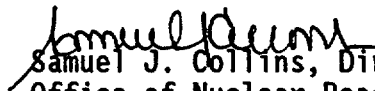
Further, the staff has concluded that the requested exemption is authorized by law, will not present an undue risk to public health and safety, and is consistent with the common defense and security. Therefore, contingent upon the addition of additional fire detection capability (as the licensee agreed to in its submittals of January 15, 1997 and May 16, 1997) by December 31, 1997, and contingent upon one continuous fire watch monitoring both fire

zones RB-3 and RB-4 until installation of the additional fire detection capability, the Commission hereby grants the request for exemption from the requirements of Sections III.G.3, III.L.1(c), III.L.2.b, and III.L.3 of Appendix R to 10 CFR Part 50 described in Section III above.

Pursuant to 10 CFR 51.32, the Commission has determined that the issuance of this exemption will have no significant impact on the quality of the human environment (62 FR 30356).

This exemption is effective upon issuance.

FOR THE NUCLEAR REGULATORY COMMISSION


Samuel J. Collins, Director
Office of Nuclear Reactor Regulation

Dated at Rockville, Maryland, this
12th day of August 1997.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
EXEMPTION RELATED TO 10 CFR PART 50, APPENDIX R, SECTIONS III.G AND III.L
FIRE PROTECTION OF SAFE SHUTDOWN CAPABILITY
VERMONT YANKEE NUCLEAR POWER CORPORATION
VERMONT YANKEE NUCLEAR POWER STATION

DOCKET NO. 50-271

1.0 INTRODUCTION

Appendix R, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979," to Part 50 of Title 10 of the Code of Federal Regulations (10 CFR Part 50), establishes fire protection features required to satisfy General Design Criterion 3, "Fire Protection," of Appendix A to 10 CFR Part 50 with respect to certain generic issues for nuclear power plants licensed to operate before January 1, 1979. By letter dated April 4, 1996, as supplemented by letters dated May 21, 1996, November 4, 1996, December 13, 1996, January 8, 1996 (sic [1997]), January 15, 1997, February 19, 1997, May 16, 1997, and August 7, 1997, Vermont Yankee Nuclear Power Corporation, the licensee for Vermont Yankee Nuclear Power Station, requested exemptions from certain technical requirements of Section III.G and Section III.L of Appendix R to 10 CFR Part 50.

2.0 EXEMPTIONS REQUESTED

The licensee requested exemptions (1) from the technical requirements of Section III.G.1.a and Section III.L.2 of Appendix R to allow the use of the automatic depressurization system (ADS) in conjunction with low-pressure injection systems (either core spray (CS) or low-pressure coolant injection (LPCI)) as a means of achieving post-fire safe shutdown conditions in reactor building fire zones RB-1, RB-2, RB-3, and RB-4; (2) from the technical requirements of Section III.L.3 of Appendix R to allow the use of the Vernon tie-line as an alternative to the onsite emergency diesel generator for fire events involving the control room, the cable spreading room, and fire zones RB-1, RB-2, RB-3, and RB-4 when offsite power is not available; and (3) from the technical requirements of Section III.G.3 of Appendix R to the extent that it requires that fire detection and fixed fire suppression be provided in areas for which an alternative safe shutdown capability is provided for fire zones RB-1, RB-2, RB-3, and RB-4.

On the basis of its review of the licensee's submittals, the U.S. Nuclear Regulatory Commission (NRC) staff determined that the licensee needed exemptions from the following sections of Appendix R (some of which vary slightly from those sections cited by the licensee in its exemption requests).

Regarding the licensee's request to allow the use of the ADS in conjunction with a low-pressure injection system, exemptions were needed from Section III.G.3 (fire detection and fire suppression installed in the area, room, or zone under consideration), Section III.L.1.(c) (achieve and maintain hot shutdown), and Section III.L.2.b (maintain the reactor coolant level above the top of the core). Regarding the licensee's request to allow the use of the Vernon tie-line as an alternative to the onsite emergency diesel generator for certain fire events, an exemption was needed from Section III.L.3 (accommodation of post-fire conditions where offsite power is not available for 72 hours). The staff's evaluation, which follows, is based on exemptions from these sections of Appendix R.

3.0 DISCUSSION

The staff evaluated the licensee's exemption requests with the technical assistance of Brookhaven National Laboratory (BNL). Specifically, BNL reviewed the licensee's exemption requests regarding (1) the use of the ADS in conjunction with low-pressure injection systems as a means of achieving post-fire safe-shutdown conditions in fire zones RB-1, RB-2, RB-3, and RB-4 and (2) the use of the Vernon tie-line as an alternative to the onsite emergency diesel generator for fires in the control room, the cable spreading room, and fire zones RB-1, RB-2, RB-3, and RB-4. BNL's technical evaluation report (TER), which is appended, is incorporated into this staff safety evaluation. The NRC staff evaluated the lack of fire detection and fixed fire suppression in fire zones RB-1, RB-2, RB-3, and RB-4.

In support of its request for exemption from Section III.G.3 for fire zones RB-1, RB-2, RB-3, and RB-4, the licensee provided detailed descriptions of the zones, including safe-shutdown capabilities, existing fire protection features, and fire hazard analyses, with its submittal of January 15, 1997. In summary, fire zones RB-1 and RB-2 are located on the 213-foot and 232-foot elevations of the reactor building. They consist of the torus room on the 213-foot elevation, the corner rooms at the 213-foot and 232-foot elevations, and the high-pressure coolant injection room in the southwest corner of the 213 foot elevation. The reactor core isolation cooling room wall, the containment wall, and two floor-to-ceiling, reactor building wall to containment wall, combustible-free zones establish the boundaries between fire zones RB-1 and RB-2. Fire zones RB-3 and RB-4 are located on the 252-foot elevation of the reactor building. The containment wall, the steam tunnel wall, and a floor-to-ceiling, reactor building wall to containment wall, combustible-free zone establish the boundary between fire zones RB-3 and RB-4.

Division SI safety relief valves (SRVs), CS, and residual heat removal (RHR) equipment are used to achieve and maintain post-fire safe shutdown in the event of a fire in fire zone RB-1. Corresponding Division SII equipment is used to achieve and maintain safe shutdown for fires in fire zone RB-2. Redundant Division SI and SII raceways (cable trays and conduits) within zone RB-3 (separated by either 1-hour fire-rated barriers or a minimum of 18 feet with no intervening combustibles) were approved by the NRC in an exemption issued with a letter of December 1, 1986. For a fire in the Division SII portion of fire zone RB-3, Division SI SRVs, CS, and RHR are used to achieve and maintain post-fire safe shutdown. Similarly, for a fire in the Division

SI portion of fire zone RB-3, Division SII SRVs, CS, and RHR are used for post-fire safe shutdown. Division SI SRVs, CS, and RHR are used for fires in fire zone RB-4.

In general, in situ combustible loadings throughout RB-1, RB-2, RB-3, and RB-4 are low. The primary combustible materials in these zones consist of exposed cable insulation in overhead cable trays. Other combustibles consist of rubber, plastic, and abandoned Thermo-Lag fire barrier material (zone RB-3). Administrative and radiological material control procedures limit hot work and transient combustibles in the reactor building. Access to each of the fire zones is available for manual fire fighting by the trained fire brigade using the portable extinguishers and fire hoses available within and adjacent to the zones.

Various combinations of smoke and heat detectors are located in fire zones RB-1 and RB-2. Smoke detectors and a multi-level preaction sprinkler system have been provided in the northwest corner of fire zone RB-3 to address the concentration of redundant cables in the northwest corner of RB-3. In addition, smoke detectors are located in fire zone RB-3 to detect floor-based, cable tray-based, and stairwell fires. Smoke detectors are also provided adjacent to and within the combustible free zone between fire zones RB-3 and RB-4. In its letter of January 15, 1997, the licensee committed to install additional ceiling-level smoke detection in the open area of fire zone RB-4, the anteroom, the steam tunnel, and the railroad airlock. However, by letter dated May 16, 1997, the licensee informed the staff that, based on their review, they have determined that linear heat detection is the most appropriate method of fire detection for the steam tunnel. The staff finds this method acceptable.

4.0 EVALUATION

Reactor building fire zones RB-1, RB-2, RB-3, and RB-4 do not meet the literal technical requirements of Section III.G.3 of Appendix R because fire detection and fixed fire suppression systems are not provided throughout the zones. The staff was concerned that in the event of a fire in fire zone RB-1, RB-2, RB-3, or RB-4, the lack of an area-wide detection and suppression capability could adversely affect the post-fire safe-shutdown capability.

Taken together, the available and proposed fire detection capabilities provide reasonable assurance that a fire in zone RB-1, RB-2, RB-3, or RB-4 will be detected in its incipient stage. The fuel load throughout much of the zones is relatively low. Therefore, there is reasonable assurance that the plant's fire brigade would extinguish the fire using available equipment before significant flame propagation or a temperature rise occurs. Furthermore, the combustible-free zones preclude direct paths for fire propagation from one zone to another and provide assurance that a single fire will not spread from one redundant shutdown train to another. Moreover, the preaction sprinkler system installed in fire zone RB-3, both at ceiling level and below obstructions, provides reasonable assurance that a postulated fire involving the stacked cable trays will be controlled until the fire brigade extinguishes the fire. In the event the preaction sprinkler system does not control the fire or the fire brigade does not extinguish the fire before the redundant

safe-shutdown equipment is damaged, the alternative shutdown system would remain available and, as documented in the appended BNL TER, would provide an acceptable method of post-fire safe shutdown. Therefore, there is reasonable assurance that a fire in fire zone RB-1, RB-2, RB-3, or RB-4 will not adversely affect the licensee's ability to achieve and maintain safe shutdown.

As part of its evaluation, the staff also considered the guidance provided in Interpretation 5, "Automatic Detection and Suppression," of Generic Letter (GL) 86-10, "Implementation of Fire Protection Requirement," dated April 24, 1986. As stated in GL 86-10, Interpretation 5 applied to the Appendix R provisions that require "fire detectors and an automatic fire suppression system in the fire area." Interpretation 5 stated, in part, as follows:

"Detection and suppression sufficient to protect against the hazards of the area must be installed. In this regard, detection and suppression providing less than full area coverage may be adequate to comply with [the Appendix R requirements]. Where full area detection and suppression is not installed, licensees must perform an evaluation to assess the adequacy of partial suppression and detection against the hazards in the area."

The licensee included such an evaluation with its submittal of January 15, 1997. On the basis of its review of the licensee's evaluation, as documented above, it is the staff's judgment that the detection and suppression capabilities provided for fire zones RB-1, RB-2, RB-3, and RB-4, in combination with the additional detection capabilities proposed by the licensee for fire zone RB-4, are adequate to protect against the fire hazards in the zones.

5.0 CONCLUSIONS

On the basis of the NRC staff's evaluation above, and contingent on the installation of additional fire detection capability (as the licensee committed to in its submittals of January 15, 1997, and May 16, 1997), the staff concluded that the detection and suppression capabilities for fire zones RB-1, RB-2, RB-3, and RB-4 are adequate to protect against the fire hazards in the zones. The staff concluded further that a postulated fire in reactor building fire zones RB-1, RB-2, RB-3, or RB-4 would not prevent the operators from achieving and maintaining safe shutdown. Therefore, contingent on the installation of the additional fire detection capability in fire zone RB-4, the licensee should be granted an exemption from Section III.G.3 of Appendix R to 10 CFR Part 50 for reactor building fire zones RB-1, RB-2, RB-3, and RB-4.

On the bases of the technical evaluation contained in the appended BNL TER, and the NRC staff's evaluation of the Vermont Yankee fire protection capabilities, as documented above, the staff concluded that the licensee's revised shutdown strategy for reactor building fire zones RB-1, RB-2, RB-3, and RB-4 (use of ADS with either LPCI or CS) and the redesignation of these fire zones as areas requiring an alternative shutdown capability provide an acceptable level of safe-shutdown protection. In addition, on the basis of the technical evaluation contained in the BNL TER, the staff concluded that the Vernon tie-line provides an acceptable alternative to power from an on-site emergency diesel generator when normal sources of offsite power are not

available for (1) a fire in the control room or the cable spreading room that forces control room evacuation and (2) for a fire in reactor building fire zones RB-1, RB-2, RB-3, and RB-4 that requires the use of the alternative post-fire safe-shutdown strategy. Therefore, exemptions should be granted for Sections III.L.1.(c), III.L.2.b, and III.L.3 of Appendix R to 10 CFR Part 50.

6.0 APPENDIX

"Technical Evaluation of Vermont Yankee Nuclear Power Corporation Requests for Exemption from 10 CFR 50 Appendix R, Section III.G and III.L," Revision 2, Brookhaven National Laboratory, Department of Advanced Technology, Engineering Technology Division, dated February 20, 1997.

Principal Contributors: L. E. Whitney
K. S. West

Date: August 12, 1997

APPENDIX

BROOKHAVEN NATIONAL LABORATORY DEPARTMENT OF ADVANCED TECHNOLOGY ENGINEERING TECHNOLOGY DIVISION

Technical Evaluation of Vermont Yankee Nuclear Power Corporation Requests For Exemption From 10 CFR 50 Appendix R, Section III.G and III.L to allow:

- (1) Use of the Automatic Depressurization System (ADS) in conjunction with Low Pressure Coolant Injection (LPCI) mode of the Residual Heat Removal System as a means of achieving post-fire safe shutdown conditions in Reactor Building Fire Zones RB-1, RB-2, RB-3, and RB-4; and,
- (2) Use of the Vernon Tie Line as an alternative to its on-site Emergency Diesel Generator as a means of providing an assured source of electrical a.c. power during certain fire events which may require implementation of an alternative shutdown capability when normal sources of offsite power are unavailable.

Revision 2
February 20, 1997

Prepared By: Kenneth Sullivan
Engineering Assessment and
Technical Training Group

Prepared For: U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation

1. INTRODUCTION

Section III.G.1 "Fire Protection of Safe Shutdown Capability," of Appendix R to 10 CFR 50 requires fire protection features which are capable of limiting fire damage so that one train of systems necessary to achieve and maintain hot shutdown conditions is free of fire damage. Alternatives for achieving this level of fire protection are delineated in Section III.G.2 of the regulation. Where the protection of systems whose function is required for hot shutdown can not be adequately protected from fire, Section III.G.3 of Appendix R to 10 CFR 50 requires an alternative or dedicated shutdown capability that is physically and electrically independent of the fire area(s) under consideration. Specific performance criteria of this alternative or dedicated capability are delineated in Section III.L.2 of the regulation. With regard to the availability of the normal (offsite) sources of electrical motive power, Section III.L.3 of the regulation requires the alternative or dedicated shutdown capability accommodate post-fire conditions where offsite power is available and where offsite power is not available for 72 hours.

By letter dated May 21, 1996, VYNPC submitted a request for exemption from the specific technical requirements of Appendix R Section III.G.1.a, and III.L.2. to allow the use of the Automatic Depressurization System (ADS) in conjunction with low pressure injection systems (either Core Spray (CS) or Low Pressure Coolant Injection (LPCI) mode of the Residual Heat Removal System, as a means of satisfying the safe shutdown performance criteria of Section III.G.1 in the event of fire in Fire Zones RB-1, RB-2, RB-3, and RB-4 of the Reactor Building. Exemption from Section III.G.1.a was deemed necessary because the proposed systems are not capable of maintaining hot shutdown conditions, and an exemption from Section III.L.2 was deemed necessary because the use of these systems would result in short-term uncover of the reactor core. Subsequent to this submittal, VYNPC withdrew its request for exemption from Section III.G.1.a, and redesignated Fire Zones RB-1, RB-2, RB-3, and RB-4 as areas requiring an alternative shutdown capability in accordance with Section III.G.3 of the regulation.

By letter dated April 4, 1996, Vermont Yankee Nuclear Power Corporation (VYNPC) submitted a request for exemption from the specific technical requirements of Appendix R Section III.L.3 to allow the use of the Vernon Tie-Line, which originates from the adjacent Vernon Hydroelectric Station, as an alternative to the on-site emergency diesel generator for control room and cable spreading room fire events when offsite power is not available. By letter dated December 13, 1996, the licensee expanded this request to include Reactor Building fire zones where an alternative shutdown capability, per the requirements of Appendix R Section III.G.3, is now being provided.

At the request of the NRC Office of Nuclear Reactor Regulation (NRR), Brookhaven National Laboratory (BNL) performed a technical evaluation of the alternative approaches described in the licensee's April 4, 1996 and May 21, 1996 requests for exemption. Based on the results of our review of information contained these submittals, several concerns were identified which required further clarification from the licensee. To address these and other issues, and to provide the licensee an opportunity to explain the technical merits of its proposed approach, on August 1, 1996, a meeting was held between

representatives of NRR, the licensee, and BNL at NRC Headquarters located in Rockville, Maryland. Based on the results of this meeting, by letter dated September 20, 1996, the staff forwarded a request for additional information (RAI) to the licensee, and by letter dated November 4, 1996 VYNPC provided its response. The BNL review of the licensee's November 4 submittal identified several additional questions which were documented in an second request for additional information and forwarded to the NRC Technical Monitor, by letter dated December 6, 1996. Following its review of the BNL request, by letter dated December 12, 1996, the staff forwarded a second RAI to the licensee and by letters dated December 13, 1996 and January 15, 1997, the licensee provided its response.

In its December 12, 1996 letter the staff informed the licensee that since its proposed shutdown strategies (ADS/LPCI or ADS/CS) are not capable of satisfying the performance criteria of Section III.G.1 of the regulation, the Reactor Building fire zones where this approach is intended to be used should be designated as "alternative shutdown" fire zones under Section III.G.3 of the regulation. In this manner, defense-in-depth would be maintained by assuring that the fire detection and suppression system requirements of Section III.G.3 are considered when a less than preferred method of shutdown is used.

In its submittal dated January 15, 1997 VYNPC concurred with the staff's position, withdrew its request for exemption from Section III.G.1.a, and stated that Fire Zones RB-1, RB-2, RB-3, and RB-4 have been redesignated as areas provided with an alternative shutdown capability in accordance with Section III.G.3 of the regulation. Redesignating these areas as alternative shutdown fire areas required the licensee to perform additional evaluations of the existing fire protection features and fire hazards. As a result of this review, the licensee has determined that the existing fire protection features do not satisfy the specific technical requirements of Section III.G.3, to the extent that fire detection and fixed fire suppression systems are not provided throughout fire zones RB-1, RB-2, RB-3 and RB-4. However, the licensee further stated that the existing protection, in conjunction with proposed modifications to install additional detection capability in Fire Zones RB-3 and RB-4, would provide a level of protection that, in its view, meets the intent of the regulation. On the basis of its technical justification included in the January response, VYNPC requested an exemption from the Section III.G.3 requirement for detection and fixed fire suppression in Reactor Building Fire Zones RB-1, RB-2, RB-3 and RB-4.

It should be noted that evaluating the adequacy of fire protection features for conformance to Section III.G.3 of the regulation is beyond the scope of work assigned to BNL. Therefore, the licensee's technical justification for satisfying the intent of fire protection criteria of Section III.G.3 should be evaluated separately by the staff.

2. REQUESTED EXEMPTIONS

- 2.1 Use of the Automatic Depressurization System (ADS) in conjunction with Low Pressure Coolant Injection (LPCI) or Core Spray (CS) as a means of

achieving post-fire safe shutdown conditions in Reactor Building Fire Zones RB-1, RB-2, RB-3, and RB-4

In accordance with the provisions of 10 CFR Part 50.12, by letter dated May 21, 1996, Vermont Yankee Nuclear Power Corporation (VYNPC) requested an exemption from technical provisions of 10 CFR 50, Appendix R, Section III.G.1.a, "Fire Protection of Safe Shutdown Capability" and III.L.2.b "Alternative and Dedicated Shutdown Capability" to allow the use of the Automatic Depressurization System (ADS) in conjunction with either Core Spray (CS) or Low Pressure Coolant Injection (LPCI) mode of the Residual Heat Removal System, for fires in Reactor Building Fire Zones RB-1, RB-2, RB-3, and RB-4 where the normally preferred, high pressure coolant injection systems, may not remain free of fire damage.

By letter dated December 12, 1996, the staff informed the licensee that the Reactor Building fire zones where this approach is intended to be used should be designated as "alternative shutdown" fire zones under Section III.G.3 of the regulation.

In its submittal dated January 15, 1997 VYNPC concurred with the staff's position, withdrew its request for exemption from Section III.G.1.a., redesignated Fire Zones RB-1, RB-2, RB-3, and RB-4 as areas provided with an alternative shutdown capability, and requested an exemption from the requirements of Section III.G.3, to the extent that fire detection and fixed fire suppression systems are not provided throughout fire zones RB-1, RB-2, RB-3 and RB-4.

2.2 Use of the Vernon Tie Line as an alternative to the on-site Emergency Diesel Generator.

In accordance with the provisions of 10 CFR Part 50.12, by letters dated April 4, 1996 and December 13, 1996, VNPC requested an exemption from the specific technical requirements of Appendix R Section III.L.3 to allow the use of the Vernon Tie-Line for the following two cases:

- 1) As an alternative to its on-site emergency diesel generator for control room and cable spreading room fire events requiring control room evacuation and the implementation of the alternative shutdown capability when normal sources of offsite power are not available, and
- 2) For fire events in Reactor Building fire zones RB-1, RB-2, RB-3 and RB-4, utilizing III.G.3 compliance strategies when normal sources of offsite power are not available.

3. DISCUSSION

- 3.1 Use of ADS/LPCI or ADS/CS as a means of achieving post-fire safe shutdown conditions in Reactor Building Fire Zones RB-1, RB-2, RB-3, and RB-4

Section III.G "Fire Protection of Safe Shutdown Capability," paragraph 1.a, requires fire protection features which are capable of limiting fire damage so that one train of systems necessary to achieve and maintain hot shutdown conditions is free of fire damage. From an analysis of the effects of fire in Reactor Building Fire Zones RB-1, RB-2, RB-3 and RB-4 VYNPC determined that redundant trains of the preferred means of providing the post-fire safe shutdown function of reactor coolant makeup (i.e. high pressure injection systems) may be susceptible to damage. As an alternative to this preferred approach, in its May 21, 1996 submittal, VYNPC requested an exemption to allow the use of the Automatic Depressurization System (ADS) safety relief valves (SRVs) in conjunction with either the Core Spray (CS) system or the Residual Heat Removal System (RHR) in the Low Pressure Coolant Injection (LPCI) mode as a means of satisfying the safe shutdown performance criteria of Section III.G.1 of the regulation.

By letter dated December 12, 1996, the staff informed the licensee that:

- (a) the proposed use of low pressure injection systems (LPIS) does not appear to satisfy the hot shutdown performance criterion of Section III.G to the extent that hot shutdown conditions can not be maintained; and,
- (b) the proposed approach appears to be relied on in lieu of preferred high pressure makeup systems (HPCI or RCIC), because redundant components of the preferred systems do not meet the separation criteria of Section III.G.2.

Based on these concerns, the staff recommended that the proposed approach be designated as an alternative shutdown capability for the identified fire zones and information provided which demonstrates that the fire protection features (detection and suppression) of Reactor Building Fire Zones RB-1, RB-2, RB-3, and RB-4 are equivalent to that required by Section III.G.3 of the regulation, or justification provided where this level of protection is not achieved.

In its submittal dated January 15, 1997 VYNPC concurred with the staff's concerns and withdrew its request for exemption from Section III.G.1.a. In the revised approach described in this submittal, the licensee states that Fire Zones RB-1, RB-2, RB-3, and RB-4 were redesignated as areas requiring an alternative shutdown capability, and requested an exemption from the requirements of Section III.G.3, to the extent that fire detection and fixed fire suppression systems are not provided throughout the fire zones as required by the regulation. As part of this submittal, the licensee provided a technical justification to demonstrate that the combination of existing fire protection features and proposed fire detection system enhancements for Reactor Building Fire Zones RB-3, and RB-4 would provide a level of protection that is equivalent to that required by Section III.G.3 of the regulation.

3.2 Use of the Vernon Tie Line as an alternative to the on-site Emergency Diesel Generator

The Vermont Yankee Nuclear Power Corporation (VYNPC) analysis of the effects of fire in the Main Control Room, Cable Spreading Room, and the Reactor Building Fire Zones RB-1, RB-2, RB-3 and RB-4, has determined that suitable protection of redundant trains of equipment necessary to achieve and maintain hot shutdown conditions can not be assured for these areas. Accordingly, VYNPC has developed alternative shutdown capabilities for these areas which are physically and electrically independent of the fire affected areas. With regard to this approach, Section III.L, "Alternative and Dedicated Shutdown Capability," of Appendix R to 10 CFR 50 requires, in part, that the alternative shutdown methodology be capable of accommodating post-fire conditions where offsite power is not available for 72 hours. The Control Room and Cable Spreading Room are the only areas where fire may force operators to abandon the control room and achieve safe shutdown conditions at local/remote control stations. For certain Reactor Building fires (RB-1, RB-2, RB-3 and RB-4), shutdown will be accomplished from the main control room using low pressure injection systems as an alternative capability to the normally preferred high pressure makeup systems.

The alternate shutdown methodology developed by VYNPC currently credits the use of one of the two onsite emergency diesel generators (EDG) to power required shutdown systems. As a result of a recent Appendix R design verification, however, VYNPC has determined that additional margin is necessary in the amount of time available for operators to perform actions necessary to initiate the alternate shutdown capability. To reduce the operator time-line for implementing the alternate shutdown capability and facilitate the restoration of a.c. power to safe shutdown equipment, VYNPC has proposed the use of an existing source of 4.16 kV power, known as the "Vernon Tie Line", as a means of providing a.c. power to required alternate shutdown loads. However, since the Vernon Tie Line originates from the adjacent Vernon Hydroelectric Station, it may also be considered as an offsite power source, and, therefore, does not satisfy the specific technical requirements of Section III.L.3 of Appendix R.

4. EVALUATION

4.1 Use of ADS/LPCI or ADS/CS as a means of achieving post-fire safe shutdown conditions in Reactor Building Fire Zones RB-1, RB-2, RB-3, and RB-4

As a result of a reverification of its post-fire safe shutdown analysis, VYNPC determined that the original hot-shutdown core cooling strategy, which relied on the use of Reactor Core Isolation Cooling (RCIC) for a fire in Reactor Building fire zones RB-1, RB-2, RB-3, may not be available due to inadequate cable separation. The licensee states this deficiency was reported to the NRC by letter dated November 20, 1995.

To resolve the identified cable separation deficiencies, in its May 21, 1996 submittal, the licensee proposed a change to the reactor core cooling strategy for Reactor Building Fire Zones RB-1, RB-2, RB-3, and RB-4. Specifically, in the event of fire in these areas, the licensee proposed to satisfy the shutdown performance requirements of Section III.G by depressurizing the reactor using two safety relief valves (SRVs), and providing reactor coolant

makeup through the use of one train of the Core Spray system or Low Pressure Coolant Injection (LPCI) mode of the Residual Heat Removal System (ADS/LPCI or ADS/CS).

To ensure two SRVs and one train of Core Spray will remain available and operable from the Control Room for postulated fires in Reactor Building Fire Zones RB-1, RB-2, RB-3, and RB-4, the licensee implemented a design change to reroute cables for two SRVs outside the unprotected portion of Reactor Building Fire Zone RB-3. As an added feature, the licensee is providing isolation and transfer capability at an alternate shutdown location for two of the four SRVs. The licensee states that this change will eliminate the current need for a cold shutdown SRV repair procedure and will enhance the capability of the alternate shutdown system by providing operators with the option to use either a high pressure (RCIC) or low pressure makeup capability (ADS/LPCI).

Reactor depressurization (via the ADS) and subsequent makeup (via low pressure injection systems), while a proven core cooling strategy under certain accident conditions, inherently results in a short duration uncover of the reactor core. To ensure that no fuel clad damage would occur the licensee states that it has performed transient analyses to examine the thermal-hydraulic response of the core for the spectrum of postulated fire scenarios and recovery strategies. The licensee further states that the results of these analyses demonstrate that the peak clad temperature would remain below 1500 °F and core heatup is quickly quenched soon after low pressure injection is initiated.

The post-fire safe shutdown criteria of Section III.G.1 and III.G.2 are directed at ensuring that at least one train of redundant systems, capable of achieving and maintaining hot shutdown conditions, will remain operable in the event of fire in any plant area. Where the protection of systems capable of satisfying the performance criteria of these paragraphs is not assured, Section III.G.3 requires an alternative or dedicated shutdown capability to be provided which is independent (physically and electrically) of the fire area, room, or zone under consideration.

The use of low pressure injection systems (LPIS) does not satisfy certain shutdown system performance criteria specified in the regulation. Specifically, this approach:

- (a) is not capable of achieving and maintaining hot-shutdown conditions, as specified in Section III.G.1.a of Appendix R to 10 CFR 50; and
- (b) is not capable of maintaining the reactor coolant level above the top of the core, as required by Section III.L.2 of Appendix R to 10 CFR 50.

With regard to determining whether a shutdown capability is "redundant" (per III.G.1 and III.G.2) or "alternative" (per III.G.3 and III.L), the staff has issued the following guidance in Generic Letter 86-10:

(a) Response to Question 3.8.3:

"...If the system is being used in lieu of the preferred system because the redundant components of the preferred system do not meet the separation criteria of Section III.G.2, the system is considered an alternative shutdown capability."

(b) Response to Question 5.1.2

"For the purpose of analysis to Section III.G.2 criteria, the safe shutdown capability is defined as one of the two normal safe shutdown trains..."

(c) Response to Question 5.2.3

"The only requirement for post-fire operating procedures is for those areas where alternative shutdown is required. For other areas of the plant, shutdown would be achieved utilizing one of the two normal trains of shutdown systems."

The preferred method of shutdown in the event of fire in a BWR, when normal shutdown systems (i.e. feedwater) are not available, is through the use of high pressure injection systems (e.g., HPCI or RCIC). The effect of fire on the availability of normal shutdown systems has not been evaluated by VYNPC. Therefore, the licensee's safe shutdown analysis appropriately assumes that these systems would not be available. In the absence of this normal shutdown capability, the licensee recognizes that the preferred method of shutdown is through the use of high pressure injection systems (i.e., Reactor Core Isolation Cooling [RCIC] or High Pressure Coolant Injection [HPCI]) to accomplish the reactor coolant makeup control function.

Section III.L.1(c) of 10 CFR 50 also requires alternative or dedicated shutdown strategies to be capable of achieving and maintaining hot shutdown conditions. However, as documented in previous staff positions (Reference: NRC Memorandum, L. S. Rubenstein to R. J. Mattson, dated December 3, 1982, "Use of the Automatic Depressurization System (ADS) and Low Pressure Coolant Injection (LPCI) to Meet Appendix R, Alternate Shutdown Goals), the use of ADS in conjunction with low pressure injection systems, has been evaluated and found to provide a suitable alternative shutdown capability. The basis for this acceptance rests, in part, with the established principles of defense-in-depth for fire protection. Specifically, when an "alternative" shutdown capability is provided for a specific fire area, room or zone, the regulation (Section III.G.3 of Appendix R) imposes an additional requirement of fire detection and fixed fire suppression systems in all areas where the alternative shutdown capability is credited for accomplishing required shutdown functions. These additional fire safety features serve to limit the probability of fire growth and damage, thereby minimizing reliance on the "less-than-preferred" alternative capability to accomplish the required shutdown functions. Areas of the plant which do not require an alternative shutdown capability may not be provided with an equivalent level of fire protection.

By letter dated December 12, 1996, the licensee was informed of the staff's concern that its proposed use of low pressure injection systems (LPIS) did not appear to be capable of satisfying the performance criterion of Section III.G. Additionally, the licensee was informed that since the proposed approach would be relied on in lieu of preferred systems (HPCI or RCIC) because redundant components of the preferred system do not meet the separation criteria of Section III.G.2, it appears the proposed approach is providing an alternative shutdown capability for the identified fire areas. Therefore, these fire zones should be designated as alternative shutdown fire areas and information should be provided which demonstrates that the fire protection features (detection and suppression) provided for Reactor Building Fire Zones RB-1, RB-2, RB-3, and RB-4 are equivalent to that required by Section III.G.3 of the regulation, or justification provided where this level of protection is not achieved.

In its January 15, 1997 submittal VYNPC concurred with the staff's position and withdrew its request for exemption from Section III.G.1.a. In its revised approach, Fire Zones RB-1, RB-2, RB-3, and RB-4 were redesignated as areas requiring an alternative shutdown capability and an exemption was requested from Section III.G.3, to the extent that fire detection and fixed fire suppression systems are not provided throughout the Reactor Building fire zones under consideration. As part of this submittal, the licensee provided a technical justification to demonstrate that the existing fire protection features (detection and suppression) for Reactor Building Fire Zones RB-1, RB-2, RB-3, and RB-4, when modified to include proposed fire detection enhancements in fire zones RB-3 and RB-4, would provide an equivalent level of protection to that required by Section III.G.3 of the regulation.

It should be noted that the evaluation of fire protection features for conformance to Section III.G.3 of the regulation is beyond the scope of work assigned to BNL. Therefore, the licensee's technical justification for satisfying the intent of fire protection criteria of Section III.G.3, documented in its January 15, 1997 submittal, should be evaluated separately by the staff.

4.2 Use of the Vernon Tie Line as an alternative to its on-site Emergency Diesel Generator

Section III.L.3 of Appendix R to 10 CFR 50 requires the alternative shutdown methodology to be capable of accommodating post-fire conditions where offsite power is not available for 72 hours. To satisfy this requirement, the current alternative shutdown strategy relies on the use of one of the two onsite emergency diesel generators (DG-1-1A) powering required shutdown loads from 4.16 kV Emergency Bus 4. To reduce the operator time-line and facilitate the restoration of a.c. power to safe shutdown equipment, the licensee proposes to use an existing source of 4.16 kV power, called the "Vernon Tie Line", as a means of providing a.c. power to required shutdown loads. The licensee states that this approach (i.e., use of the Vernon Tie Line) will reduce the time necessary to restore ac power from 30 minutes to approximately 10 minutes.

The Vernon Tie Line is a dedicated, underground, transmission line capable of providing power from the Vernon Hydroelectric Station Switchyard to 4.16 kV

Emergency Buses 3 and 4 of the Vermont Yankee Nuclear Power Plant. The Tie Line originates at a 69/13.2 kV transformer located in the Vernon Switchyard. The transformer is rated at 5000 kVA. The 13.2 kV level of voltage supplied from this transformer supplies two radial lines: one to the town of Vernon and one dedicated, underground, feed line to a 13.2/4.16 kV, 3750 kVA, transformer located on the Vermont Yankee site (called the Vernon Tie transformer). Electrical protection of the Vernon Tie Line is provided by an oil circuit breaker and the feed to the town of Vernon is protected by a vacuum recloser. The licensee states that transient faults on the line to the town of Vernon would not cause actuation of protective relaying of Vermont Yankee circuit or affect safe shutdown loads.

The 4.16 kV voltage appearing on the secondary of the 13.2/4.16 kV Vernon Tie Transformer is connected, via a dedicated underground cable, to a series/parallel configuration of three normally open circuit breakers (breaker 3V4 in series with a parallel combination of breakers 3V and 4V) located in the Vermont Yankee Switchgear Room. Breakers 3V, 4V and 3V4 are normally open and can only be closed by manual operation. Normally open circuit breaker 3V serves as the feed breaker to 4160 V Bus 3 and normally open circuit breaker 4V serves as the feed breaker to 4160 V Bus 4. Only 4160 V Bus 4 is required to be energized to power required shutdown loads. To ensure that the Vernon Tie can not be connected to a live emergency bus, the control circuit for breaker 3V4 is interlocked so breakers 3V and 4V must both be open before 3V4 can be closed. Once 3V4 is closed, in order to close breaker 4V and energize emergency bus 4, the breaker for EDG 1A and the normal feed breaker to Bus 4 (4T2) must both be open. Similar logic applies to the closing of breaker 3V to energize Bus 3. The licensee states that its analysis of potential spurious actuations for these breakers has determined that there is a potential for circuit breaker 3V4 to spuriously close prior to isolation (as described in paragraph below) as a result of fire in the Control Room or Cable Spreading Room. However, as described above, breaker 4V is interlocked with EDG-1-1A output breaker and the 4160 V Bus 4 normal feed breaker 4T2 such that both breakers EDG 1A and 4T2 must be open in order for breaker 4V to close. The licensee states that this interlock circuitry is local to the switchgear and will not be bypassed by a Control Room or Cable Spreading Room fire damage prior to actuation of the isolation switches. Spurious closure of breaker 3V4 due to fire damage prior to isolation, therefore, will not cause the inadvertent energization of 4160 V Bus 4.

The Vernon Tie Line can be connected to the Vermont Yankee Emergency Bus 4 by the control room operator via operation of manual control switches which operate circuit breakers located in the Vermont Yankee switchgear rooms. To permit the use of the Vernon Tie as part of the post-fire alternative shutdown system, the licensee has modified the controls of the Vernon Tie line circuit breakers to isolate control room cables and transfer control of the Vernon Tie breakers to local control switches at the switchgear. New transfer switches isolate control room wiring for breakers 3V4 and 4V. To eliminate the potential for hot-shutdown repairs, redundant fuses are automatically switched into the circuit upon operation of the transfer switches. Local control switches at the switchgear permit the operator to operate breakers 3V4 and 4V

to align the Vernon Tie to 4160 V Bus 4. Implementation of the Vernon Tie Line requires the de-energization of only Emergency Bus 4 which will then be re-energized from the Vernon Tie.

Since a loss of offsite power must also be assumed for Reactor Building fire zones which utilize alternative shutdown (III.G.3) compliance strategies (Fire Zones RB-1, RB-2, RB-3 and RB-4) described in Sections 3.1 and 4.1 above, the Vernon Tie Line is also credited for use in these areas. The licensee states that a loss of normal sources of offsite power is not expected to occur as a result of fire in these areas. Therefore, use of the Vernon Tie provides defense-in-depth and would only be used in the unlikely event that the normal sources of power were not available.

The 69 kV Vernon Switchyard distribution system may receive power from the Vernon Hydroelectric Station and five (5) separate 69 kV feeds. The Hydroelectric Station is a "run of the river" facility comprised of 8 generators that are capable of providing between 3 MW and 20 MW of power. In the event that power supplied by the hydroelectric station were not sufficient to supply Vermont Yankee's emergency needs (2705 kW), power may be drawn from the five 69 kV offsite feeds to the 69 kV Vernon Switchyard. The licensee states the 69 kV Vernon Switchyard distribution system is physically and electrically independent of Vermont Yankee's 345 kV and 115 kV normal sources of offsite power. The licensee further states that the total of all shutdown loads is 2705 kW and the Vernon Tie Line capacity of 3750 kVA is equivalent to one emergency diesel generator. The Tie Line, therefore, has the capability to supply all the ac power loads needed for the alternate shutdown system.

Based on its review of known losses of the Vernon Tie Line, the licensee states that the availability of the Vernon Station has historically been above 99%, exceeding the required alternate ac source availability of 95%. The licensee further states that the Vernon Hydroelectric Station has been unavailable for only four hours over the last thirty years. Further, in the highly unlikely event of fire in the control room or cable spreading room requiring implementation of the alternate shutdown capability with a concomitant loss of electrical power from both the normal offsite sources and the Vernon Tie Line, a diesel generator will be available to provide backup power. The "A" EDG circuitry and its support systems were previously modified to allow electrical isolation of fire damaged control circuitry for Control Room and Cable Spreading Room fires. Local controls are available to isolate and enable the "A" EDG to be used to power Emergency Bus 4 for alternate shutdown scenarios.

The licensee has established administrative controls to prevent Vernon Tie Line maintenance or surveillance coincident with planned maintenance of either onsite emergency diesel generator. Because of the potential safety significance of an unplanned unavailability of the Vernon Tie Line, the licensee states that it will administratively limit power operation of Vermont Yankee to no more than 15 days, unless the Vernon Tie Line is restored or a Basis for Maintaining Operability (BMO) evaluation is approved by the Plant Operations On-site Review Committee. At Vermont Yankee, a BMO is developed to provide the basis for maintaining continued operation with a known deficiency. The BMO must demonstrate that there is no unacceptable reduction in the

protection provided to public health and safety, and/or there are appropriate compensating factors that can be applied in the interim until the deficiency is corrected. If the Vernon Tie can not be returned to service within 15 days the licensee states that within the next 24 hours, a special report will be submitted to the Nuclear Regulatory Commission, in accordance with 10 CFR 50.4. This report will outline the reason for the unavailability, corrective actions being taken to restore the Vernon Tie, compensatory actions in place to provide ac power for Appendix R alternative shutdown fire scenarios, and the time required to make the Vernon Tie available.

All actions necessary to restore ac power using the Vernon Tie Line are performed in the Vermont Yankee switchgear rooms in accordance with established procedures. No operator actions are performed at the Vernon Hydroelectric Generating Station. To estimate the amount of time necessary to restore ac power to the Emergency Buses from outside the main control room using the Vernon Tie Line, the licensee has performed plant walkdowns of required operator actions. Based on the results of this effort, the licensee estimates the time required for operators to isolate the Vernon Tie Line control circuitry from the Control Room and Cable Spreading Room, transfer circuit breaker control power to the alternate source, and restore power to the Emergency Bus to be approximately 10 minutes. This represents a 20 minute reduction in the amount of time currently necessary to restore ac power using the onsite emergency diesel generator.

5. CONCLUSIONS

5.1 Use of ADS/LPCI or ADS/CS as a means of achieving post-fire safe shutdown conditions in Reactor Building Fire Zones RB-1, RB-2, RB-3, and RB-4

As indicated in Section 4.1 above, reactor depressurization (via the ADS) and subsequent makeup (via low pressure injection systems), while a proven core cooling strategy under certain accident conditions, inherently results in a short duration uncover of the reactor core and is not capable of maintaining hot shutdown conditions as required by Section III.G.1 of the regulation. However, the staff has approved the use of this shutdown strategy as a means of providing an alternative shutdown capability (Reference: NRC Memorandum, L.S. Rubenstein to R.J. Mattson, dated December 3, 1982, "Use of the Automatic Depressurization System (ADS) and Low Pressure Coolant Injection (LPCI) to Meet Appendix R, Alternate Shutdown Goals).

As documented in its January 15, 1997 submittal, the licensee has revised its shutdown strategy for Reactor Building fire zones RB-1, RB-2, RB-3 and RB-4 by designating these fire zones as areas where alternative shutdown capability is required (i.e., areas where compliance with Section III.G.3 is demonstrated). In accordance with previous guidance issued by the staff (Reference: NRC Memorandum, L.S. Rubenstein to R. J. Mattson, dated December 3, 1982, "Use of the Automatic Depressurization System (ADS) and Low Pressure Coolant Injection (LPCI) to Meet Appendix R, Alternate Shutdown Goals) the licensee's proposed use of ADS in conjunction with low pressure coolant injection systems as an

alternative shutdown capability in the event of fire in these areas, conforms to Appendix R to 10 CFR 50 and is, therefore, acceptable.

The licensee's revised shutdown strategy for Reactor Building Fire Zones RB-1 through RB-4 and redesignation of these fire zones as areas requiring an alternative shutdown capability, provides a level of protection equivalent to that required by Section III.G of Appendix R to 10 CFR 50. Therefore, pending NRR approval of the fire protection features provided for these areas, we recommend that exemptions from Section III.L.1.(c) and III.L.2.(b) of Appendix R to 10 CFR 50 be granted;

5.2 Use of the Vernon Tie Line as an alternative to an on-site Emergency Diesel Generator

Based on the evaluation described in Section 4.2 above, it is concluded that the use of the Vernon Tie Line as a means of powering alternative shutdown systems, provides a suitable alternative to an Emergency Diesel Generator for the following two cases:

- 1) As an alternative to its on-site emergency diesel generator for control room and cable spreading room fire events requiring control room evacuation and the implementation of the alternative shutdown capability when normal sources of offsite power are not available, and
- 2) For fire events in reactor building zones RB-1, RB-2, RB-3 and RB-4, utilizing III.G.3 compliance strategies when normal sources of offsite power are not available.

Based on the high availability (99%) of the Vernon Hydroelectric Station and the high reliability of the underground Vernon Tie transmission line, the licensee's proposed use of the Vernon Tie Line provides a level of fire protection equivalent to the requirements of Section III.L of Appendix R to 10 CFR 50. On this basis, therefore, we recommend that the requested exemption from Section III.L.3 of Appendix R to 10 CFR 50 be granted to accommodate post-fire alternative shutdown conditions where offsite power is not available for 72 hours.

August 12, 1997

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Docket File
PDI-3 RF

MEMORANDUM TO: Rules and Directives Branch
Division of Administrative Services
Office of Administration

FROM: Office of Nuclear Reactor Regulation

SUBJECT: VERMONT YANKEE NUCLEAR POWER STATION (TAC NOS. M95442 AND M95149)

One signed original of the *Federal Register* Notice identified below is attached for your transmittal to the Office of the Federal Register for publication. Additional conformed copies (5) of the Notice are enclosed for your use.

- ☐ Notice of Receipt of Application for Construction Permit(s) and Operating License(s).
- ☐ Notice of Receipt of Partial Application for Construction Permit(s) and Facility License(s): Time for submission of Views on Antitrust matters.
- ☐ Notice of Consideration of Issuance of Amendment to Facility Operating License. (Call with 30-day insert date).
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- ☐ Notice of Limited Work Authorization.
- ☐ Notice of Availability of Safety Evaluation Report.
- ☐ Notice of Issuance of Construction Permit(s).
- ☐ Notice of Issuance of Facility Operating License(s) or Amendment(s).
- ☐ Order.
- ☒ Exemption.
- ☐ Notice of Granting Exemption.
- ☐ Environmental Assessment.
- ☐ Notice of Preparation of Environmental Assessment.
- ☐ Receipt of Petition for Director's Decision Under 10 CFR 2.206.
- ☐ Issuance of Final Director's Decision Under 10 CFR 2.206.
- ☐ Other: _____

DOCKET NO. 50-271

Attachment(s): As stated

Contact: S. Little
Telephone: 415-2025

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