December 1, 1986

Docket No. 50-271

Mr. R. W. Capstick
Licensing Engineer
Vermont Yankee Nuclear Power
Corporation
1671 Worcester Road
Framingham, Massachusetts 01701

Dear Mr. Capstick:

SUBJECT: EXEMPTION FROM APPENDIX R TO 10 CFR 50 CONCERNING AUTOMATIC FIRE SUPPRESSION, SEPARATION, AND REPAIRS.

Re: Vermont Yankee Nuclear Power Station

The Commission has issued the enclosed Exemption from the requirements of Section III.G.1 and III.G.2 of Appendix R to 10 CFR 50.

The exemption is granted to the extent that automatic fire suppression is not installed in four locations (reactor building torus areas elevations 213 feet 9 inches and 232 feet 6 inches, reactor building northeast and southeast corner rooms elevations 213 feet-9 inches through 252 feet, reactor building northeast corner vital MCCs elevation 252 feet, and reactor building east side instrument racks), and to the extent that separation is not provided in three locations (RCIC room elevation 213 feet 9 inches, reactor building northeast corner vital MCCs elevation 252 feet, and reactor building northeast corner elevation 252 feet), and to the extent that operators are allowed to perform the following repairs to achieve and maintain hot shutdown:

(a) Rearranging electrical leads to connect a back-up battery charger in the event a fire in the cable vault disables the operating battery charger; and

(b) Replacing fuses that could be blown due to a fire in the cable spreading area.

The Exemption is being forwarded to the Office of the Federal Register for publication.

Also enclosed for your information is a copy of our Safety Evaluation and a copy of an Environmental Assessment and Finding of No Significant Impact which has been published in the Federal Register.

Sincerely,

Original signed by

Robert M. Bernero, Director
Division of BWR Licensing
Office of Nuclear Reactor Regulation

Enclosures:
As stated

cc w/enclosures:
See next page

DISTRIBUTION
Docket File
NRC PDR
Local PDR
PD#2 Plant File
HDenton/RVollmer
RBernero
GLainas
ORAS
SNorris
VRooney
OGC-Bethesda
EJordan
BGrimes
JPartlow
NThompson
TBarnhart (4)
ACRS (10)
OPA
SECY
LFMB

PD#2:DBL	PD#2:DBL	OGC-Bethesda	PD#2:DBL	DD:DBL	D:DBL
SNorris	VRooney:cd	W.Shields	DMuller	WHouston	RBernero
11/18/86	11/20/86	11/21/86	11/26/86	11/25/86	11/28/86

OFFICIAL RECORD COPY

→ See minor change on p. 6 of Exemption and typo on p. 14.

Mr. R. W. Capstick
Vermont Yankee Nuclear Power Corporation

cc:
Mr. J. G. Weigand
President & Chief Executive Officer
Vermont Yankee Nuclear Power Corp.
R. D. 5, Box 169
Ferry Road
Brattleboro, Vermont 05301

Mr. Donald Hunter, Vice President
Vermont Yankee Nuclear Power Corp.
1671 Worcester Road
Framingham, Massachusetts 01701

New England Coalition on
Nuclear Pollution
Hill and Dale Farm
R. D. 2, Box 223
Putney, Vermont 05346

Mr. Walter Zaluzny
Chairman, Board of Selectman
Post Office Box 116
Vernon, Vermont 05345

Mr. J. P. Pelletier, Plant Manager
Vermont Yankee Nuclear Power Corp.
Post Office Box 157
Vernon, Vermont 05354

Mr. Raymond N. McCandless
Vermont Division of Occupational
& Radiological Health
Administration Building
10 Baldwin Street
Montpelier, Vermont 05602

Honorable John J. Easton
Attorney General
State of Vermont
109 State Street
Montpelier, Vermont 05602

John A. Ritscher, Esquire
Ropes & Gray
225 Franklin Street
Boston, Massachusetts 02110

Vermont Yankee Nuclear Power
Station

Mr. W. P. Murphy, Vice President &
Manager of Operations
Vermont Yankee Nuclear Power Corp.
R. D. 5, Box 169
Ferry Road
Brattleboro, Vermont 05301

Mr. Gerald Tarrant, Commissioner
Vermont Department of Public Service
120 State Street
Montpelier, Vermont 05602

Public Service Board
State of Vermont
120 State Street
Montpelier, Vermont 05602

Vermont Yankee Decommissioning
Alliance
Box 53
Montpelier, Vermont 05602-0053

Resident Inspector
U. S. Nuclear Regulatory Commission
Post Office Box 176
Vernon, Vermont 05354

Vermont Public Interest
Research Group, Inc.
43 State Street
Montpelier, Vermont 05602

Regional Administrator, Region I
U. S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, Pennsylvania 19406

7590-01

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
VERMONT YANKEE NUCLEAR POWER CORPORATION	)	Docket No. 50-271
	)	
Vermont Yankee Nuclear Power Station	)	

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 Vermont Yankee Nuclear Power Station. This license provides, among other things, that Vermont Yankee Nuclear Power Station is subject to all rules, regulations, and Orders of the Commission now or hereafter in effect.

The station is a boiling water reactor located at the licensee's site in Windham County, Vermont.

II.

On November 19, 1980, the Commission published a revised Section 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 specified requirements for a particular aspect of the fire protection features at a nuclear power plant. One of these subsections, III.G, is the subject of the licensee's exemption requests.

Section III.G.2 of Appendix R requires that one train of cables and equipment necessary to achieve and maintain safe shutdown be maintained free of fire damage by one of the following means:

a. Separation of cables and equipment and associated nonsafety circuits of redundant trains by a fire barrier having a 3-hour rating. Structural steel forming a part of or supporting such fire barriers shall be protected to provide fire resistance equivalent to that required of the barrier.

b. Separation of cables and equipment and associated nonsafety circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustibles or fire hazards. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.

c. Enclosure of cable and equipment and associated nonsafety circuits of one redundant train in a fire barrier having a 1-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.

In addition, Section III.G.1.a of Appendix R requires that one train of cables and equipment necessary to achieve and maintain hot shutdown conditions from either the control room or emergency control stations(s) be free of fire damage.

III.

By letter dated April 24, 1985, the licensee requested exemptions from III.G.2 of Appendix R in 11 areas of the plant.

On July 16, 1985, the licensee met with the NRC in Bethesda and a request was made of the licensee to provide additional information. By letters dated July 26, 1985, August 2, 1985, and August 16, 1985, the licensee provided additional information and/or revisions to its submitted exemption requests. By letters dated August 2 and August 16, 1985, the licensee subsequently

withdrew four exemption requests identified as numbers 3, 9, 10, and 11 and also withdrew exemption number item 8 after incorporating it into exemption number 7.

The following list of exemption requests, therefore, reflects the latest status of the exemption request from Appendix R Section III.G.2 resulting from the original April 24, 1985 letter:

1. Reactor Building, Torus Area Elevations 213 feet 9 inches, and 232 feet 6 inches (Zones RB-1 and RB-2). Exemptions were requested from the specific requirements of Section III.G.2.b to the extent that an automatic fire suppression system is not installed in these zones.
2. RCIC Room Elevation 213 feet 9 inches (RCIC Room Fire Area). Exemptions were requested from the specific requirement of Section III.G.2.a to the extent that this area is not separated by 3-hour fire rated barriers from the areas containing redundant shutdown systems, cables, and associated circuits.

   Note: This exemption is a revised version. The original exemption request in the April 24, 1985 submittal was from the provisions of III.G.2.c.
3. Reactor Building Northeast and Southeast Corner Rooms Elevation 213 feet 9 inches to 252 feet (Zones RB-1 and RB-2).

   Exemptions were requested from the specific requirements of Section III.G.2.b to the extent that automatic fire suppression is not provided in the corner rooms and within the area between these rooms and the stairs at elevation 252 feet.
4. Reactor Building Northeast Corner Vital MCCs Elevation 252 feet (Zones RB-3 and RB-4). Exemptions were requested from the specific requirement of III.G.2.b to the extent that automatic fire suppression is not installed

within the vital Motor Control Center (MCC) area and to the extent that 20 feet of separation without intervening combustible or fire hazard is not provided between redundant safe shutdown systems.

5. Reactor Building Northwest Corner Elevation 252 feet (Zone RB-3).

   Exemptions were requested from the specific requirement of III.G.2.b to the extent that redundant trains of cables and equipment are not separated by a horizontal distance of more than 20 feet free of combustibles or fire hazards.

6. Reactor Building East Side Instrument Racks Elevation 280 feet (Zones RB-5 and RB-6).

   Exemptions were requested from the specific requirement of III.G.2.b to the extent that automatic fire suppression systems are not installed throughout the area.

In addition, by letter dated October 31, 1985, the licensee requested two exemptions from III.G.1.a of Appendix R. Because Section II G.1.a does not allow for repairs in order to achieve and maintain hot shutdown, the exemption request involved allowing the operators to perform the following repairs:

1. Rearranging electrical leads to connect a back-up battery charger in the event a fire in the cable vault disables the operating battery charger; and
2. Replacing fuses that could be blown due to a fire in the cable spreading area.

By letter dated August 15, 1986, the licensee provided information relevant to the "special circumstances" finding required by revised 10 CFR 50.12(a) (50 FR 50764) for the licensee's April 24, 1985 request. The licensee stated that existing and proposed fire protection features at Vermont Yankee accomplish the underlying purpose of the rule. Implementing additional modifications

to provide additional suppression systems, detection systems, and fire barriers would require the expenditure of engineering and construction resources as well as the associated capital costs which would represent an unwarranted burden on the licensee's resources. The licensee stated that the costs to be incurred are as follows:

- o Engineering and installation of additional piping, sprinkler heads, and supporting structures.
- o Engineering and installation of fire barriers, supports, support protection, and ongoing maintenance.
- o Rerouting of power and control cables, and associated conduits, and supports.
- o Increased surveillance on new or extended fire suppression and fire detection systems.
- o Increased congestion in numerous plant locations complicating future plant modifications/operation.

Also by letter dated June 10, 1986, the licensee provided information relevant to the "special circumstances" finding required by revised 10 CFR 50.12(a) (50 FR 50764) for the licensee's October 31, 1985 request. The licensee stated that existing and proposed fire protection features at Vermont Yankee accomplish the underlying purpose of the rule. Implementing additional modifications to provide additional suppression systems, detection systems, and fire barriers would require the expenditure of engineering and construction resources as well as the associated capital costs which would represent an unwarranted burden on the licensee's resources. The licensee stated that the costs to be incurred are as follows

- o Engineering of additional power and control circuits and the analysis and design of associated equipment supports.
- o Significant additions and routing of power and control cables, associated conduits, and supports.

o Increased congestion in numerous plant locations complicating plant modifications and operation.

The licensee stated that in both instances the costs are significantly in excess of those required to meet the underlying purpose of the rule. The staff concludes that "special circumstances" exist for the licensee's requested exemptions in that application of the regulation in these particular circumstances is not necessary to achieve the underlying purpose of Appendix R to CFR Part 50. See 10 CFR 50.12(a)(2)(ii).

The licensee requested an exemption from Section III.G.2.b to the extent that it requires installation of an automatic fire suppression system in Fire Zones RB-1 and RB-2 (Reactor Building, Torus Area Elevation 213 feet 9 inches), Fire Zones RB-1 and RB-2 (Reactor Building Northeast and Southeast Corner Rooms Elevation 213 feet 9 inches to 252 feet), and Fire Zones RB-5 and RB-6 (Reactor Building East and West Side Instrument Racks Elevation 280 feet).

For Fire Zone RB-1 and RB-2, the existing fire protection includes smoke detection, fire extinguishers, and manual hose stations. All redundant safe shutdown systems are separated by 20 feet with no intervening combustibles located within the spatial separation. The licensee proposes to provide fire stopping for the cable trays to create a 20-foot separation zone in the northwest quadrant and providing the dc power feed from the alternative shutdown battery with a 3-hour fire barrier. This fire-stopped separation zone precludes the direct propagation of a fire from zone RB-1 to RB-2 and vice versa. The licensee committed to provide fire detections on elevation 252 feet for both zones.

The existing fire protection for fire zones RB-5 and RB-6 is in the form of fire extinguishers, fire detection in the MG set area, manual hose stations,

and an automatic foam fire suppression system for the Motor Generator (MG) set. The separation between the racks is 30 feet with a low fire load (6,100 Btu per square feet excluding the MG set area fire load). The licensee proposes to create 20-foot separation zones by fire stopping cable trays. These separation zones will be from the concrete shield wall to the edge of the MG set area berm and from the concrete shield wall to the reactor building wall on the west side. The licensee has committed to install early warning fire detectors on the ceiling within the 20-foot separation zones just described.

The staff's principal concern with the level of fire protection in these locations was that because of the absence of an area-wide automatic fire suppression system, a fire of significant magnitude could develop and damage redundant shutdown-related systems. However, the fire load in these locations is low. If a fire were to occur, the staff anticipates that it would develop slowly, with initially low heat release and slow room temperature rise. The MG set fire hazard is protected by early warning fire detection and an automatic fire suppression system. Because of the presence of the early warning fire detection systems, the fire would be detected in its incipient stages. The alarms from these detectors are annunciated in the control room. The fire brigade would then be dispatched and would extinguish the fire manually. Until the fire was extinguished, the 20 feet of spatial separation between the redundant shutdown-related systems will provide sufficient passive protection to provide reasonable assurance that one shutdown division would remain free of fire damage.

Based on the above evaluation, the staff concludes that the existing fire protection combined with the proposed fire protection measures in the above zones provides a level of fire protection equivalent to the technical requirements of Section III.G.2.b of Appendix R.

The licensee also requested an exemption from Section III.G.2.a to the extent that it requires 3-hour fire rated barrier between redundant trains of safe shutdown equipment for the RCIC room fire area.

The RCIC room contains the Reactor Core Isolation Cooling System (RCIC) and the alternative safe shutdown panel. The RCIC room contains only division II shutdown cables. The room directly above is part of fire zone RB-1 and contains division I and II cables.

The existing fire protection in the RCIC room consists of 3-hour fire rated barriers forming the walls, floor, ceiling, and penetration seals. The exception to this is the steel plate stairway enclosure, equipment hatch, and the steel security door to the torus area. Fire detection exists in the RCIC room and both fire detection and fire suppression systems exists in the torus area adjacent to the RCIC room. Manual hose stations and fire extinguishers are available to the area. Finally, this room is accessible by the fire brigade from two separate access entry points. The licensee has committed to provide fire stopping in the torus area cable trays directly outside and near the steel security door to the RCIC room.

The staff's principal concern in the RCIC room was that because of the absence of a 3-hour fire rated barrier, a fire of significant magnitude could develop and damage safe shutdown cables. However, there is no significant fire load on the floor area and the cable fire load is low (less than 20-minute severity). If a fire were to occur, then the staff anticipates that it would develop slowly, with initially a low heat release and slow area temperature rise. The floor, walls, ceiling, and penetrations are 3-hour fire rated barriers. However, the stairway enclosure, a hatch cover, and the security door to the torus area are constructed of steel. This steel construction is substantial since it was designed for a high energy steam line break. Because of the presence of the early warning fire detection system, the fire would be

detected in its incipient stages. The alarms from these detectors are annunciated in the control room. The fire brigade would then be dispatched and would extinguish the fire. Until the fire was put out, the steel barriers between the RCIC room and the upper room/torus area would provide sufficient passive protection to provide reasonable assurance that one division would remain free of fire damage. The staff finds that the provision of a complete 3-hour fire rated barrier would not significantly increase the level of fire protection in this zone.

Based on the above evaluation, the staff concludes that the existing and the proposed fire protection measures in the area (cable tray fire stops) provide a level of fire protection equivalent to the technical requirements of Section III.G.2.a of Appendix R.

The licensee also requested an exemption from Section III.G.2.b to the extent that it requires the installation of an automatic fire suppression system in the area and to the extent that it requires 20 feet of separation free of intervening combustibles for fire zones RB-3 and RB-4 (Reactor Building northwest corner).

The existing fire protection in these zones is in the form of the fire extinguishers, manual hose stations, and a radiant energy heat shield installed between MCC 89A and MCC 89b. This noncombustible shield is 14 feet high and extends out from the wall by 4 feet. Also, fire stops have been installed in all conduits that span the separation zone between the redundant MCCs. The licensee committed to install an early warning fire detection system in the separation zones and over the MCCs. Also, the licensee committed to install 20-foot-wide fire stops in all cable trays that cross from fire zones RB-3 and RB-4. This separation zone would prevent fire propagation from one fire zone to the other. Finally, in the northwest sector of RB-3, a partial area

sprinkler system has been installed in the separation zone. The licensee also committed to install a 1-hour fire rated barrier for cables in raceways required for safe shutdown that pass through any of the two separation zones.

Because the fire load in these locations is low, the staff expects that if a fire were to occur, then it would develop slowly, with initially low heat release and slow room temperature rise. Because of the presence of the early warning fire detection systems, the fire would be detected in its incipient stages. The fire brigade would then be dispatched and would extinguish the fire manually. Until the fire was extinguished, the 20 feet of spatial separation between the redundant shutdown-related systems would provide sufficient passive protection to provide reasonable assurance that one shutdown division would remain free of fire damage.

Where redundant safe shutdown cables are routed through separation zones, they will be provided with a 1-hour fire rated barrier. Finally, in the northwest corner of Fire Zone RB-3, there is a partial area sprinkler system. The staff finds that the installation of an area wide automatic fire suppression system would not significantly increase the level of fire protection in these zones.

Based on the above evaluation, the staff concludes that the existing fire protection combined with the proposed fire protection measures in Fire Zones RB-3 and RB-4 provides a level of fire protection equivalent to the technical requirements of Section III.G.2.b of Appendix R.

The licensee also requested an exemption from Section III.G.2.b to the extent that it requires 20 feet of separation free of intervening combustibles in Fire Zone RB-3 (Reactor Building Northwest Corner Elevation 252 feet).

The existing fire protection is in the form of fire extinguishers and manual hose stations on an area wide basis. Fire stops have been installed on

all cable trays that span the separation zone in the northwest corner. The licensee has provided an early warning fire detection system in the separation zone containing the cables in question. Also, a preaction sprinkler system has been installed beneath the lowest level of cable trays and above the top trays throughout the corner area. The licensee has committed to provide a 1-hour fire rated barrier for cables in raceways required for safe shutdown that pass through the separation zone in the northwest corner of Fire Zone RB-3.

The safe shutdown systems that exist within Fire Zone RB-3 include MCCs and cables. The issue of redundant MCCs in the northeast corner is addressed above.

The staff's principal concern with the level of fire protection in the northwest corner of Fire Zone RB-3 was that because of the absence of a 20-foot separation free of intervening combustibles, a fire of significant magnitude could develop and damage redundant safe shutdown cables. However, there is no significant fire load on the floor area and the cable fire load is low. If a fire were to occur, then the staff expects that it would develop slowly, with initially a low heat release and slow area temperature rise. Because of the presence of the early warning fire detection system, the fire would be detected in its incipient stages. The fire brigade would then be dispatched and would extinguish the fire. Until the fire is put out, the 18 feet of spatial separation between the cable trays in question would provide sufficient passive protection to provide us with reasonable assurance that one division would remain free of fire damage. Another major factor that reduces the fire risk in this zone is that redundant cable trays are well separated after diverging from the one point where 18 feet of separation exists. The staff finds that the provision of 20-foot separation free of all intervening combustibles would not significantly increase the level of fire protection in this zone.

Based on the above evaluation, the staff concludes that the existing fire protection combined with the proposed fire protection measures in the above area of Fire Zone RB-3 provides a level of fire protection equivalent to the technical requirements of Section III.G.2.b of Appendix R.

The licensee also requested exemptions from Section III.G.1.a of Appendix R to allow operators to perform certain repairs in order to achieve and maintain hot shutdown. These exemption requests are to allow the operators to connect a spare battery charger to the batteries in the event of a fire in the cable vault, and to replace fuses following a fire in the cable spreading area. The repairs are simple and can be completed quickly with materials that are readily available following acceptable procedures.

The batteries associated with the battery charger, which carry post-fire loads, would not be discharged before 24 hours. Since the battery charger is not required to be functional for 24 hours and the repairs involved in aligning the back-up battery charger are routine, the staff concludes that operator action to connect a back-up battery charger is acceptable.

The fuse replacement repair involves components in the Reactor Core Isolation Cooling System and the Residual Heat Removal System. The RCIC System is required to be operational within 43 minutes of reactor scram, and the RHR System is required to be operational within 3 hours of reactor scram. In either case it is unlikely that all fuses would be damaged, however, in either case, all fuses could be replaced in less than 20 minutes, two sets of spare fuses are readily available at the locations needed. Based on the proximity of the fuse replacement locations and the adequacy of licensee preparations for possible fuse replacement, the staff concludes that fuse replacement is an acceptable repair.

A more detailed analysis of each exemption request is contained in the staff's concurrently issued Safety Evaluation.

IV.

Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12(a), (1) these exemptions as described in Section III are authorized by law and will not present an undue risk to the public health and safety, and are consistent with common defense and security and (2) special circumstances are present for the exemptions in that application of the regulation in these particular circumstances is not necessary to achieve the underlying purposes of Appendix R to 10 CFR Part 50. Therefore, the Commission hereby grants the following exemptions from the requirements of Section III.G of Appendix R to 10 CFR Part 50:

1. Reactor Building Torus Area Elevations 213 feet - 9 inches and 232 feet - 6 inches (fire zones RB-1 and RB-2) to the extent that an automatic fire suppression system is not installed in the zones pursuant to III.G.2.b.
2. RCIC Room Elevations 213 feet - 9 inches (RCIC Room Fire Area) to the extent that this area is not separated by 3-hour fire rated barriers from the areas containing redundant shutdown system equipment, cables, and associated circuits pursuant to III.G.2.a.
3. Reactor Building Northeast and Southeast Corner Rooms Elevations 213 feet 9 inches through 252 feet (Fire Zones RB-1 and RB-2) to the extent that automatic fire suppression systems are not installed within the corner rooms and within the area between the stairs at Elevation 252 feet and the corner rooms pursuant to III.G.2.b.
4. Reactor Building Northeast Corner Vital MCCs Elevations 252 feet (Fire Zones RB-3 and RB-4) to the extent that automatic fire suppression is not installed in the vital MCC area and to the extent that 20 feet of separation

without intervening combustibles is not provided between redundant safe shutdown systems pursuant to III.G.2.b.

5. Reactor Building Northwest Corner Elevation 252 feet (Fire Zone RB-3) to the extent that 20 feet of separation is not provided between redundant safe shutdown systems pursuant to III.G.2.b.
6. Reactor Building East Side Instrument Racks Elevation 280 feet (Fire Zones RB-5 and RB-6) to the extent that an automatic fire suppression system is not installed in the zones pursuant to III.G.2.b.
7. To the extent that rearranging electrical leads to connect a back-up battery charger in the event a fire in the cable vault disables the operating battery charger be permitted in order to achieve and to maintain hot shutdown conditions pursuant to III.G.1.a.
8. To the extent that replacing fuses that could be blown due to a fire in the cable spreading area be permitted in order to achieve and to maintain hot shutdown conditions pursuant to III.G.1.a.

Pursuant to 10 CFR 51.32, the Commission has determined that the granting of these exemptions will have no significant impact on the environment (51 FR 43254).

A copy of the concurrently issued Safety Evaluation related to this action is available for public inspection at the Commission's Public Document Room, 1717 H Street, NW, Washington, D.C. and at the local public document room located at Brooks Memorial Library, 224 Main Street, Brattleboro, Vermont.

A copy may be obtained upon written request addressed to the U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Director, Division of BWR Licensing.

This Exemption is effective upon issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert M. Bernero, Director
Division of BWR Licensing
Office of Nuclear Reactor Regulation

Dated at Bethesda, Maryland this 1st day of December 1986.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATIVE TO APPENDIX R EXEMPTIONS REQUESTED BY

VERMONT YANKEE NUCLEAR POWER CORPORATION

VERMONT YANKEE POWER STATION

DOCKET NO. 50-271

1.0 INTRODUCTION

By letter dated April 24, 1985, Vermont Yankee Nuclear Power Corporation (the licensee) requested 11 exemptions from Section III.G of Appendix R to 10 CFR Part 50. On July 16, 1985, the licensee met with the NRC in Bethesda and a request was made of the licensee to provide additional information. By letters dated July 26, 1985, August 2, 1985, and August 16, 1985, the licensee provided additional or clarifying information and/or revisions to its submitted exemption requests. By letters dated August 2 and 16, 1985, the licensee subsequently withdrew the following exemption requests:

- (Fire Zone RB-1) Reactor Building Northwest Corner Room Elevation 232 Feet 6 Inches
- (Fire Zone RB-5 and RB-6) Reactor Building West Side Elevation 280 Feet
- (Fire Area 13) Turbine Building, Radwaste Building Hallway
- (Fire Area 12) Diesel Fuel Oil Transfer Pump Building
- (Fire Area 17) Condensate Storage Tank and Instrument Area

By letter dated August 15, 1986, the licensee provided a description of the special circumstances pertaining to the April 24, 1985 exemption request as subsequently modified.

By letter dated October 31, 1985, with a supporting description of special circumstances provided by letter dated June 10, 1986, the licensee requested two additional exemptions from III.G.1.a of Appendix R.

This Safety Evaluation which addresses both sets of exemption requests, is based in part on the attached Technical Evaluation Report (TER) written by the NRR contractor, Franklin Research Center (FRC). The staff has reviewed the TER and agrees with the conclusions reached in the FRC TER.

Section III.G.1 of Appendix R requires fire protection features to be provided for structures, systems, and components important to safe shutdown, capable of limiting fire damage so that:

a. One train of systems necessary to achieve and maintain hot shutdown conditions from either the control room or emergency control station(s) is free of fire damage; and

b. Systems necessary to achieve and maintain cold shutdown from either the control room or emergency control station(s) can be repaired within 72 hours.

Section III.G.2 of Appendix R requires that one train of cables and equipment necessary to achieve and maintain safe shutdown be maintained free of fire damage by one of the following means:

a. Separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating. Structural steel forming a part of or supporting such fire barriers shall be protected to provide fire resistance equivalent to that required of the barrier.

b. Separation of cables and equipment and associated non-safety circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustibles or fire hazards. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.

c. Enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.

If the above conditions are not met, Section III.G.3 requires that there be an alternative shutdown capability independent of the room, zone or area of concern. It also requires that fire detection and a fixed suppression system be installed in the area of concern if it contains a large concentration of cable or other combustibles. These alternative requirements are not deemed to be equivalent; however, they provide an acceptable level of fire protection for those configurations in which they are approved by the staff.

Because it is not possible to predict the specific conditions under which fires may occur and propagate, the design-basis protective features rather than the design-basis fire are specified in the rule. Plant-specific features may require protection different from the measures specified in Section III.G. In such a case, the licensee must demonstrate, by means of a detailed fire hazards analysis, that existing protection or existing protection in conjunction with proposed modifications will provide a level of safety equivalent to the technical requirements of Section III.G of Appendix R.

In summary, Section III.G is related to fire protection features for ensuring that systems and associated circuits used to achieve and maintain safe shutdown are free of fire damage. Either fire protection configurations must meet the specific requirements of Section III.G or an alternative fire protection configuration must be justified by a fire hazards analysis. Generally, the staff will accept an alternative fire protection configuration if:

- o The alternative ensures that one train of equipment necessary to achieve hot shutdown from either the control room or emergency control stations is free of fire damage.
- o The alternative ensures that fire damage to at least one train of equipment necessary to achieve cold shutdown is limited so that it can be repaired within a reasonable time (minor repairs using components stored on the site).
- o Fire-retardant coatings are not used as fire barriers.
- o Modifications required to meet Section III.G would not enhance fire protection safety levels above that provided by either existing or proposed alternatives.
- o Modifications required to meet Section III.G would be detrimental to overall facility safety.

2.0 REACTOR BUILDING, ELEVATION 213 FEET 9 INCHES THROUGH 252 FEET AND 280 FEET (FIRE ZONES RB-1, RB-2, RB-5, AND RB-6)

2.1 Exemption Requested

Exemptions were requested from Section III.G.2.b to the extent that it requires installation of an automatic fire suppression system for total area coverage.

2.2 Discussion

2.2.1 Fire Zones RB-1 and RB-2) Reactor Building, Torus Area Elevation 213 Feet 9 Inches

Fire Zones RB-1 and RB-2 in the reactor building incorporate the entire torus area and corner rooms, except for the reactor core isolation cooling (RCIC) room. The RCIC room is a separate fire area. Fire Zones RB-1 and RB-2 run from elevations 213 feet 9 inches through 252 feet in the reactor building. Fire Zone RB-1 includes the "northern" part of the reactor building and is distinguished from Fire Zone RB-2 by two fire separation zones. These separation zones contain no combustible loads on the floor, and the cable trays that run through these separation zones are fire stopped over a 20-foot distance using material and design details that have been tested and approved by a nationally recognized laboratory. This

fire stopping has no fire rating and it is not used as a fire barrier, but it is a Factory Mutual (a nationally recognized independent fire test laboratory) approved noncombustible material and application design prevents flame propagation along a cable tray. The cables are totally enclosed with the fire stop material over a 20-foot length.

The torus area is an octagonally shaped room constructed of reinforced concrete. The floor area is about 14,200 square feet and the ceiling height is 37 feet. The net available floor space is small because the containment and the torus fills a large volume of the room. There is essentially no fire loading on the floor proper and the fixed combustibles consist of cable insulation. The total heat content is about 84,756,000 Btu and is distributed in the form of cables in open trays throughout the area. There are no concentrated fire loads or fire hazards. The average fire load is approximately 5,790 Btu per square foot which translates into a fire severity of less than 5 minutes on the ASTM E-119 time-temperature curve. Fire Zones RB-1 and RB-2 (torus area) also contain corner rooms and these are described under the northeast and southeast corner rooms in Section 2.2.2 below.

The safe shutdown systems in the torus area include residual heat removal (RHR), RHR service water cables for divisions I and II. Also, core spray, automatic depressurization system (ADS), high pressure coolant injection (HPCI), and instrumentation for division I and core spray, ADS, RCIC, and instrumentation for division II are located in the torus area (Fire Zones RB-1 and RB-2). Finally, the torus area contains power and control cables for the aforementioned redundant divisions.

The existing fire protection includes smoke detection, fire extinguishers, and manual hose stations. All redundant safe shutdown systems are separated by 20 feet with no intervening combustibles located within the spatial separation. The licensee proposes to provide fire stopping for the cable trays to create a 20-foot separation zone in the northwest quadrant and providing the dc power feed from the alternative shutdown battery with a 3-hour fire barrier. This fire-stopped separation zone precludes the direct propagation of a fire from Fire Zone RB-1 to RB-2 and vice versa.

2.2.2 (Fire Zones RB-1 and RB-2) Reactor Building, Northeast and Southeast Corner Rooms Elevation 213 Feet 9 Inches To 252 Feet

Both of these rooms are triangular-shaped, have two levels each, and are in opposite corners of the reactor building. The floor area of each room is 800 square feet and runs from elevation 213 feet 9 inches up to 252 feet via an open stairway. The fire load is in the form of cables and lubricants. There is essentially no fire load on the floors proper and construction is reinforced concrete with no combustible finishes. The walls facing into the torus areas are constructed of concrete. There are no concentrated fire loads or fire hazardous equipment. The total heat content for the combustibles present is about 17,736,000 Btu per room per level. The average fire load is approximately 22,170 Btu per square foot, which translates into a fire severity of less than 20 minutes on the ASTM E-119 time-temperature curve.

The safe shutdown systems in each room are redundant to each other and include a core spray pump, two RHR pumps, two RHR service water pumps, associated piping, valves, and cables. Also, each room has a RHR heat exchanger and associated instrument cable.

The existing fire protection is in the form of fire extinguishers, a fire detection system in the rooms and torus area between the two rooms (except elevation 252 feet), and manual hose stations. Redundant trains of safe shutdown systems are separated by 20 feet with no intervening combustibles. The entrances to each room are separated from each other by 100 feet with no intervening combustibles. The licensee committed to provide fire detection on elevation 252 feet for both zones.

2.2.3 (Fire Zones RB-5 and RB-6) Reactor Building East and West Side Instrument Racks Elevation 280 Feet

Fire Zones RB-5 and RB-6 are located in the reactor building; RB-5 is in the northern section, and RB-6 is in the southern end, and form a common open area with boundaries of reinforced concrete and no combustible finishes. The floor area is about 14,500 square feet. There is essentially no fire load on the floor proper. The fire load exists in the form of cable insulation and combustible lubricants. The cable trays are not grouped but are dispersed throughout the zones. The lubricants are located in the motor generator (MG) set area and are protected by an early warning detection, and an automatic foam fire suppression system. The cable insulation represents 61,296,000 Btu and the lubricants 334,400,000 Btu. This produces an average fire load of 27,300 Btu per square foot. This translates into a fire severity of about 20 minutes on the ASTM E-119 time-temperature curve which is considered low.

The safe shutdown equipment in this area are the division I and II electrical instrument racks. These racks are separated by 30 feet.

The existing fire protection is in the form of fire extinguishers, fire detection in the MG set area, manual hose stations, and an automatic foam fire suppression system for the MG set. The separation between the racks is 30 feet with a low fire load (6,100 Btu per square feet excluding the MG set area fire load). The licensee proposes to create 20-foot separation zones by fire stopping cable trays. These separation zones will be from the concrete shield wall to the edge of the set area beam and from the concrete shield wall to the reactor building wall on the west side. The licensee has committed to install early warning fire detectors on the ceiling within the 20-foot separation zones described above.

2.3 Evaluation

The fire protection in these fire zones does not comply with the technical requirements of Section III.G.2.b of Appendix R because automatic fire suppression systems have not been installed in the zones.

The staff's principal concern with the level of fire protection in these locations was that because of the absence of an area-wide automatic fire suppression system, a fire of significant magnitude could develop and damage redundant shutdown-related systems. However, the fire load in these locations is low. If a fire were to occur, we expect that it would develop slowly, with initially low heat release and slow room temperature rise. The MG set fire hazard is protected by early warning fire detection and an automatic fire suppression system. Because of the presence of the early warning fire detection systems, the fire would be detected in its incipient stages. The alarms from these detectors are annunciated in the control room. The fire brigade would then be dispatched and would extinguish the fire manually using hose lines or portable extinguishers. Until the fire was put out, the 20 feet of spatial separation between the redundant shutdown-related systems will provide sufficient passive protection to provide reasonable assurance that one shutdown division would remain free of fire damage.

Another major factor that reduces the fire risk in these zones is that the redundant safe shutdown system equipment is well separated with either no or low intervening combustibles. This separation distance is at least 50 feet for equipment and at least 20 feet for cables that are routed in these areas. The staff finds that the installation of an area-wide automatic fire suppression system does not significantly increase the level of fire protection in these zones.

2.4 Conclusion

Based on the above evaluation, the staff concludes that the existing fire protection combined with the proposed fire protection measures in the above zones provides a level of fire protection equivalent to the technical requirements of Section III.G.2.b of Appendix R. Therefore, the exemption request for the aforementioned zones should be granted.

3.0 RCIC ROOM ELEVATION 213 FEET 9 INCHES (RCIC ROOM FIRE AREA)

3.1 Exemption Requested

An exemption was requested from Section III.G.2.a to the extent that it requires a 3-hour fire rated barrier between redundant trains of safe shutdown equipment.

3.2 Discussion

The RCIC room is located within the reactor building at elevation 213 feet 9 inches. It is a triangular-shaped room constructed of reinforced concrete. The floor area is about 800 square feet. There is no combustible interior finish. Combustibles within the area consist of cables and lubricants distributed throughout the room. The total heat content is about 20,000,000 Btu. This yields an average fire load of 25,000 Btu per square foot, which translates into a fire severity of less than 20 minutes on the ASTM E-119 time-temperature curve.

The RCIC room contains the RCIC system and the alternative safe shutdown panel. The RCIC room contains only division II shutdown cables. The room directly above is part of Fire Zone RB-1 and contains division I and II cables. Also, the torus area adjacent to the RCIC room on the same elevation contains both divisions of cable. Finally, the HPCI system and its associated cables (division I) can serve as a separate safe shutdown path to maintain coolant inventory and remove decay heat in the event of the loss of the RCIC system.

The existing fire protection in the RCIC room consists of 3-hour fire rated barriers forming the walls, floor, ceiling, and penetration seals. The exceptions to this are the steel plate stairway enclosure, equipment hatch, and the steel security door to the torus area. Fire detection exists in the RCIC room and both fire detection and fire suppression systems exist in the area directly above. Also, fire detection exists in the torus area adjacent to the RCIC room. Manual hose stations and fire extinguishers are available to the area. Finally, this room is accessible by the fire brigade from two separate access entry points. The licensee proposes to provide fire stopping in the torus area cable trays directly outside and near the steel security door to the RCIC room. This fire stopping has no fire rating, but it is a Factory Mutual approved noncombustible material and application design prevents flame propagation along a cable tray.

3.3 Evaluation

The fire protection in the RCIC room does not comply with the technical requirements of Section III.G.2.a of Appendix R because a complete 3-hour fire rated barrier has not been provided between redundant safe shutdown equipment and cables.

Our principal concern with the level of fire protection in the RCIC room was that because of the absence of a 3-hour fire rated barrier, a fire of significant magnitude could develop and damage safe shutdown cables. However, there is no significant fire load on the floor area and the cable fire load is low (less than 20 minute severity). If a fire were to occur, then we expect it would develop slowly, with initially a low heat release and slow area temperature rise. The floor, walls, ceiling, and penetrations are 3-hour fire rated barriers. However, the stairway enclosure, a hatch cover, and the security door to the torus area are constructed of steel. This steel construction is substantial since it was designed for a high energy steam line break. Because of the presence of the early warning fire detection system, the fire would be detected in its incipient stages. The alarms from these detectors are annunciated in the control room. The fire brigade would then be dispatched and would extinguish the fire using hose lines or portable extinguishers. Until the fire was put out, the steel barriers between the RCIC room and the upper room/torus area would provide sufficient passive protection to provide us with reasonable assurance that one division would remain free of fire damage. The licensee stated that the high pressure core injection (HPCI) system will be used to safely shutdown the plant if the RCIC pump is damaged due to fire. The HPCI pump and cables are located in a separate fire area independent from the RCIC pumps. The staff finds that the provision of a complete 3-hour fire rated barrier would not significantly increase the level of fire protection in this zone.

3.4 Conclusion

Based on the above evaluation, the staff concludes that the existing and the proposed fire protection measures in the area provide a level of fire protection equivalent to the technical requirements of Section III.G.2.a of Appendix R. Therefore, the exemption for the RCIC room fire area should be granted.

4.0 REACTOR BUILDING NORTHEAST CORNER VITAL MOTOR CONTROL CENTERS (MCCs) ELEVATION 252 FEET (FIRE ZONES RB-3 AND RB-4)

4.1 Exemptions Requested

Exemptions were requested from Section III.G.2.b to the extent that it requires the installation of an automatic fire suppression system in the area and to the extent that it requires 20 feet of separation free of intervening combustibles.

4.2 Discussion

Fire Zone RB-3 is in the northernmost portion and Fire Zone RB-4 is in the southern end of the reactor building. Fire Zones RB-3 and RB-4 have about a 30-foot ceiling height. Construction is reinforced concrete with no combustible interior finishes. Fire Zone RB-3 and RB-4 are separated by the steam tunnel wall on the west side and by a 20-foot separation zone on the east side. This separation zone is free of combustibles on the floor proper, and where cables pass through, they will be provided with a 20-foot-long fire stop using materials and application approved by Factory Mutual. Redundant safe shutdown cables that are routed through separation zones will be provided with a 1-hour fire rated barrier. Also, a separation zone exists on the west side of Fire Zone RB-3 and is adjacent to the steam tunnel wall. However, the steam tunnel wall provides a reinforced concrete barrier between Fire Zone RB-3 and RB-4. The total floor area of these two zones is 16,000 square feet. The combustibles present are in the form of cable insulation. The total heat content is about 318,904,000 Btu. The average fire load is about 19,932 Btu per square foot, which translates into a fire severity of less than 15 minutes on the ASTM E-119 time-temperature curve.

The safe shutdown systems that exist within these fire zones include MCC 9D, MCC 89A, MCC 89b, and safe shutdown cables in trays. The MCCs contain control and power feeds for redundant AC motor-operated valves. There is approximately an 18-foot separation between the MCCs in question. Also, two cable trays pass over MCCs 89A and 9D and these trays are 18 feet off the floor and extend 6 feet toward MCC 89b. Other cables are in conduit and there are no in-situ combustibles. There is no redundant safe shutdown equipment in these zones other than the MCCs.

The existing fire protection is in the form of fire extinguishers, manual hose stations, and a radiant energy heat shield installed between MCC 89A and MCC 89b. This noncombustible shield is 14 feet high and extends out from the wall by 4 feet. Also, fire stops have been installed in all conduits that span the separation zone between the redundant MCCs. The licensee proposes to install an early warning fire detection system in the separation zones and over the MCCs. Also, the licensee proposes to install 20-foot-wide fire stops in all cable trays that cross from Fire Zones RB-3 and RB-4. This separation zone would prevent fire propagation from one fire zone to the other. Finally, in the northwest sector of Fire Zone RB-3, a partial area sprinkler system has been installed in the separation zone. The licensee also committed to install a 1-hour fire rated barrier for cables in raceways required for safe shutdown that pass through any of the two separation zones.

4.3 Evaluation

The fire protection in these fire zones does not comply with the technical requirements of Section III.G.2.b of Appendix R because automatic fire suppression has not been installed and 20 feet of separation free of intervening combustibles has not been provided between redundant safe shutdown system equipment or cables.

Our principal concern with the level of fire protection in these locations was that because of the absence of an area-wide automatic fire suppression system, a fire of significant magnitude could develop and damage redundant shutdown-related systems, e.g., the MCCs. However, the fire load in these locations is low. If a fire were to occur, we expect that it would develop slowly, with initially low heat release and slow room temperature rise. Because of the presence of the early warning fire detection systems, the fire would be detected in its incipient stages. The alarms from these detectors are annunciated in the control room. The fire brigade would then be dispatched and would extinguish the fire manually using hose lines or portable extinguishers. Until the fire was put out, the 20 feet of spatial separation between the redundant shutdown-related systems would provide sufficient passive protection to provide reasonable assurance that one shutdown division would remain free of fire damage. Another major factor that reduces the fire risk in these zones is that redundant safe shutdown system equipment and cables are well separated (except for the vital MCCs which are separated by 18 feet) with either no or low in-situ combustibles, and a large radiant heat shield.

Where redundant safe shutdown cables are routed through separation zones, they will be provided with a 1-hour fire rated barrier. Finally, in the northwest corner of Fire Zone RB-3, there is a partial area sprinkler system. The staff finds that the installation of an area wide automatic fire suppression system would not significantly increase the level of fire protection in these zones.

4.4 Conclusions

Based on the above evaluation, the staff concludes that the existing fire protection combined with the proposed fire protection measures in the above fire zones provides a level of fire protection equivalent to the technical requirements of Section III.G.2.b of Appendix R. Therefore, this exemption request for the aforementioned zones should be granted.

5.0 REACTOR BUILDING NORTHWEST CORNER ELEVATION 252 FEET (FIRE ZONE RB-3)

5.1 An exemption was requested from Section III.G.2.b to the extent that it requires 20 feet of separation free of intervening combustibles.

5.2 Discussion

Fire Zone RB-3 is located in the northern part of the reactor building and measures about 47 by 138 feet, with the 47-foot length being along the northwest perimeter line of the reactor building. Construction is reinforced concrete with no combustible interior finishes. The ceiling height is 27.5 feet. Fire Zone RB-3 is separated from Fire Zone RB-4 by the steam tunnel wall on the west side and by a 20-foot separation zone on the east side. This separation zone is free of combustibles on the floor proper, and where cables pass through, they will be provided with a 20-foot-long fire stop using Factory Mutual-approved material and design. The total floor area of Fire Zone RB-3 is about 6,500 square feet. The combustibles present are in the form of cable insulation. The average fire load is negligible.

The safe shutdown systems that exist within Fire Zone RB-3 include MCCs and cables. The issue of redundant MCCs in the northeast corner is addressed in the previous exemption request (see Section 4.0). The cables in question are in the northwest corner and are associated with division II ADS, RHR controls and instruments, and division I HPCI and valve cables. The exposed division I and II cables are separated by only 18 feet at their closest point with a low fire load.

The existing fire protection is in the form of fire extinguishers and manual hose stations on an area-wide basis. Fire stops have been installed on all cable trays that span the separation zone in the northwest corner. The licensee has provided an early warning fire detection system in the separation zone containing the cables in question. Also, a preaction sprinkler system has been installed beneath the lowest level of cable trays and above the top trays throughout the corner area. The licensee proposes to provide a 1-hour fire rated barrier for cables in raceways required for safe shutdown that pass through the separation zone in the northwest corner of Fire Zone RB-3.

5.3 Evaluation

The fire protection in this fire zone does not comply with the technical requirements of Section III.G.2.b of Appendix R because 20-feet separation free of intervening combustibles has not been provided between redundant safe shutdown cables.

Our principal concern with the level of fire protection in the northwest corner of Fire Zone RB-3 was that because of the absence of a 20-foot separation free of intervening combustibles, a fire of significant magnitude could develop and damage redundant safe shutdown cables. However, there is no significant fire load on the floor area and the cable fire load is low. If a fire were to occur, then we expect it would develop slowly, with initially a low heat release and slow area temperature rise. Because of the presence of the early warning fire detection system, the fire would be detected in its incipient stages. The alarms from these detectors are annunciated in the control room. The fire brigade would then be dispatched and would extinguish the fire using hose lines or portable extinguishers. Until the fire is put out, the 18 feet of spatial separation between the cable trays in question would provide sufficient passive protection to provide us with reasonable assurance that one division would remain free of fire damage. Another major factor that reduces the fire risk in this zone is that redundant cable trays are well separated after diverging from the one point where 18 feet of separation exists. The staff finds that the provision of 20-feet separation free of all intervening combustibles would not significantly increase the level of fire protection in this zone.

5.4 Conclusion

Based on the above evaluation, the staff concludes that the existing fire protection combined with the proposed fire protection measures in the above area of Fire Zone RB-3 provides a level of fire protection equivalent to the technical requirements of Section III.G.2.b of Appendix R. Therefore, this exemption request for the aforementioned zone should be granted.

6.0 REPAIRS PERMITTED TO ACHIEVE AND MAINTAIN HOT SHUTDOWN

6.1 Exemption Requested

Exemptions were requested from Section III.G.1.a to the extent that it requires one train of systems necessary to achieve and maintain hot shutdown conditions from either the control room or emergency control station(s) be free of fire damage. The licensee requested that, rather than being free of fire damage, the following repairs be permitted, if necessary in order to make equipment functional:

(1) Rearranging electrical leads to connect a back-up battery charger in the event a fire in the cable vault disables the operating battery charger; and

(2) Replacing fuses that would be blown due to a fire in the cable spreading area.

6.2 Discussion

In order to justify allowing the operators to make repairs following a fire, the licensee provided information to demonstrate that the repairs were simple and could be quickly completed with materials that were readily available. The repairs involve connecting a back-up charger in the event a fire damages the normal battery charger in the cable vault, and replacing fuses that have the potential to be blown due to spurious signals resulting from a fire in the cable spreading area.

6.3 Evaluation

Procedures require the operator to check the battery charger and fuses after a fire to determine if any of these components need replacing. In both instances the plant procedures require determination of the need for such repairs. The procedure for connecting the back-up battery charger include the following:

(1) open the supply breaker to the normal battery charger;

(2) open the feed breaker from the normal battery charger;

(3) remove the supply cable from the normal battery charger and connect it to the back-up battery charger; and

(4) close the supply breaker for the back-up battery charger.

The areas involved for these actions are in close proximity to one another require only simple and readily available tools, and the total time needed for the operator to complete these actions is no more than 20 minutes. Since the battery charger is not required to be functional for 24 hours and the repairs involved in aligning the back-up battery charger are routine, we concur with the licensee that these repairs can be accomplished within the 24 hour time interval.

The fuse replacement repair involves components in the Reactor Core Isolation Cooling (RCIC) System and the Residual Heat Removal (RHR) System. The RCIC System is required to be operational within 43 minutes of reactor scram. Following a fire that requires reactor scram and implementation of the alternate shutdown system, operators can reach the control panels within 5 minutes and avoid any fuses being blown prior to operating the transfer/isolation switches. However, in the unlikely event the fire damages all the RCIC System fuses, all the fuses could be replaced in less than 20 minutes. The RCIC System components, which must be operable within 43 minutes of reactor scram, are controlled from Panel CP-82-1 located in the RCIC Room on the 213 foot elevation of the Reactor Building. This control panel is within a 5 minute walk of the Control Room. Spare fuses for the 125 volt dc control circuits of these components are sealed and labeled, and located along with necessary tools in a metal enclosure adjacent to Panel CP-82-1. An additional set of spare fuses will be located in a locked metal enclosure (accessible to operators only) also within the immediate vicinity of Panel CP-82-1.

The RHR System is required to be operational within 3 hours of reactor scram. In the unlikely event the fire damaged all the RHR System fuses, all the fuses could be replaced in less than 20 minutes. The RHR System components, which must be operable within 3 hours, are controlled from Panel CP-82-1 located on the 280 foot level of the Reactor Building. Spare fuses for the 120 volt ac control circuits of these components are located, with the spare RCIC System fuses, in the metal enclosure adjacent to CP-82-1 in the RCIC Room (within 5-minute walk from CP-82-1). An additional set of spare fuses will be located in the new locked metal enclosure within the immediate vicinity of Panel CP-82-1.

In the unlikely event a fire damages the RHR and RCIC System fuses, the operator has ample time and materials to replace the fuses. Therefore, we concur with the licensee that fuse replacement is an acceptable repair.

The training and operator performance for the necessary repairs is to be verified by a Region inspection.

6.4 Conclusion

Based on the above evaluation, the staff concludes that the exemptions from Appendix R to 10 CFR 50 involving operator actions to replace fuses and connect a back-up battery charge are acceptable. Therefore, this exemption request to permit the above mentioned repairs should be granted.

Principal Contributors: John Stang and Peter Hearn

Dated: December 1, 1986

Attachment:
Technical Evaluation Report

FRANKLIN RESEARCH CENTER

DIVISION OF ARVIN/CALSPAN

TECHNICAL REPORT

20TH & RACE STREETS PHILADELPHIA, PA 19103 TWX 710-670-1889 TEL. (215) 448-1000

TECHNICAL EVALUATION REPORT

NRC DOCKET NO. 50-271

NRC LICENSE NO. DPR-28

NRC CONTRACT NO. NRC-03-81-130

FRC PROJECT C5506

FRC ASSIGNMENT 36

FRC TASK 587

EVALUATION OF FIRE PROTECTION EXEMPTION REQUESTS
FROM 10CFR50.48 AND APPENDIX R TO 10CFR50

YANKEE NUCLEAR POWER CORPORATION
VERMONT YANKEE NUCLEAR POWER STATION

TER-C5506-587

Prepared for

Nuclear Regulatory Commission
Washington, D.C. 20555

FRC Group Leader: N. Ahmed
NRC Lead Engineer: J. Stang

Prepared by: N. Ahmed
Principal Author
Date: 4/8/86

Reviewed by: Gregory B. Hanson
Date: 4/4/86

Approved by: O P Cafagno
Department Director
Date: 4-8-86

FRANKLIN RESEARCH CENTER
DIVISION OF ARVIN/CALSPAN
20th & RACE STREETS, PHILADELPHIA, PA 19103

CONTENTS

FOREWORD

This Technical Evaluation Report was prepared by Franklin Research Center (FRC) under a contract with the U.S. Nuclear Regulatory Commission (Office of Nuclear Reactor Regulation, Division of Operating Reactors) for technical assistance in support of NRC operating reactor licensing actions. The technical evaluation was conducted in accordance with criteria established by the NRC.

Mr. Gregory Harrison, a consultant to FRC, contributed to the technical preparation of this report.

1. INTRODUCTION

1.1 PURPOSE OF REVIEW

This technical evaluation report documents an independent review of exemptions or deviations from the fire protection requirements of 10CFR50.48 or Appendix R to 10CFR50 requested for Yankee Nuclear Power Corporation's (VYNPC) Vermont Yankee Nuclear Power Station. This evaluation was performed with the following objectives:

- To assess if each exemption request demonstrates an equivalent level of overall protection of plant safe shutdown capability following a disabling fire event
- To determine the bases for acceptance or denial of each exemption request
- To recommend the minimum level of fire protection the applicant or licensee should provide to achieve an equivalent level of fire protection in case a request is denied.

1.2 GENERIC BACKGROUND

Following a major fire at the Browns Ferry Nuclear Station in March 1975, the NRC established a Special Review Group which initiated an evaluation of the need for improving the fire protection programs at all nuclear power plants. The group found serious design inadequacies regarding fire protection at Browns Ferry, and its report, "Recommendation Related to Browns Ferry Fire" (NUREG-0050, February 1976), contained over 50 recommendations regarding improvements in fire prevention and control in existing facilities. The report also called for the development of specific guidance for implementing fire protection regulations, and for a comparison of that guidance with the fire protection program at each operating plant.

NRC developed technical guidance from the technical recommendations in the Special Group's report, and issued those guidelines as Branch Technical Position (BTP) APCSB 9.5-1 [1]. This guidance did not apply to plants operating at that time. Guidance to operating plants was provided later in Appendix A to BTP APCSB 9.5-1 [2], which, to the extent practicable, relies on BTP APCSB 9.5-1. The guidance in these documents was also published as Regulatory Guide 1.120 [3].

By early 1980, most operating plants had implemented most of the guidelines in Appendix A. However, the fire protection program has had some significant problems with implementation. To establish a definitive resolution of these problems in a manner consistent with the general guidelines in Appendix A to the BTP and to assure timely compliance by licensees, the Commission issued a proposed fire protection rule and its Appendix R, which was

described as setting out minimum fire protection requirements for the unresolved issues. The fire protection features addressed included protection of safe shutdown capability, emergency lighting, fire barriers, associated circuits, reactor coolant pump lubrication system, and alternate shutdown systems.

On February 17, 1981, the final rule 10CFR50.48 [4] and Appendix R to 10CFR50 [5] became effective, replacing the proposed rule. Only three of the 15 items in Appendix R were of such safety significance that they should apply to all plants, including those for which alternative fire protection actions had been approved previously by the staff. These items are protection of safe shutdown capability (including alternate shutdown systems), emergency lighting, and the reactor coolant pump lubrication system. Accordingly, the final rule required all reactors licensed to operate before January 1, 1979, to comply with these three items even if the NRC had previously approved alternative fire protection features in these areas. However, the final rule is more flexible than the proposed rule because Item III.G now provides three alternative fire protection features which do not require analysis to demonstrate the protection of redundant safe shutdown equipment, and reduces the acceptable distance in the physical separation alternative from 50 feet to 20 feet. In addition, the rule now provides an exemption procedure which can be initiated by a licensee's assertion that any required fire protection feature will not enhance fire protection safety in the facility or that such modifications may be detrimental to overall safety.

In summary, Section III.G is related to fire protection features for ensuring that systems and associated circuits used to achieve and maintain safe shutdown are free of damage. Either fire protection configurations must meet the specific requirements of Section III.G or an alternative fire protection configuration must be justified by a fire hazard analysis. Generally, the staff will accept an alternative fire protection configuration if:

- The alternative ensures that one train of equipment necessary to achieve hot shutdown from either the control room or emergency control stations is free of fire damage.
- The alternative ensures that fire damage to at least one train of equipment necessary to achieve cold shutdown is limited so that it can be repaired within a reasonable time (minor repairs using components stored on the site).
- Fire-retardant coatings are not used as fire barriers.
- Modifications required to meet Section III.G would not enhance fire protection safety levels above those provided by either existing or proposed alternatives.
- Modifications required to meet Section III.G would be detrimental to overall facility safety.

Guidance to the industry and the NRC positions on certain requirements of Appendix R is covered by various documents, one of them being the Generic Letter 83-33 [6] which has recently been slated to be superseded by yet another draft Generic Letter 85-01 [7]. "The interpretations of Appendix R" and "the responses to industry questions," two sections of Reference 7, are written to facilitate industry implementation of Appendix R and represent NRC position on all issues covered.

Following the promulgation of the final rule, licensees and applicants have requested exemptions and deviations from Appendix R to 10CFR50. The exemptions and deviations are in the form of a fire hazard analysis. The NRC is to review exemption requests and associated analysis to ensure each alternative to meeting the requirements of the rule provides an equivalent level of overall protection of plant safe shutdown capability. Franklin Research Center (FRC) was to provide technical assistance to the NRC within the context of the following scope of work [8]:

Subtask 1: Review each exemption request for information deficiencies. Provide Request for Information (RFI) to resolve such deficiencies.

Subtask 2: Review and evaluate each exemption or deviation request submitted by the licensees or the applicants and all additional information provided for conformance with acceptance criteria. Prepare final Technical Evaluation Report (TER) with recommendations, and their basis in support of granting or denying the exemption/deviation request.

1.3 PLANT-SPECIFIC BACKGROUND

By letter dated April 24, 1985 [9], Vermont Yankee Nuclear Power Corporation (the Licensee) requested 11 exemptions from Section III.G of Appendix R to 10 CFR Part 50. By letters dated July 26, 1985 [10], August 2, 1985 [11], and August 16, 1985 [12], the Licensee provided additional or clarifying information and/or revisions to their submitted exemption requests. By letters dated August 2 [11] and August 16 [12], 1985, the Licensee subsequently withdrew exemptions requests numbered 3, 8, 9, 10, and 11.

The Request for Information (RFI) required in satisfaction of Subtask 1 was transmitted to the NRC on October 4, 1985 [13]. This RFI did not identify any items of additional information required, and as such no site visit was conducted.

The draft TER [14] was issued to NRC on January 15, 1986. The contents of the draft reflected the information contained in the Licensee's submittals identified above. The final TER incorporates all comments received from NRC to date.

1.4 REVIEW CRITERIA

The criteria used in reviewing the Licensee-submitted exemption requests are based on the following documents:

1. Fire Protection Program for Operating Nuclear Power Plants, 10CFR50.48

2. Appendix R to 10CFR50

3. Standard Review Plan, NUREG-0800, Branch Technical Position (BTP), APCSB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants"

4. Appendix A to BTP APCSB 9.5-1

5. Generic Letter 85-01, "Fire Protection Policy," dated January 9, 1985.

2. EVALUATION

2.1 GENERAL

This section presents review and evaluation of exemptions or deviations from 10CFR50.48 or Appendix R to 10CFR50 requested by the Licensee (VYNPC) of Vermont Yankee Nuclear Power Station. Evaluation of exemption requests for each fire area/zone singly or collectively follows a format suggested by the NRC and is arranged in the following subsections:

- o Exemption requested
- o Discussion
- o Evaluation
- o Conclusion.

The fire area/fire zone numbering used in this section corresponds to that used in the Licensee's submittal [9].

2.2 Reactor Building, Elevation 213 Feet 9 Inches through 252 Feet 0 Inch, and 280 Feet (Fire Zones RB-1, RB-2, RB-5, and RB-6)

2.2.1 Exemptions Requested

Exemptions were requested from Section III.G.2.b to the extent that it requires installation of total area coverage automatic fire suppression systems.

2.2.2 Discussion

2.2.2.1 Fire Zones RB-1 and RB-2 - Reactor Building, Torus Area Elevation 213 Feet, 9 Inches

Fire Zones RB-1 and RB-2 in the reactor building incorporate the entire torus area and corner rooms, except for the RCIC room. The RCIC room is a separate fire area. Fire Zones RB-1 and RB-2 run from elevations 213 feet, 9 inches through 252 feet in the reactor building. Fire Zone RB-1 includes the "northern" part of the reactor building and is distinguished from RB-2 by two fire separation zones. These separation zones contain no combustible loads on the floor, and the cable trays that run through these separation zones are fire stopped over a 20-foot distance. This fire stopping has no fire rating, but it is a Factory Mutual approved noncombustible material and application design that prevents flame propagation along a cable tray. The cables are totally enclosed with the fire stop material over a 20-foot length.

The torus area is an octagonally shaped room constructed of reinforced concrete. The floor area is about 14,200 square feet and the ceiling height is 37 feet. The net available floor space

is small because the containment and the torus fill a large volume of the room. There is essentially no fire loading on the floor proper and the fixed combustibles consist of cable insulation. The total heat content is about 84,756,000 Btu and is distributed in the form of cables in open trays throughout the area. There are no concentrated fire loads or fire hazards. The average fire load is approximately 5,790 Btu per square foot, which translates into a fire severity of less than 5 minutes on the ASTM E119 time-temperature curve. Fire Zones RB-1 and RB-2 (torus area) also contain corner rooms and these are described under the northeast and southeast corner room heading (Section 2.2.2.2).

The safe shutdown systems in the torus area include RHR, and RHR service water cables for divisions I and II. Also, core spray ADS HPCI and instrumentation for division I and core spray ADC RCIC and instrumentation for division II are located in the torus area (Fire Zones RB-1 and RB-2). Finally, the torus area contains power and control cables for the aforementioned redundant divisions.

The existing fire protection includes smoke detection, fire extinguishers, and manual hose stations. All redundant safe shutdown systems are separated by 20 feet with no intervening combustibles located within the spatial separation. The Licensee is committed to provide fire stopping for the cable trays to create a 20-foot separation zone in the northwest quadrant and to provide the dc power feed from the alternative shutdown battery with a 3-hour fire barrier. This fire-stopped separation zone precludes the direct propagation of a fire from zone RB-1 to RB-2 and vice versa.

2.2.2.2 Fire Zones RB-1 and RB-2 - Reactor Building, Northeast and Southeast Corner Rooms Elevation 213 Feet, 9 Inches through 252 Feet

Both of these rooms are triangular-shaped, have two levels each, and are in opposite corners of the reactor building. The floor area of each room is 800 square feet and runs from elevation 213 feet, 9 inches up to 252 feet via an open stairway. The fire load is in the form of cables and lubricants. There is essentially no fire load on the floors proper, and construction is reinforced concrete with no combustible finishes. The walls facing into the torus areas are constructed of concrete. There are no concentrated fire loads or fire hazards. The total heat content of the combustibles present is about 17,736,000 Btu per room per level. The average fire load is approximately 22,170 Btu per square foot, which translates into a fire severity of less than 20 minutes on the ASTM E119 time-temperature curve.

The safe shutdown systems in each room are redundant to each other and include a core spray pump, two RHR pumps, two RHR service water pumps, associated piping, valves, and cables. Also, each room has a RHR heat exchanger and associated instrument cable.

The existing fire protection is in the form of fire extinguishers, a fire detection system in the rooms and torus area between the two rooms (except elevation 252 feet), and manual hose stations. Redundant trains of safe shutdown systems are separated by 20 feet with no intervening combustibles. The entrances to each room are separated from each other by 100 feet with no intervening combustibles. The Licensee has made a commitment to provide fire detection on elevation 252 feet for both zones.

2.2.2.3 Fire Zones RB-5 and RB-6 - Reactor Building East and West Side Instrument Racks Elevation 280 Feet

Fire Zones RB-5 and RB-6 are located in the reactor building; RB-5 is in the northern section, and RB-6 is in the southern end. They form a common open area with boundaries of reinforced concrete and no combustible finishes. The floor area is about 14,500 square feet. There is essentially no fire load on the floor proper. The fire load exists in the form of cable insulation and combustible lubricants. The cable trays are not grouped but are dispersed. The lubricants are located in the MG set area and are protected by a berm, an early warning detection, and an automatic foam fire suppression system. The cable insulation represents 61,296,000 Btu and the lubricants 334,400,000 Btu. This produces an average fire load of 27,300 Btu per square foot, which translates into a fire severity of about 20 minutes on the ASTM E-119 time-temperature curve.

The safe shutdown equipment in this area is the division I and II electrical instrument racks. These racks are 30 feet apart.

The existing fire protection is in the form of fire extinguishers, fire detection in the MG set area, manual hose stations, and an automatic foam fire suppression system for the MG set. The separation between the racks is 30 feet with a low fire load (6,100 Btu per square feet excluding the MG set area fire load). The Licensee is committed to create 20-foot separation zones by fire stopping cable trays. These separation zones will be from the concrete shield wall to the edge of the MG set area berm and from the concrete shield wall to the reactor building wall on the west side. The Licensee has made a commitment to install early warning fire detectors on the ceiling within the 20-foot separation zones just described.

2.2.3 Evaluation

The fire protection in these fire zones does not comply with the technical requirements of Section III.G.2.b of Appendix R because automatic fire suppression systems have not been installed in the zones.

The principal concern with the level of fire protection in these locations was that, because of the absence of an area-wide automatic fire suppression system, a fire of significant magnitude

could develop and damage redundant shutdown-related systems. However, the fire load in these locations is low. If a fire were to occur, it is expected that it would develop slowly, with initially low heat release and slow room temperature rise. The MG set fire hazard is protected by early warning fire detection and an automatic fire suppression system. Because of the presence of the early warning fire detection systems, the fire would be detected in its incipient stages. The alarms from these detectors are annunciated in the control room. The fire brigade would then be dispatched and would extinguish the fire. Until the fire is put out, the 20 feet of spatial separation between the redundant shutdown-related systems will provide sufficient passive protection to provide reasonable assurance that one shutdown division would remain free of fire damage.

Another major factor that reduces the fire risk in these zones is that the redundant safe shutdown system equipment is well separated with either no or low intervening combustibles. This separation distance is at least 50 feet for equipment and at least 20 feet for cables that are routed in these areas. It is found that the installation of an area-wide automatic fire suppression system would not significantly increase the level of fire protection in these zones.

2.2.4 Conclusion

Based on the above evaluation, it is concluded that the existing fire protection combined with the committed fire protection measures in the above zones provides a level of fire protection equivalent to the technical requirements of Section III.G.2.b of Appendix R. Therefore, the exemption request for the aforementioned zones can be granted.

2.3 RCIC Room Elevation 213 Feet, 9 Inches (RCIC Room Fire Area)

2.3.1 Exemptions Requested

An exemption was requested from Section III.G.2.a to the extent that it requires a 3-hour fire rated barrier between redundant trains of safe shutdown equipment.

2.3.2 Discussion

The RCIC room is located within the reactor building at elevation 213 feet, 9 inches. It is a triangular-shaped room constructed of reinforced concrete. The floor area is about 800 square feet. There is no combustible interior finish. Combustibles within the area consist of distributed cables and lubricants. The total heat content is about 20,000,000 Btu. This yields an average fire load of 25,000 Btu per square foot, which translates into a fire severity of less than 20 minutes on the ASTM E-119 time-temperature curve.

The RCIC room contains the RCIC system and the alternative safe shutdown panel. The RCIC room contains only division II shutdown cables. The room directly above is part of Fire Zone RB-1 and contains division I and II cables. Also, the torus area adjacent to the RCIC room on the same elevation contains both divisions of cable.

The existing fire protection in the RCIC room consists of 3-hour fire rated barriers forming the walls, floor, ceiling, and penetration seals. The exception to this is the steel plate stairway enclosure, equipment hatch, and the steel security door to the torus area. Fire detection exists in the RCIC room and both fire detection and fire suppression systems exist in the area directly above. Also, fire detection exists in the torus area adjacent to the RCIC room. Manual hose stations and fire extinguishers are available to the area. Finally, this room is accessible to the fire brigade from two separate access entry points. The Licensee is committed to provide fire stopping in the torus area cable trays directly outside and near the steel security door to the RCIC room. This fire stopping has no fire rating, but it is a Factory Mutual approved noncombustible material and application design that prevents flame propagation along a cable tray.

2.3.3 Evaluation

The fire protection in the RCIC room does not comply with the technical requirements of Section III.G.2.a of Appendix R because a complete 3-hour fire rated barrier has not been provided between redundant safe shutdown equipment and cables.

The principal concern with the level of fire protection in the RCIC room was that, because of the absence of a 3-hour fire rated barrier, a fire of significant magnitude could develop and damage safe shutdown cables. However, there is no significant fire load on the floor area and the cable fire load is low (less than 20 minute severity). If a fire were to occur, then it is expected to develop slowly, with initially a low heat release and slow area temperature rise. The floor, walls, ceiling, and penetrations are 3-hour fire rated barriers. However, the stairway enclosure, a hatch cover, and the security door to the torus area are constructed of steel. This steel construction is substantial since it was designed for a high energy steam line break. Because of the presence of the early warning fire detection system, the fire would be detected in its incipient stages. The alarms from these detectors are annunciated in the control room. The fire brigade would then be dispatched and would extinguish the fire. Until the fire is put out, the steel barriers between the RCIC room and the upper room/torus area will provide sufficient passive protection to provide reasonable assurance that one division would remain free of fire damage. It is found that the provision of a complete 3-hour fire rated barrier would not significantly increase the level of fire protection in this zone.

2.3.4 Conclusion

Based on the above evaluation, it is concluded that the existing and the committed fire protection measures in the area (cable tray fire stops) provide a level of fire protection equivalent to the technical requirements of Section III.G.2.a of Appendix R. Therefore, the exemption for the RCIC room fire area can be granted.

2.4 Fire Zone RB-1 - Reactor Building Northwest Corner Room Elevation 232 Feet 6 Inches

Fire Zones RB-5 and RB-6 - Reactor Building West Side Elevation 280 Feet

Fire Area 13 - Turbine Building, Radwaste Building Hallway

Fire Area 12 - Diesel Fuel Oil Transfer Pump Building

Fire Area 17 - Condensate Storage Tank and Instrument Area

By letters dated August 2 [11] and August 16 [12], 1985, the Licensee withdrew the exemption requests for these zones and areas.

2.5 Reactor Building Northeast Corner Vital MCCs Elevation 252 Feet (Fire Zones RB-3 and RB-4)

2.5.1 Exemptions Requested

Exemptions were requested from Section III.G.2.b to the extent that it requires the installation of an automatic fire suppression system in the area and to the extent that it requires 20 feet of separation free of intervening combustibles.

2.5.2 Discussion

2.5.2.1 Fire Zones RB-3 and RB-4 - Reactor Building Northeast Corner Vital MCCs Elevation 252 Feet

RB-3 is in the northernmost portion and RB-4 is in the southern end of the reactor building. Construction is reinforced concrete with no combustible interior finishes. RB-3 and RB-4 are separated by the steam tunnel wall on the west side and by a 20-foot separation zone on the east side. This separation zone is free of combustibles on the floor proper, and where cables pass through, they will be provided with a 20-foot-long fire stop using materials and application approved by Factory Mutual, which is a nationally recognized fire test laboratory. Redundant safe shutdown cables that are routed through separation zones will be provided with a 1-hour fire rated barrier. Also, a separation zone exists on the west side of RB-3 and is adjacent to the steam tunnel wall. However, the steam tunnel wall provides a reinforced concrete barrier between RB-3 and RB-4. The total floor area of these two zones is 16,000 square feet. The combustibles present

are in the form of cable insulation. The total heat content is about 318,904,000 Btu. The average fire load is about 19,932 Btu per square foot, which translates into a fire severity of less than 15 minutes on the ASTM E-119 time-temperature curve.

The safe shutdown systems that exist within these fire zones include MCC 9D, MCC 89A, MCC 89b, and safe shutdown cables in trays. The MCCs contain control and power feeds for redundant AC motor-operated valves. There is approximately an 18-foot separation between the MCCs in question. Also, two cable trays pass over MCCs 89A and 9D and these trays are 18 feet off the floor and extend 6 feet toward MCC 89b. Other cables are in conduit and there are no in situ combustibles. There is no redundant safe shutdown equipment in these zones other than the MCCs.

The existing fire protection is in the form of fire extinguishers, manual hose stations, and a radiant energy heat shield installed between MCC 89A and MCC 89B. This noncombustible shield is 14 feet high and extends out from the wall by 4 feet. Also, fire stops have been installed in all conduits that span the separation zone between the redundant MCCs. The Licensee is committed to install an early warning fire detection system in the separation zones and over the MCCs. Also, the Licensee is committed to install 20-foot-wide fire stops in all cable trays that cross Fire Zones RB-3 and RB-4. This separation zone would prevent fire propagation from one fire zone to the other. Finally, in the northwest sector of RB-3, a partial area sprinkler system has been installed in the separation zone. The Licensee also has made a commitment to install a 1-hour fire rated barrier for cables in raceways required for safe shutdown that pass through any of the two separation zones.

2.5.3 Evaluation

The fire protection in these fire zones does not comply with the technical requirements of Section III.G.2.b of Appendix R because automatic fire suppression has not been installed and 20 feet of separation free of intervening combustibles has not been provided between redundant safe shutdown system equipment or cables.

The principal concern with the level of fire protection in these locations was that because of the absence of an area-wide automatic fire suppression system, a fire of significant magnitude could develop and damage redundant shutdown-related systems, e.g., the MCCs. However, the fire load in these locations is low. If a fire were to occur, it is expected that it would develop slowly, with initially low heat release and slow room temperature rise. Because of the presence of the early warning fire detection systems, the fire would be detected in its incipient stages. The alarms from these detectors are annunciated in the control room. The fire brigade would then be dispatched and would extinguish the fire. Until the fire is put out, the 20 feet of spatial

separation between the redundant shutdown-related systems will provide sufficient passive protection to provide reasonable assurance that one shutdown division would remain free of fire damage. Another major factor that reduces the fire risk in these zones is that redundant safe shutdown system equipment and cables are well separated (except for the vital MCCs which are separated by 18 feet) with either no or low in-situ combustibles.

Where redundant safe shutdown cables are routed through separation zones, they will be provided with a 1-hour fire rated barrier. Finally, in the northwest corner of Fire Zone RB-3, there is a partial area sprinkler system. It is found that the installation of an area-wide automatic fire suppression system would not significantly increase the level of fire protection in these zones.

2.5.4 Conclusion

Based on the above evaluation, it is concluded that the existing fire protection combined with the committed fire protection measures in the above fire zones provides a level of fire protection equivalent to the technical requirements of Section III.G.2.b of Appendix R. Therefore, this exemption request for the aforementioned zones can be granted.

2.6 Reactor Building Northwest Corner Elevation 252 Feet, 0 Inch (Fire Zone RB-3)

2.6.1 Exemptions Requested

An exemption was requested from Section III.G.2.b to the extent that it requires 20 feet of separation free of intervening combustibles.

2.6.2 Discussion

Fire Zone RB-3 is located in the northern part of the reactor building and measures about 47 by 32 feet, with the 47-foot length being along the northwest perimeter line of the reactor building. Construction is reinforced concrete with no combustible interior finishes. The ceiling height is 27.5 feet. Fire Zone RB-3 is separated from RB-4 by the steam tunnel wall on the west side and by a 20-foot separation zone on the east side. This separation zone is free of combustibles on the floor proper, and where cables pass through, they will be provided with a 20-foot-long fire stop using FM-approved material and design. The total floor area of RB-3 is about 8,000 square feet. The combustibles present are in the form of cable insulation. The average fire load is 19,932 Btu per square foot, which translates into a fire severity of less than 15 minutes on the ASTM E-119 time-temperature curve.

The safe shutdown systems that exist within Fire Zone RB-3 include MCCs and cables. The issue of redundant MCCs in the northeast corner is addressed in the previous exemption request

2.5. The cables in question are in the northwest corner and are associated with division II ADS, RHR controls and instruments, and division I HPCI and valve cables. The exposed division I and II cables are separated by only 18 feet at their closest point with a low fire load.

The existing fire protection is in the form of fire extinguishers and manual hose stations on an area-wide basis. Fire stops have been installed on all cable trays that span the separation zone in the northwest corner. The Licensee has provided an early warning fire detection system in the separation zone containing the cables in question. Also, a preaction sprinkler system has been installed beneath the lowest level of cable trays and above the top trays throughout the corner area. The Licensee is committed to provide a 1-hour fire rated barrier for cables in raceways required for safe shutdown that pass through the separation zone in the northwest corner of RB-3.

2.6.3 Evaluation

The fire protection in this fire zone does not comply with the technical requirements of Section III.G.2.b of Appendix R because 20-feet separation free of intervening combustibles has not been provided between redundant safe shutdown cables.

The principal concern with the level of fire protection in the northwest corner of Fire Zone RB-3 was that, because of the absence of a 20-foot separation free of intervening combustibles, a fire of significant magnitude could develop and damage redundant safe shutdown cables. However, there is no significant fire load on the floor area and the cable fire load is low. If a fire were to occur, then it is expected to develop slowly, with initially a low heat release and slow area temperature rise. Because of the presence of the early warning fire detection system, the fire would be detected in its incipient stages. The alarms from these detectors are annuniciated in the control room. The fire brigade would then be dispatched and would extinguish the fire. Until the fire is put out, the 18 feet of spatial separation between the cable trays in question will provide sufficient passive protection to provide reasonable assurance that one division would remain free of fire damage. Another major factor that reduces the fire risk in this zone is that redundant cable trays are well separated after diverging from the one point where 18 feet of separation exists. It is found that the provision of 20-feet separation free of all intervening combustibles would not significantly increase the level of fire protection in this zone.

2.6.4 Conclusion

Based on the above evaluation, it is concluded that the existing fire protection combined with the committed fire protection measures in the above area of Fire Zone RB-3 provides a level of fire protection equivalent to the technical requirements of Section III.G.2.b of Appendix R. Therefore, this exemption request for the aforementioned zone can be granted.

3. CONCLUSIONS

This section is provided to consolidate the results of the evaluation contained in Section 2 concerning the exemptions requested by the Licensee from the requirements of Section III.G of Appendix R to 10CFR50 for Vermont Yankee Nuclear Power Station. It is not meant as a substitute for the specific conclusions reached in the various subsections of Section 2 for which the reader is referred to specific subsections.

Based on the evaluation, the existing fire protection and/or proposed fire protection modifications in the aforementioned areas provide a level of fire protection equivalent to the technical requirements of Section III.G of Appendix R and, therefore, the following exemptions from the requirements of Section III.G of Appendix R are deemed reasonable and can be granted.

- Reactor Building Torus Area Elevations 213 feet, 9 inches and 232 feet, 6 inches (Fire Zones RB-1 and RB-2) to the extent that an automatic fire suppression system is not installed in the zones pursuant to III.G.2.b. Section 2.2 provides additional information.

- RCIC Room Elevation 213 feet, 9 inches (RCIC Room Fire Area) to the extent that this area be separated by 3-hour fire rated barriers from the areas containing redundant shutdown system equipment, cables, and associated circuits pursuant to III.G.2.a. See Section 2.3 for additional information.

- Reactor Building, Northwest Corner Room Elevation 232 feet, 6 inches (Fire Zone RB-1) WITHDRAWN BY THE LICENSEE.

- Reactor Building Northeast and Southeast Corner Rooms Elevations 213 feet, 9 inches through 252 feet (Fire Zones RB-1 and RB-2) to the extent that automatic fire suppression systems are not installed within the corner rooms and within the area between the stairs at elevation 252 feet and the corner rooms pursuant to III.G.2.b. Section 2.3 provides additional information.

- Reactor Building Northeast Corner Vital MCCs Elevation 252 feet (Fire Zones RB-3 and RB-4) to the extent that automatic fire suppression is not installed in the vital MCC area and to the extent that 20 feet of separation without intervening combustibles is not provided between redundant safe shutdown systems pursuant to III.G.2.b. See Section 2.5 for additional information.

- Reactor Building Northwest Corner Elevation 252 feet (Fire Zone RB-3) to the extent that 20 feet of separation is not

provided between redundant safe shutdown systems pursuant to III.G.2.b. See Section 2.6 for additional information.

- Reactor Building East Side Instrument Racks Elevation 280 feet (Fire Zones RB-5 and RB-6) to the extent that automatic fire suppression system is not installed in the zones pursuant to III.G.2.b. Section 2.2 provides additional information.

- Reactor Building West Side Elevation 280 feet (Fire Zones RB-5 and RB-6) WITHDRAWN BY THE LICENSEE AND INCORPORATED INTO REACTOR BUILDING EAST SIDE INSTRUMENT RACKS ELEVATION 280 FEET (FIRE ZONES RB-5 AND RB-6).

- Turbine Building - Radwaste Building Hallway (Fire Area 13) WITHDRAWN BY THE LICENSEE.

- Diesel Fuel Oil Transfer Pump Building (Fire Area 12) WITHDRAWN BY THE LICENSEE.

- Condensate Storage Tank and Instrument Area (Fire Area 17) WITHDRAWN BY THE LICENSEE.

4. REFERENCES

1. BTP APCSP 9.5-1 "Fire Protection Program," July 1981 (Standard Review Plan, NUREG-0800)

2. Appendix A to BTP APCSP 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976," August 23, 1976

3. Regulatory Guide 1.120, "Fire Protection Guidelines for Nuclear Power Plants," November 1977

4. 10CFR50, "Fire Protection Program for Operating Nuclear Power Plants," November 19, 1980

5. Appendix R to 10CFR50, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979," November 19, 1980

6. Generic Letter 83-33, "NRC Position on Certain Requirements of Appendix to 10CFR50," October 19, 1983

7. Generic Letter 85-01, "Fire Protection Policy," January 9, 1985

8 Final Work Assignment No. 36, transmitted by M. Carrington (NRC) to Dr. S. Pandey (FRC) on July 17, 1985

9. Vermont Yankee Nuclear Power Corporation Transmittal to NRC titled, "Vermont Yankee Exemption Requests From 10CFR50, Appendix R" dated April 24, 1985.

10. Letter from Mr. W. D. Hinkle (Vermont Yankee Nuclear Power Corporation) to Mr. Robert Hermann (NRC), dated July 26, 1985.

11. Letter from Mr. W. D. Hinkle (Vermont Yankee Nuclear Power Corporation) Mr. Robert Hermann (NRC), dated August 2, 1985.

12. Letter from Mr. W. D. Hinkle (Vermont Yankee Nuclear Power Corporation) to Mr. Robert Hermann (NRC), dated August 16, 1985.

13. Requests for Information (RFI), transmitted by N. Ahmed (FRC) to J. Stang (NRC) on October 4, 1985.

14. Draft TER, transmitted by N. Ahmed (FRC) to J. Stang (NRC) on January 15, 1986.

Dated

7590-01

UNITED STATES NUCLEAR REGULATORY COMMISSION

VERMONT YANKEE NUCLEAR POWER CORPORATION

DOCKET NO. 50-271

ENVIRONMENTAL ASSESSMENT AND

FINDING OF NO SIGNIFICANT IMPACT

The U.S. Nuclear Regulatory Commission (NRC/the Commission) is considering issuance of an exemption from the requirements of Appendix R of 10 CFR 50 to the Vermont Yankee Nuclear Power Corporation VYNPC/the licensee) for the Vermont Yankee Nuclear Power Station located in Windham County, Vermont.

ENVIRONMENTAL ASSESSMENT

Identification of Proposed Action: The licensee would be exempted from the requirements of Sections III.G.1 and III.G.2 of Appendix R to 10 CFR 50 that require that automatic fire suppression be installed in four locations, that separation be provided in three locations, and that in two instances equipment necessary to achieve and maintain safe hot shutdown be free of fire damage without taking credit for repairs. Specifically, the repairs would involve connecting a backup battery charger and replacing fuses.

The Need for the Proposed Action: Because of low combustible loading in the locations being exempted from separation or automatic fire suppression, a fire in one of these areas would be of low intensity and short duration. Furthermore, safe shutdown could be effected if a fire occurred in one of these areas because of the passive protection afforded by such separation and barriers as exist, and because of the provision of detection systems to alert the fire brigade. The fire brigade could then take action to extinguish the

fire. Therefore, automatic fire suppression and additional separation in these locations would not enhance the level of fire protection and are unnecessary.

With regard to the repairs needed in order to achieve and maintain safe hot shutdown, the times in which the repairs are required are well in excess of the times required to perform the repairs considering the proximity of work locations, the provision of necessary tools and equipment, and the simplicity of the actions required.

Environmental Impacts of the Proposed Action: The proposed action would not impact the ability to effect safe shutdown of the plant in the event of a fire in the above mentioned areas and would provide an acceptable level of safety, equivalent to that attained by compliance with Section III.G of Appendix R to 10 CFR 50. On this basis, the Commission concludes there are no significant radiological environmental impacts associated with this proposed exemption.

With regard to potential nonradiological impacts, the proposed exemption involves features located entirely within the restricted areas as defined in 10 CFR Part 20. It does not affect nonradiological plant effluents and has no other environmental impact. Therefore, the Commission concludes that there are no significant nonradiological environmental impacts associated with the proposed exemption.

Alternative Use of Resources: This action involves no use of resources not previously considered in the Final Environmental Statement (construction permit and operating license) for the Vermont Yankee Nuclear Power Station.

Agencies and Persons Consulted: The NRC staff based their review in part on an evaluation by the NRC contractor, Franklin Research Center (FRC). Except for FRC assistance the NRC staff did not consult other agencies or persons.

FINDING OF NO SIGNIFICANT IMPACT

The Commission has determined not to prepare an environmental impact statement for the proposed exemption.

Based upon the foregoing environmental assessment, we conclude that the proposed action will not have a significant effect on the quality of the human environment.

For further details with respect to this action, see the applications for exemption dated April 24, 1985, August 2, 1985, August 16, 1985, October 31, 1985, August 15, 1986, and June 10, 1986, which are available for public inspection at the Commission's Public Document Room, 1717 H Street, N.W., Washington, D.C., and at Brooks Memorial Library, 224 Main Street, Brattleboro, Vermont.

Dated at Bethesda, Maryland, this 24th day of November, 1986.

FOR THE NUCLEAR REGULATORY COMMISSION

Daniel R. Muller

Daniel R. Muller, Director
BWR Project Directorate #2
Division of BWR Licensing