

VERMONT YANKEE NUCLEAR POWER CORPORATION

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BVY 00-67

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Reference: (a) Letter, USNRC to VYNPC, "Request for Additional Information on Vermont Yankee Nuclear Power Station Individual Plant Examination of External Events (IPEEE) Submittal (TAC No. M83689), NVY 00-47, dated May 19, 2000.

Subject: Vermont Yankee Nuclear Power Station
License No. DPR-28 (Docket No. 50-271)
Response to Request for Additional Information Concerning VY-IPEEE

In Reference (a) Vermont Yankee was requested to respond to questions concerning our IPEEE submittal within 60 days. Attachment A to this letter provides the requested information.

If you have any questions concerning this transmittal, or require any additional information, please contact Mr. Jeffrey T. Meyer at (802) 258-4105.

Sincerely,

VERMONT YANKEE NUCLEAR POWER CORPORATION



Don M. Leach
Vice President, Engineering

Attachment

cc: USNRC Region 1 Administrator
USNRC Resident Inspector - VYNPS
USNRC Project Manager - VYNPS
Vermont Department of Public Service

AD11

Docket No. 50-271
BVY 00-67

ATTACHMENT A

Response to USNRC Request for Additional Information (RAI) on
Vermont Yankee Individual Plant Examination External Events (IPEEE) Submittal

FIRE Supplemental RAI #1:

The IPEEE submittal identified a proposed improvement to relocate or otherwise protect the control cables for Vernon Tie Breakers 3V, 4V and 3V4 in the east and west Switchgear Rooms from fires that are likely to damage offsite power control cables. This improvement was credited in the fire analysis, but its evaluation was planned; i.e., an implementation decision had not been made. Since the submittal and the response to original RAI #2 identified the east and west Switchgear Rooms as the second and third most dominant risk contributors, this improvement may reflect a risk reduction which is not actually reflected in the hardware configuration that is present in the event of a fire.

Please provide the status of the proposed improvement to the Vernon Tie Breakers 3V, 4V and 3V4 in the east and west Switchgear Rooms. If this improvement has not yet been implemented and will not be completed in the near future, please reevaluate the fire scenarios for the east and west Switchgear Rooms without crediting the improvement. Provide the results of the reanalysis, including revised core damage frequency (CDF) estimates for the applicable fire scenarios.

Response to FIRE Supplemental RAI #1:

The proposed improvement to the control cables for Vernon Tie Breakers 3V, 4V and 3V4 has been evaluated and a design change has been engineered to protect the 3V, 4V and 3V4 control cables from fires that are also likely to affect the offsite power control cables. The engineering design is complete and is scheduled for implementation by December 31, 2000. This schedule is consistent with the "near future" time frame; as such, no additional analysis on this issue is provided here.

FIRE Supplemental RAI #2:

The response to original RAI #5 stated that the detailed evaluation of compartment RB3 in the reactor building included plant walkdowns and internal inspection of specific electrical cabinets/panels to determine those cabinets which do not propagate a fire. The result of the evaluation was that non-vented panels and cabinets of low voltage (<480V) were judged not to propagate fire (non-fire hazard) and were eliminated from the detailed target-set evaluations. This indicates that non-vented panels, regardless of voltage, were screened, and low voltage cabinets (<480V), vented or non-vented, were screened. The original IPEEE submittal did not state that panels and cabinets in RB3 were screened on this basis. If panels and cabinets were so screened, fire risk could have been significantly underestimated due to the failure to consider potential propagation of a fire outside a cabinet boundary.

The screening that was apparently used is not consistent with the Electric Power Research Institute (EPRI) guidance for responding to Generic RAI Question #11 "Guidance for Development of Response to Request for Additional Information on Fire IPEEE," EPRI, May 1999. Based on this guidance, cabinets with voltage less than 480V cannot be screened if they are vented. To account for the possibility that cabinet doors may distort as the result of a high energy fire, panels with voltage greater than 480V cannot be screened regardless of venting conditions.

Please clarify the panel and cabinet screening guidance/criteria that were used in the analysis of compartment RB3. Compare these criteria to the EPRI panel and cabinet screening guidance per the revised guidance for response to Generic RAI Question #11. If the applied criteria were not consistent with the revised guidance, identify and reevaluate the affected compartments using the revised EPRI screening criteria. Reanalyze those panels and cabinets that do not meet these screening criteria and provide the results, including revised CDF estimates, for the applicable fire scenarios. As part of the reanalysis, include the factors (ignition frequencies, severity factors, partitioning factors, weighting factors, etc.) that were used to estimate fire ignition frequencies, damage probabilities, and a discussion of the conditional core damage probability (CCDP) for each fire scenario in RB3.

Response to FIRE Supplemental RAI #2:

The fire risk for area RB3 has been accurately characterized in the VY IPEEE submittal and in VY's response to the initial RAI. The criteria used to screen electrical panels and cabinets, based on potential for fire propagation, in reactor building RB3 is consistent with the EPRI Fire PRA Implementation Guide, TR-105928 and Generic RAI Question #11 as follows:

1. Electrical cabinets or panels (typically MCCs) having a voltage rating of $\geq 480\text{V}$ (high voltage), irrespective of being vented or non-vented, were included in the detailed fire modeling/scenario assessments.
2. Electrical cabinets or panels having a voltage rating $< 480\text{V}$ (low voltage) were reviewed for vented/non-vented attributes per the EPRI Fire PRA Implementation Guide, Table E-3. Low voltage cabinet/panel configurations with ventilation were evaluated in the detailed fire modeling assessment. Cabinet/panel configurations that met the no-ventilation criteria were screened from further evaluation.

With respect to conduit penetrations, the EPRI Fire PRA Implementation Guide, Table E-3, criteria specifies the following as no-ventilation configurations:

- Conduit diameter $< 2"$ and length $> 1'$
or
- Conduit diameter = $2"$ and length $> 3'$
or
- Conduit has a rated seal.

However, TR-105928 provides no guidance regarding conduit penetrations of $> 2"$ in diameter. Given the lack of specific guidance on this issue, the VY IPEEE used Technical Evaluation Report - Conduit Fire Protection Research Program, (submitted to the NRC by Wisconsin Electric Power Company, TAC No. 66623, May 12, 1989) as the basis to conclude that conduit penetration configurations with diameter $> 2"$ and length $\geq 20'$ are no-ventilation cases.

The $> 2"$ diameter criterion was used to screen 6 completely enclosed, low voltage panels in reactor building RB3 and 5 similar panels in reactor building RB4. If it is reconsidered here that the lack of a $> 2"$ diameter conduit criterion in TR-105928 indicates that all such configurations should be considered "vented" cases, no additional internal fire insights result. Sensitivity studies of these eleven screened configurations are summarized in Table 1. In each case a fire was assumed to occur at the top of the electrical cabinet. As can be seen from Table 1, these panels do not represent a significant fire risk in RB3 and RB4.

In summary, the VY IPEEE deterministic fire scenario screening approach for electrical panels and cabinets is consistent with the revised guidance to Generic RAI #11, and did not employ the TR-105928 "fully enclosed sources" criterion as a condition to screen all enclosed ignition sources from further analysis.

FIRE Supplemental RAI #3:

The response to original RAI #5 addressed cabinet/panel fires in compartment RB3. However, the response did not discuss the process and assumptions that were used to treat cabinet and panel fires in other areas that were analyzed in detail. The original IPEEE submittal also does not include this information. If panels and cabinets in these 9 areas (10 including the Turbine building) were screened using a process similar to that employed for compartment RB3, fire risk could have been significantly underestimated due to fire propagation as noted in Supplemental RAI #2.

Please compare the screening criteria used in the IPEEE to the EPRI Generic RAI Response #11 on panel and cabinet screening guidance. If compartments were screened on a basis which is not consistent with the EPRI guidance, identify and reevaluate the affected compartments using the revised EPRI screening criteria. Also, provide the results, including revised CDF estimates, for applicable fire scenarios for each area that has been reanalyzed. As part of the reanalysis, include the factors (ignition frequencies, severity factors, partitioning factors, weighting factors, etc.) that were used to estimate fire ignition frequencies, damage probabilities, and a discussion of the CCDP for each fire scenario in each area that has been reanalyzed.

Response to FIRE Supplemental RAI #3:

Similar to the RAI #2 response, the VY IPEEE deterministic fire scenario screening approach, based on potential fire propagation from electrical panels and cabinets, is consistent with the EPRI Fire PRA Implementation Guide and Generic RAI Question #11 throughout the plant ⁽¹⁾. This approach is described previously in the RAI #2 response. The >2" no ventilation screening criterion used in RB3 and RB4 was not applied to cabinets/panels in the other plant fire areas.

⁽¹⁾ During the preparation of this response it was discovered that a 480V MCC in the west switchgear room (SGW) had not been appropriately included in the VY IPEEE fire target set analyses. This fire scenario has been incorporated into the SGW analyses and the total fire induced CDF of SGW increased from 9E-06/yr to 1.2E-05/yr; no new insights resulted. As a check, the east switchgear room and cable vault were reviewed and no other omissions were identified.

Table 1

**Vermont Yankee IPEEE Fire Sensitivity Evaluation
Response to Supplemental Fire RAI # 2**

Fire Area	Fire Source	Heat Release Rate (HRR) BTU/Sec	Fire Damage Description	Impact on Risk of Core Damage
RB3	Fuse Panel 5-7A	95	No damage from plume, hot gas layer/ceiling jet or radiant exposure.	No impact on CDF.
RB3	Fuse Panel 5-7B	95	No damage from plume or hot gas layer/ceiling jet exposure. Nearby conduits and junction box used for Containment Air Dilution System (CAD) may be affected by radiant heat.	No impact on CDF. CAD is not credited as a mitigative system in the calculation of core damage.
RB3	Fuse Panel 5-7C	95	No damage from plume or hot gas layer/ceiling jet exposure. Nearby vertical portion of open cable tray R332SII may be affected by radiant heat. Tray is lightly loaded.	Negligible impact on CDF. The panel fire frequency is estimated to be $4.7E-05/\text{yr}$ consistent with our response to the initial fire RAIs. Conservatively assuming the CCDP associated with FRB3CL (major cable tray fire in RB3) at $4.0E-03$, would increase the CDF in RB3 by $1.9E-07/\text{yr}$ (assuming no credit for manual suppression).
RB3	Fuse Panel 5-7D	95	No damage from plume or hot gas layer/ceiling jet exposure. Nearby vertical portion of metal covered cable tray R332SII may be affected by radiant heat. Damage to metal covered cables is judged to be unlikely given the configuration.	Negligible impact on CDF, judged to be less than $1E-07/\text{yr}$ based on evaluation for Fuse Panel 5-7C.
RB3	SRM-IRM Drive Control Panel 25-14	224	No damage from radiant exposure. Plume could impact a conduit related to HPCI auto start logic (manual start still available). Hot gas layer/ceiling jet could impact conduits for outboard MSIV control cables and EDG-1A control cables; conduits are located near ceiling, approximately 18 feet above panel.	Negligible impact on CDF, judged to be less than $1E-07/\text{yr}$ based on evaluation for Fuse Panel 5-7C.

Table 1

**Vermont Yankee IPEEE Fire Sensitivity Evaluation
Response to Supplemental Fire RAI # 2**

Fire Area	Fire Source	Heat Release Rate (HRR) BTU/Sec	Fire Damage Description	Impact on Risk of Core Damage
RB3	SRM-IRM Pre-Amp Panel B	224	No damage of critical equipment postulated from plume, hot gas layer/ceiling jet or radiant exposure. HRR is based on Panel 25-14 and is judged conservative based on panel size.	No impact on CDF.
RB4	Fuse Panel 5-7E	95	No damage of critical equipment from plume, hot gas layer/ceiling jet or radiant exposure.	No impact on CDF.
RB4	Fuse Panel 5-7F	95	No damage from plume or hot gas layer/ceiling jet exposure. Nearby vertical portion of metal covered cable tray R235SI may be affected by radiant heat. Damage to metal covered cables is judged to be unlikely given the configuration.	Negligible impact on CDF. The panel fire frequency is estimated to be 4.7E-05/yr consistent with VY's response to the initial fire RAIs. Conservatively assuming the CCDP associated with FRB4CL (cable fire in RB4) at 1.7E-03, would increase the CDF in RB4 by 8E-08/yr (assuming no credit for manual suppression).
RB4	Fuse Panel 5-7G	95	No damage of critical equipment from plume, hot gas layer/ceiling jet or radiant exposure.	No impact on CDF.
RB4	Fuse Panel 5-7H	95	No damage of critical equipment from hot gas layer/ceiling jet or radiant exposure. Plume could impact conduit related to remote control of the hard-piped torus vent valve, which can be locally/manually operated, if needed.	Negligible impact on CDF, judged to be less than 8E-08/yr based on evaluation for Fuse Panel 5-7F.
RB4	SRM-IRM Pre-Amp Panel A	224	No damage of critical equipment from plume, hot gas layer/ceiling jet or radiant exposure. HRR is based on Panel 25-14 and is judged conservative based on panel size.	No impact on CDF.

SUMMARY OF VERMONT YANKEE COMMITMENTS

BVY NO.: 00-67

The following table identifies commitments made in this document by Vermont Yankee. Any other actions discussed in the submittal represent intended or planned actions by Vermont Yankee. They are described to the NRC for the NRC's information and are not regulatory commitments. Please notify the Licensing Manager of any questions regarding this document or any associated commitments.

COMMITMENT	COMMITTED DATE OR "OUTAGE"
Complete fire protection design improvement to the control cables for Vernon Tie Breakers.	12/31/00