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Docket No. 50-271
BVY 05-067

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: **Vermont Yankee Nuclear Power Station**
NRC Generic Letter 2003-01 "Control Room Habitability" – Final Response

References:
1) NRC Generic Letter 2003-01, "Control Room Habitability," dated June 12, 2003

2) Entergy letter to USNRC (BVY 03-72), "NRC Generic Letter 2003-01, 'Control Room Habitability,' 60-Day Response," dated August 6, 2003

3) Entergy letter to USNRC (BVY 04-095), "Response to NRC Generic Letter 2003-01, 'Control Room Habitability,' Initial Summary Actions Report," dated September 14, 2004

4) NRC letter to Entergy (NVY 05-045), "Vermont Yankee Nuclear Power Station – Issuance of Amendment Re: Alternative Source Term (TAC No. MC0253)," dated March 29, 2005

Entergy Nuclear Operations, Inc. and Entergy Nuclear Vermont Yankee, LLC (Entergy) hereby submits our final response to Generic Letter 2003-01 (Reference 1) for the Vermont Yankee Nuclear Power Station (VY) as stated in References 2 and 3.

The initial response (Reference 2) to the Generic Letter outlined a course of action and schedule for VY that accounted for the planned adoption of an alternative source term. A schedule update was provided in Reference 3. NRC issued Amendment 223 to VY's facility operating license on March 29, 2005 (Reference 4), approving incorporation of a full-scope application of an alternative source term methodology. Based upon the completion of this major milestone which affected the licensing basis for control room habitability at VY, Entergy is submitting the information requested by the Generic Letter.

If you have any questions regarding this submittal, please contact Jim DeVincentis at (802) 258-4236.

Sincerely,

Jay K. Thayer
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Attachment (1)

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ATTACHMENT 1 TO BVY 05-067

NRC Generic Letter 2003-01 "Control Room Habitability" – Final Response

Entergy Nuclear Operations, Inc
Vermont Yankee Nuclear Power Station
Docket No. 50-271

VERMONT YANKEE NUCLEAR POWER STATION
NRC GENERIC LETTER 2003-01, "CONTROL ROOM HABITABILITY" – FINAL RESPONSE

Introduction:

On June 12, 2003, the NRC issued Generic Letter 2003-01, "Control Room Habitability." The Letter requested licensees to submit information demonstrating that control rooms comply with the current licensing and design bases, and applicable regulatory requirements, and that suitable design, maintenance, and testing control measures are in place for maintaining this compliance. The Letter requested that licensees provide certain information as described below. The Letter requested that this information be provided within 180 days of the date of the letter or if unable to meet this schedule, provide proposed plans for completion within 60 days of the date of the letter.

Entergy Nuclear Operations, Inc.'s (Entergy's) initial response to Generic Letter 2003-01 (BVY 03-72, dated August 6, 2003) proposed a systematic approach to assess and evaluate control room habitability based on the actions described in Section 3 of NEI 99-03, Revision 1 (Control Room Habitability Guidance, March 2003). Following are the initial, "one-time actions" to be performed, as necessary and appropriate:

- Assemble CRH licensing and design bases (3.1.1)
- Assemble CRH analyses (3.1.2)
- Document CRH licensing and design bases and analyses (3.1.3)
- Assess and evaluate licensing/design bases and operator dose analyses (3.2.1)
- Confirm that limiting DBA has been used to assure adequacy of CRH design (3.2.2)
- Assess and evaluate potential sources of hazardous chemicals. Update hazardous chemicals surveys as necessary (3.2.3)
- Assess and evaluate control room in leakage (3.2.4)
- Assess and evaluate control room during smoke events (3.2.5)
- Assess and evaluate the adequacy of existing control room emergency ventilation system technical specifications (3.2.6)

Entergy has accomplished these actions, as deemed necessary and appropriate, for the Vermont Yankee Nuclear Power Station (VY). Relevant information pertaining to the actions described in NEI 99-03 is incorporated into the following responses to information requested in the Generic Letter.

Generic Letter 2003-01 requests utilities to:

1. *Provide confirmation that your facility's control room meets the applicable habitability regulatory requirements (e.g., GDC 1, 3, 4, 5, and 19) and that the CRHSs are designed, constructed, configured, operated, and maintained in accordance with the facility's design and licensing basis. Emphasis should be based on the following:*

   (a) That the most limiting unfiltered in-leakage into your CRE (and the filtered in-leakage, if applicable) is no more than the value assumed in your design basis radiological analyses for control room habitability. Describe how and when you performed the analyses, tests and measurements for this confirmation.

Response to 1(a):

For the Vermont Yankee Nuclear Power Station (VY), the Control Room (CR) unfiltered in-leakage limitation to meet design basis radiological analysis is 3700 cfm. In NRC letter to Entergy (NVY 05-045, dated March 29, 2005), NRC authorized use and implementation of alternative source term (AST) methodology in accordance with 10CFR50.67. This radiological analysis assumes a CR in-leakage of 3700 cfm. Under this scenario, the CR isolation dampers fail to isolate and intake air flow is the CR heating, ventilation and air conditioning (HVAC) system design fresh air intake flow of 3700 cfm.

A previous test of CR in-leakage was performed in 1982. In NRC's letter to the Vermont Yankee Nuclear Power Corporation (VYNPC) (NVY 93-167, dated October 4, 1993), NRC requested verification that the actual rate of infiltration into the CR envelope satisfied assumptions of the CR dose analysis. In response (BVY 94-02, dated January 10, 1994), VYNPC identified that tracer gas testing in accordance with ASTM 741-80 was performed (in 1982) and the results identified that the CR infiltration rate was low over a 24 hour period. The ASTM 741-80 tracer gas test identified that infiltration the rate was approximately 21.5 cfm. It was concluded that the VY CR infiltration rate was very low, based on over four hours of testing during prevailing wind conditions. In November 1985 representatives from the NRC staff and Argonne National Laboratory surveyed the VY CR from a control room habitability (CRH) perspective. In letter to the VYNPC (NVY 87-76, dated May 20, 1987), the NRC provided a report of the survey which discussed outside air infiltration and concluded that the VY CR was believed to be the tightest CR envelope inspected to date. Based on the conservative in-leakage value and past testing, no further testing is planned to verify that in-leakage is within the assumed value utilized in design basis radiological analysis.

(b) That the most limiting unfiltered in-leakage into your CRE is incorporated into your hazardous chemical assessments. This in-leakage may differ from the value assumed in your design basis radiological analyses. Also, confirm that the reactor control capability is maintained from either the control room or the alternate shutdown panel in the event of smoke.

Response to 1(b):

On-Site Storage of Chemicals

On-site storage of hazardous chemicals was evaluated in response to NUREG 0737, Item III D.3.4 using Regulatory Guide (RG) 1.78, June 1974. Isolation of the CR was not considered in this analysis (since VY had no hazardous chemical detection or emergency filter system for the CR) and it was identified that no potential hazard existed for CR personnel for toxic chemical material stored on-site. The NRC's Safety Evaluation Report provided in NRC letter to VYNPC (NVY 82-22, dated February 24, 1982) documented acceptance of this analysis.

In 1995 hazardous materials on-site were reviewed again as part of the Individual Plant External Events Examination (IPEEE) analysis, specifically to identify and evaluate hazardous chemicals that may present a hazard to CRH. This review confirmed that

CRH is not affected by the storage of on-site hazardous chemicals. In 2004, the inventory of hazardous chemicals on-site was again reviewed utilizing state inventory reporting correspondence and the hazardous materials on-site was procedurally identified. These materials were reviewed in accordance with the applicable regulatory guidance provided in RG 1.78, Rev. 1. It was concluded that previous evaluations remain valid and CRH continues to not to be affected by the storage of on-site hazardous chemicals. Consistent with RG 1.78, Rev. 1 for on-site hazardous chemical storage, the VY CR has the capability to be manually isolated, if required, and VY has written emergency procedures to be initiated in the event of a hazardous chemical release within or near the plant. In the event of a toxic gas or chemical release on or off-site that may affect CRH at VY, CR personnel will place the CR HVAC system in emergency mode, announce the condition, order evacuation of affected areas, put on self contained breathing apparatus (SCBA) and then have the CR atmosphere sampled per procedure, OP 2106, "Oil and Hazardous Materials Spill Prevention and Control." VY's Chemical Control Program, PP7602, provides assurance that chemical materials used on-site do not adversely impact plant operation and precludes chemical intrusion into plant systems. Additional procedural controls exist to ensure safety during shipment and transportation and storage incidental to movement of hazardous materials.

Off-Site Shipments of Chemicals

Off-site highway and rail transportation shipments of hazardous bulk chemicals near VY were evaluated. The radiological risk to the public from toxic chemical releases is small, as the release of toxic chemicals that have the potential to result in a significant concentration in the CR are of low frequencies such that they satisfy RG 1.78 screening criteria.

In 1981 hazardous chemicals shipped by rail or highway in bulk quantities identified to pose a threat to CRH consisted of anhydrous ammonia, chlorine, vinyl chloride, carbon dioxide and methanol. CR habitability was reviewed using RG 1.78, June 1974 guidance and it was concluded that chlorine, vinyl chloride, ammonia, methanol and carbon dioxide presented potential hazards to the CR with the CR isolated with an in-leakage of 11 cfm. It was concluded that additional protection for CR personnel was required to satisfy NUREG 0737, Item III.D.3.4 for a postulated off-site chemical release. The installation of a toxic gas monitoring system (TGMS) was proposed for early warning upon the release of hazardous chemicals, and upon detection manual shutdown of CR HVAC outside air intake and operators donning Bio Pak protective respiratory equipment, if required. Off-site chemical releases were the only basis for the TGMS. The TGMS was installed and reflected in station Technical Specifications (TS). However, the system proved to be problematic due to spurious trips.

In 1990 subsequent analysis using RG 1.78 methodology concluded that in the event of spill and the release of the largest single shipping container for any hazardous chemicals shipped in the vicinity of the site would not produce concentrations in the VY CR such that CRH would be challenged. In 1991, further analysis concluded that in the event of a railroad accident involving hazardous chemicals, if instantaneously released, would not produce toxic concentrations in the CR above concentrations immediately dangerous to life or health (IDLH), within two minutes, with the exception of chlorine. For chlorine, it was determined that the frequency of an event leading to CR inhabitability and subsequent fission product release was 4.39E-7 per year, below NUREG 0800 Section 2.2.3 threshold consideration for a design basis event. Analysis also concluded that the

probability of a propane spill resulting in loss of CRH was 1.75E-7 per year. As such, the TGMS was not required to satisfy the provisions of NUREG 0737, Item III.D.3.4.

In VYNPC letter to the NRC (BVY 91-02, dated January 15, 1991), removal of the TGMS from station TS was proposed on the basis that all chemicals satisfied RG 1.78, June 1974 screening criteria. In NRC letter to VYNPC (NVY 91-205, dated October 24, 1991), NRC issued Amendment 132 to the facility operating license approving this proposal with the condition that a report be submitted every three (3) years (beginning in 1994) providing the annual frequency of railroad shipments of bulk chlorine within 5 miles of the plant site to verify that the probability of loss of CRH continues to meet acceptance criteria of Section 2.2.3 of NUREG 0800. The TGMS was subsequently removed. The latest report identifying the annual frequency of railroad shipment of bulk chlorine was submitted to the NRC in December 2003 (BVY 03-110) and it concluded that the annual frequency was less than previously analyzed and that the probability of a loss of CRH continues to meet the acceptance criteria of Section 2.2.3 of the NRC Standard Review Plan (SRP) (NUREG 0800, July 1981).

In 1994, required IPEEE analysis of off-site hazardous chemicals shipped by highway and by railroad concluded that 1995 SRP Sections 2.2.1 – 2.2.3 were met and that there were no design basis events from this potential hazard. The frequency of an event leading to CR inhabitability from rail transportation of bulk shipments of chlorine was again analyzed in 1994 as part of IPEEE analysis to update hazardous chemical identification in the vicinity of the site, re-evaluate CRH in the event of a release using RG 1.78 methodology and perform an evaluation of a hazardous chemical explosion using RG 1.78 and RG 1.91 methodology. This analysis concluded that the annual probability of a railroad car chlorine accident causing a loss of CRH is 4E-7, which is below the threshold in RG 1.78, Rev. 1 of 1E-6 per year such that this toxic chemical need not be considered for further detailed evaluation for CRH.

With the implementation of hydrogen water chemistry, shipments of hydrogen to the site bulk storage facility are required. The storage of hydrogen at, and the shipment to, the bulk storage facility has no impact on CR Habitability based on the remote location of the facility. Analysis has been performed in accordance with guidelines provided in EPRI-NP-5283-SR-A, "Guidelines for Permanent BWR Hydrogen Water Chemistry Installation." The results of this analysis indicate that the distance from any safety-related building is well in excess of the Safe Distance Separation guideline. Additionally, the probability of a hydrogen explosion during shipment to VY has been evaluated to be 6.5E-7 per year, less than the regulatory guideline of 1E-6 per year.

Event of Smoke and Alternate Shutdown Capability

Reactor control capability is maintained from either the CR or by alternate shutdown capability, in the event of smoke. The VY CR is physically remote from safe shutdown panel locations. Events related to fire are procedurally controlled. The first priority of any individual who discovers a fire is to immediately report the location and source of the fire (if known) to the CR. In accordance with VY procedure, OP 3020, "Fire Emergency Response Procedure, the Shift Manager will evaluate the operational consequences of the fire and ensure the plant is placed in an appropriate safe shutdown condition, as warranted. If CR operators are aware of smoke entering the CR from the outside, actions to isolate the CR could be taken and operators would don SCBA, if required.

Shutdown from outside the CR is part of VY design basis. The station is designed with the ability to bring the reactor to a shutdown condition using controls and equipment outside the CR.

If the CR were to become uninhabitable, safe shutdown is accomplished using the Alternate Shutdown System. The Alternate Shutdown System was established to meet 10CFR50 Appendix R (Items III.G.3 and III.L) and VY received regulatory approval by safety evaluation for the Alternate Shutdown System (NVY 83-05 dated January 13, 1983 and NVY 84-167, dated July 24, 1984). Also, VY's safe shutdown capability analysis is formally documented. Operator actions necessary to safely shutdown the plant in the event in the event that the CR must be evacuated are procedurally controlled by VY procedure, OP 3126, "Shutdown Using Alternate Shutdown Methods." Switches, local control panels and alternate power sources are provided to permit the reactor to be shut down without reliance on the CR.

(c) *That your technical specifications verify the integrity of the CRE, and the assumed in-leakage rates of potentially contaminated air. If you currently have a ΔP surveillance requirement to demonstrate CRE integrity, provide the basis for your conclusion that it remains adequate to demonstrate CRE integrity in light of the ASTM E741 testing results. If you conclude that your ΔP surveillance requirement is no longer adequate, provide a schedule for: 1) revising the surveillance requirement in your technical specifications to reference an acceptable surveillance methodology (e.g. ASTM E741), and 2) making any necessary modifications to your CRE so that compliance with your new surveillance requirement can be demonstrated. If your facility does not currently have a technical specification surveillance requirement for our CRE integrity, explain how and at what frequency you confirm your CRE integrity and why this is adequate to demonstrate CRE integrity.*

Response to 1 (c):

VY does not have a TS surveillance requirement associated with CR integrity. Current CRH radiological and on-site and off-site chemical analysis do not take credit for CR isolation.

It is not expected that the integrity of the VY CRE will change such that design bases assumptions will be challenged. The CR HVAC ductwork is a low vibration, low pressure system and primarily passive. Because CR ductwork is not subjected to movement, the likelihood of duct breach due to fatigue is low and leakage into the ductwork from areas other than the CR that the ductwork passes through is not likely.

The VY radiological analysis assumes an in-leakage of air into the CR of 3700 cfm (all CR isolation dampers fail in the open position). Isolation functions of the CR are procedurally tested semi-annually. There are no required modifications or additional testing associated with the CRE to demonstrate that in-leakage is within analysis design basis values.

In November 1985 representatives from the NRC staff and Argonne National Laboratory surveyed the VY CRE. In NRC letter to VYNPC (NVY 87-76, dated May 20, 1987) NRC concluded that the VY CR was believed to be the tightest CR envelope inspected to date. In NRC letter to VYNPC (NVY 93-167, dated October 4, 1993), NRC requested verification that the actual rate of infiltration into the CR envelope

satisfied assumptions used in CR dose analysis. In response, VYNPC identified that tracer gas testing in accordance with ASTM 741-80 was performed in 1982 and the results identified that the CR infiltration rate was low over a 24 hour period. The results indicated that the infiltration rate was approximately 21.5 cfm. Subsequent to this testing, the results were considered somewhat inconclusive because when the system was placed in the emergency mode using the switch from the CR, the kitchen and toilet exhaust fans were not automatically secured and their respective isolation dampers remained open. Accordingly, modifications to the logic for the CR kitchen and bathroom exhaust dampers and computer room supply damper were made to automatically close these dampers when the CR was switched to the recirculation (isolation) mode by operators.

Interaction between the CRHS and adjacent areas has been evaluated. From the tightness of the CRE demonstrated from the ASTM 741-80 testing performed in 1982 and subsequent modifications and improved CR preventative maintenance practices, CR in-leakage from adjacent areas or outside is considered to be small. If additional potential sources of unfiltered leakage are identified they will be addressed through preventative maintenance practices and the site corrective action process.

2. *If you currently use compensatory measures to demonstrate control room habitability, describe the compensatory measures at your facility and the corrective actions needed to retire these compensatory measures.*

Response to 2:

Entergy is not currently using compensatory measures to demonstrate CRH at VY. CRH is maintained in the event of a design basis radiological release or in the event of a chemical spill on-site or off-site.

Conservative precautionary procedural measures direct CR operators to manually isolate the CR if abnormally high levels or radiation are detected and cannot be readily determined or contained. In the event of a toxic gas or chemical release on or off-site, operators procedurally isolate the CR HVAC system and if necessary order evacuation of the affected areas, don self contained breathing apparatus, and then sample the CR atmosphere, if required. In the event high radiation levels are detected, operators are procedurally directed to isolate the CR.

3. *If you believe that your facility is not required to meet either the GDC, the draft GDC, or the "Principal Design Criteria" regarding control room habitability, in addition to responding to 1 and 2 above, provide documentation (e.g., Preliminary Safety Analysis Report, Final Safety Analysis Report sections, or correspondence) of the basis for this conclusion and identify your actual requirements.*

   Response to 3:

   As discussed in the UFSAR, Appendix F.1 "Summary Description," VY is licensed to the 1967 draft AEC design criteria. In addition, the current dose limit acceptance criterion of 5 rem is consistent with 10CFR Part 50, Appendix A, GDC 19. In NRC letter to Entergy (NVY 05-045, dated March 29, 2005), NRC authorized use and implementation of alternative source term (AST) methodology in accordance with 10CFR50.67.

Conclusion

The VY CRHS is designed, constructed, configured, operated and maintained in accordance with the VY design and licensing basis. The VY CR in-leakage value utilized in CRH analysis is the CR HVAC maximum fresh air intake value of 3700 cfm. With this amount of unfiltered in-leakage, the CR is habitable considering design basis radiological dose and the effects of hazardous materials stored on-site and transported off-site.

Additional testing of the CRE per ASTM E741-00 to measure CR in-leakage to verify that leakage is within licensing and design basis values is not planned. VY utilizes a very conservative value of CR in-leakage which is associated with no isolation of the CR HVAC system. Adequate controls are in place to continue to maintain the CRE such that CR in-leakage is within the facility design and licensing basis.