Entergy

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Christopher J. Wamser
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BVY 14-061

August 13, 2014

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

SUBJECT: Technical Specifications Proposed Change No. 309, Defueled Technical Specifications and Revised License Conditions for Permanently Defueled Condition - Supplement 4 (TAC No. MF3714)
Vermont Yankee Nuclear Power Station
Docket No. 50-271
License No. DPR-28

REFERENCES:

1. Letter, Entergy Nuclear Operations, Inc. to NRC, "Technical Specifications Proposed Change No. 309, Defueled Technical Specifications and Revised License Conditions for Permanently Defueled Condition," BVY 14-010, dated March 28, 2014 (ML14091A291) (TAC No. MF3714)
2. Email, NRC to Entergy Nuclear Operations, Inc. "RAI - Defueled Technical Specification Amendment (TAC No. MF3714)," dated July 29, 2014 (ML14210A161)

Dear Sir or Madam:

By letter dated March 28, 2014 (Reference 1), Entergy Nuclear Operations, Inc. (ENO) proposed an amendment to Renewed Facility Operating License (OL) DPR-28 for Vermont Yankee Nuclear Power Station (VY). The proposed amendment would revise the VY OL and Technical Specifications (TS) to be consistent with the expected permanently shutdown and defueled condition of VY.

In Reference 2, the NRC provided ENO with a request for additional information (RAI). Attachment 1 of this letter contains the response to the RAI.

The conclusions of the no significant hazards consideration and the environmental considerations contained in Reference 1 are not affected by, and remain applicable to, this supplement.

There are no new regulatory commitments made in this letter.

If you have any questions on this transmittal, please contact Mr. Philip Couture at 802-451-3193.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on August 13, 2014.

Sincerely,

CJW/plc

Attachment: 1. Response to Request for Additional Information

cc: Mr. William M. Dean
Region 1 Administrator
U.S. Nuclear Regulatory Commission
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King of Prussia, PA 19406-2713

Mr. James S. Kim, Project Manager
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Attachment 1

Vermont Yankee Nuclear Power Station

Proposed Change 309 - Supplement 4

Response to Request for Additional Information

REQUEST FOR ADDITIONAL INFORMATION
BY CONTAINMENT AND VENTILATION BRANCH
VERMONT YANKEE NUCLEAR POWER STATION,
TECHNICAL SPECIFICATION CHANGES AND REVISED LICENSE CONDITION FOR
PERMANENTLY DEFUELED CONDITION
DOCKET NO. 50-271

In a letter dated March 28, 2014 (Reference 1), pursuant to Section 50.90 of Title 10 of the Code of Federal Regulations (CFR), Entergy Nuclear Operations, Inc. (ENO) submitted a license amendment request to Renewed Facility Operating License (OL) DPR-28 for Vermont Yankee Nuclear Power Station (VY). The submitted amendment revises the OL and revises the associated Technical Specifications (TS) to Permanently Defueled Technical Specifications (PDTS). ENO is requested to provide response to the following RAIs for NRC staff to complete its review:

SCVB-RAI-1

The staff understands that in the defueled state, the fuel pool cooling will be performed by the non-safety related fuel pool cooling system and also should to be backed up by a safety-related system in case the non-safety pool cooling is lost due to an event, such as a seismic event, or loss of offsite power. In case there is no safety-related pool cooling back up system and given the secondary containment and the standby gas treatment system have been removed from TS, please respond to the following questions:

(a) Would the fuel pool be allowed to boil with offsite steam release?
(b) What system will provide the makeup water to the spent fuel pool to maintain its level?
(c) What will be the offsite dose from the steam release, and verify that it is within the 10 CFR 100 allowed limit.

Response

(a) Once VY is permanently defueled, the plan is to transition to a electrical distribution scheme where the normal and backup power supplies for fuel pool cooling will be provided as follows:

- Normal power will be provided from the 115 kV switchyard through the startup transformers
- Backup power will be provided from the Vernon Hydroelectric Station (VHS) tie line and will also be available from the Station Blackout Diesel Generator (SBO DG)

The 115 kV switchyard is currently credited as the immediate access offsite power source in the Bases for TS 3.10.A.4. The normal supply to the 115 kV switchyard bus is from the two paralleled, but independent, 345 kV/115 kV autotransformers described above. In the unlikely event that both autotransformers are out of service, an alternate immediate access source through the Chestnut Hill/Vernon Road line, Vernon 115 kV yard and K-40 Tie Line may be made available.

The VHS tie line is a reliable source of offsite power that was formerly credited as an alternate ac source for compliance with 10 CFR 50.63, "Loss of all Alternating Current Power," and is currently used to meet certain 10 CFR 50 Appendix R requirements.

The SBO DG is considered a reliable power source. Reliability was initially demonstrated by an initial test program preventative maintenance and testing is performed per plant procedures to verify reliability, and it receives augmented quality treatment. Although not required to meet any regulatory requirements in the permanently defueled condition, the SBO DG was designed to meet the requirements of 10 CFR 50.63.

Based on a full core offload with an initial spent fuel pool temperature of 110°F and no credit for cooling or makeup water, the spent fuel pool time to boil (TTB) will be approximately 14 hours following 10 days after shutdown and increases to approximately 25 hours following 50 days after shutdown. VY currently maintains the ability to start and align the SBO DG to breaker 3V4 within 1 hour, providing a reliable power supply for fuel pool cooling. The SBO DG can be started in the control room or manually started locally. Maintaining the ability to start and align the SBO DG within 1 hour provides adequate assurance that backup power can be provided to restore fuel pool cooling well before the TTB is reached in the event of a loss of offsite power. Additional details on the SBO DG can be found in Reference 2.

Were a loss of all power to occur and spent fuel pool cooling could not be restored in a timely manner, VY maintains procedures and strategies for the movement of any necessary portable equipment that will be relied upon for mitigating the loss of spent fuel pool water. These diverse strategies implement the requirements of License Condition 3.N, "Mitigation Strategy License Condition," and provide defense-in-depth capability to provide makeup water or spray to the spent fuel pool prior to the onset of fuel pool boiling.

Based on the above, the VY spent fuel pool will not be allowed to boil

(b) Procedure ON-3157, Loss of Fuel Pool Level/Cooling, and Appendix G of PP 7019, Severe Accident Guidelines, establishes multiple makeup sources to the spent fuel pool from onsite and offsite. Following permanent defueling these sources will include:
- Fire Water system
- Service Water system
- Cooling Tower #2 deep basin via an engine driven emergency makeup pump

(c) Based on the response to parts (a) and (b), the spent fuel pool will not be allowed to boil and no offsite release is postulated to occur due to a steam release from the VY spent fuel pool while irradiated fuel is stored in the pool.

SCVB-RAI-2

Please confirm that spent fuel k_{eff} will not increase while the entire fuel is in the spent fuel pool. In case it increases, please discuss the effects of its increase on the decay heat generated in the pool, the pool temperature, and the offsite dose.

Response

TS 5.5.B requires that the k_{eff} of the fuel in the spent fuel pool be less than or equal to 0.95. ENO confirms that spent fuel k_{eff} will remain below 0.95 with all fuel in the spent fuel pool. The basis for this is provided in Reference 3, which documented NRC approval of expansion of the spent fuel pool storage capacity to the current level of 3,353 fuel assemblies. The criticality analyses

performed to support the capacity expansion included several assumptions which tended to maximize the reactivity of the spent fuel storage racks. These include:

1) Racks contain most reactive fuel authorized to be stored without any control rods or any uncontained burnable poison, and with the fuel at the burnup corresponding to the highest reactivity during its burnup history.
2) Unborated pool water at the temperature yielding the highest reactivity (4 °C) over the expected range of water temperatures.
3) Assumption of infinite array (no neutron leakage) of storage cells except for certain accident assessments.
4) Neutron absorption in minor structural material was neglected (i.e., spacer grids are analytically replaced by water).
5) The narrowest panel width of the three existing Boral panels was used.
6) The B-10 density in the Boral panels was assumed to be the minimum value in all panels.
7) Uniform average U-235 enrichments were used for all fuel rods in a fuel assembly instead of distributed enrichments.

The maximum reactivity calculated for a 10x10 fuel assembly in the Holtec racks that were installed as part of the expansion was 0.9280 and 0.9469 for the existing racks when combined with all known uncertainties. This met the NRC staff's criterion of k_{eff} no greater than 0.95 including all uncertainties at the 95/95 probability/confidence level.

As identified above, the analysis associated with the increase of the VY spent fuel pool capacity was based on a maximum pool storage capacity of 3,353 fuel assemblies. Once the VY core is fully defueled with all fuel assemblies placed in the pool, there will be a total of 2,995 spent fuel assemblies in the pool, providing additional assurance that the maximum calculated reactivity will not be exceeded.

Aging Management Program

As described in Section 15.2.40 of the VY Updated Final Safety Analysis Report, an aging management program is in place to manage loss of material and reduction of neutron absorption capacity of Boral neutron absorption panels in the spent fuel racks. The loss of material and the reduction of the neutron-absorbing capacity will be determined through coupon testing, direct in situ testing or both. Such testing will include periodic verification of boron loss through areal density measurement of coupons or through direct in situ techniques, such as measurement of boron areal density, measurement of geometric changes in the material (blistering, pitting and bulging), and detection of gaps through blackness testing.

As part of License Renewal Commitment 52, VY plans to perform neutron attenuation testing using an in-situ method prior to the end of 2014.

Decay Heat and Offsite Dose

Any increase in pool temperature as result of the decay heat associated with a full core offload is already contemplated in the Bases for TS 3/4.12.H:

> *The Spent Fuel Pool Cooling System is designed to maintain the pool water temperature below 125°F during normal refueling operations. If the reactor core is completely discharged, the temperature of the pool water may increase to greater than 125°F. The RHR System supplemental fuel pool cooling may be used under these conditions to maintain the pool water temperature less than 150°F.*

Since the spent fuel temperature limitations are not expected to be exceeded following the full core offload, a corresponding increase in offsite dose is not expected to occur.

REFERENCES

1. Letter, Entergy Nuclear Operations, Inc. to NRC, "Technical Specifications Proposed Change No. 309 Defueled Technical Specifications and Revised License Conditions for Permanently Defueled Condition Vermont Yankee Nuclear Power Station Docket No. 50-271", BVY 14-010, dated March 28, 2014 (ML14091A291) (TAC No. MF3714)

2. Letter, NRC to Entergy Nuclear Operations, Inc., "Vermont Yankee Nuclear Power Station - Issuance of Amendment to Renewed Facility Operating License RE: Change to Licensing Basis Regarding Station Blackout (TAC No. MF0422)," NVY 13-090, dated August 15, 2013 (ML13212A201)

3. Letter, NRC to Vermont Yankee Nuclear Power Corporation, "Vermont Yankee Nuclear Power Station - Issuance of Amendment RE: Spent Fuel Pool Storage Capacity Expansion (TAC No. MA3490)," NVY 99-124, dated December 21, 1999