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Manager, Design and Programs

10 CFR 72.7

BVY 16-030

November 9, 2016

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

SUBJECT: Exemption Request from certain requirements of 10 CFR 72.212  
and 10 CFR 72.214  
Vermont Yankee Nuclear Power Station  
License No. DPR-28  
Docket Nos. 50-271, 72-59 and 72-1014

REFERENCES: 1. Letter, USNRC to Holtec International, "Certificate of Compliance  
No. 1014, Amendment No. 10 for the HI-STORM 100 Cask  
System (CAC No. L24979), dated May 25, 2016 (ML16144A177)

Dear Sir or Madam:

Pursuant to 10 CFR 72.7, "Specific Exemptions," Entergy Nuclear Operations, Inc. (ENO) requests an exemption from certain requirements of 10 CFR 72.212 and 72.214 for Vermont Yankee Nuclear Power Station (Vermont Yankee). These regulations require, in part, compliance with the terms and conditions of the Holtec International (Holtec) Cask System Certificate of Compliance (CoC) (Reference 1) for spent fuel storage at the Vermont Yankee independent spent fuel storage installation. Specifically, the requested exemption would allow for a modification to certain requirements in Appendix B, Table 2.1-3, Note 19 of Amendment 10 to the Holtec CoC No. 72-1014, thus allowing certain low enriched channeled fuel classified as "undamaged" per the CoC to be loaded in the same Multi-purpose Canister (MPC) as higher enriched fuel. The optimization of fuel loading as allowed by the requested exemption would result in an estimated reduction in dose rates by a factor of two, and an approximate total reduction in operator dose by one half. The exemption request is provided in the attachment to this letter.

ENO requests approval of this exemption request by March 31, 2017, in order to support Vermont Yankee's cask loading schedule.

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NRR  
NMSS

This letter contains no new regulatory commitments. Should you have any questions concerning this letter, please contact me at (802) 451-3374.

Sincerely,

  
CCC/tbs

Attachment: Exemption Request from Certain Requirements of 10 CFR 72.212  
and 10 CFR 72.214

cc: Mr. Daniel H. Dorman  
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U.S. Nuclear Regulatory Commission  
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Mr. Christopher Recchia, Commissioner  
Vermont Department of Public Service  
112 State Street – Drawer 20  
Montpelier, Vermont 05602-2601

Attachment

Vermont Yankee Nuclear Power Station

Exemption Request from Certain Requirements of 10 CFR 72.212  
and 10 CFR 72.214

**ENTERGY REQUEST FOR SPECIFIC EXEMPTION FROM CERTAIN  
REQUIREMENTS OF 10 CFR 72.212 and 10 CFR 72.214  
FOR VERMONT YANKEE NUCLEAR POWER STATION**

**Request for Exemption**

Pursuant to 10 CFR 72.7, "Specific Exemptions," Entergy Nuclear Operations, Inc. (Entergy) requests an exemption from certain requirements of 10 CFR 72.212(a)(2), 10 CFR 72.212(b)(3), 10 CFR 72.212(b)(5)(i), 10 CFR 72.212(b)(11), and 10 CFR 72.214 for Vermont Yankee Nuclear Power Station (Vermont Yankee). These regulations require, in part, that a licensee store its spent fuel in compliance with the terms and conditions of the spent fuel storage cask's Certificate of Compliance (CoC). Specifically, the requested exemption would allow for a modification to certain requirements in Appendix B, Table 2.1-3, Note 19 of Amendment 10 to the Holtec CoC No. 72-1014, thus allowing certain low enriched channeled fuel classified as "undamaged" per the CoC to be loaded in the same Multi-purpose Canister (MPC) as higher enriched fuel.

**Background**

Vermont Yankee plans to utilize the HI-STORM 100 System under CoC No. 72-1014, Amendment 10 (Reference 1) for dry storage of spent nuclear fuel in MPC-68M canisters. Some of this fuel is considered low-enriched, channeled Boiling Water Reactor (BWR) fuel, which falls under item b) in the definition of UNDAMAGED FUEL ASSEMBLY in the HI-STORM 100 CoC (Reference 2):

"b) a BWR fuel assembly with an intact channel, a maximum planar average initial enrichment of 3.3 wt% U-235, without known or suspected GROSSLY BREACHED SPENT FUEL RODS, and which can be handled by normal means."

Appendix B to the CoC provides the approved contents for storage in the HI-STORM 100 system under Amendment 10. Specifically, Table 2.1-3 gives the characteristics of BWR fuel approved for storage, including the Maximum PLANAR-AVERAGE INITIAL ENRICHMENT for the MPC-68M. The row in the table that gives this parameter is modified by Note 19, which states (Reference 3):

"In accordance with the definition of UNDAMAGED FUEL ASSEMBLY, certain assemblies may be limited to 3.3 wt.% U-235. When loading these fuel assemblies, all fuel assemblies in the MPC are limited to 3.3 wt% U-235."

Based on this note, if Vermont Yankee were to load any low-enriched, channeled BWR fuel in an MPC-68M, the rest of the assemblies in the MPC would also be limited to 3.3 wt% U-235 maximum planar-average initial enrichment. As Vermont Yankee prepared loading plans for transferring all spent fuel assemblies from the spent fuel pool into dry storage in support of decommissioning, Holtec determined that allowing storage of higher enrichments with the low enriched channeled undamaged fuel will result in significantly lower operational dose rates. These lower dose rates provide a safety benefit.

Vermont Yankee's requested exemption proposes to revise the existing Note 19 language as follows:

**"In accordance with the definition of UNDAMAGED FUEL ASSEMBLY, certain assemblies may be limited to up to 3.3 wt.% U-235. When loading these fuel assemblies, all other undamaged fuel assemblies in the MPC are limited to enrichments as specified in this table 3.3 wt% U-235."**

This same change was previously submitted as part of Holtec Amendment Request Number 1014-11, with supporting technical justification and related CoC and FSAR changes (References 4 and 5). However, due to the anticipated review times associated with that amendment request, and Vermont Yankee's cask loading schedule to support decommissioning, this exemption request is submitted to facilitate approval of the single change specifically for use by Vermont Yankee during the 2017 loading campaign. Vermont Yankee would like to rely on the technical review performed or in progress by the NRC Staff of the Holtec CoC Amendment Request 1014-11 related to the change to Note 19, to provide the basis for approval of the specific exemption request.

### **Technical Considerations**

The technical concern related to the storage of certain low enriched channeled fuel classified as "undamaged" per the CoC with higher enriched fuel in the same MPC is criticality control of the system. There are no changes to the structural, thermal, or confinement characteristics, and dose rates over the course of the Vermont Yankee loading campaign are actually improved with the requested change. Additionally, there is no change to the way Vermont Yankee will be classifying spent fuel under the CoC definitions. In accordance with the definition of "Undamaged Fuel Assembly," the channeled, low-enriched fuel assemblies described in Note 19 must not have known or suspected grossly breached spent fuel rods, as determined by a review of reactor operating records or other acceptable inspection means such as fuel sipping. Therefore, this technical evaluation is limited to the criticality evaluation.

### **Criticality Considerations**

The criticality evaluation which supports the storage of low-enriched, channeled BWR fuel was submitted with Holtec's request for Amendment 11 to the HI-STORM 100 System. As stated in the proposed FSAR pages submitted with that amendment request (See Reference 5, Enclosure 5, page 141 of 171):

"Calculations are performed with these assemblies [low-enriched, channeled BWR fuel] in all cells of the MPC-68M, without DFCs [damaged fuel containers]. The results of this conservative analysis are listed in Table 6.III.4.9 and show that the system remains below the regulatory limit.

In addition, calculations are performed for the MPC-68M with checkerboard configuration of normal undamaged fuel and low enriched, channeled BWR fuel without DFCs. The results of this analysis are listed in Table 6.III.4.10 and show that the reactivity remains below the regulatory limit and bounded by the reference undamaged fuel assembly in all cells.

These results confirm that even with unknown cladding condition the maximum  $k_{eff}$  values are below the regulatory limit when fully flooded and loaded with any of BWR candidate fuel assemblies.”

This conclusion shows that there is no criticality concern with the storage of any of the allowable BWR fuel with the low-enriched, channeled BWR fuel. The FSAR tables referred to above are replicated below. This conclusion is supported by the calculation package also submitted with the HI-STORM 100 Amendment 11 request (Reference 6).

TABLE 6.III.4.9

MAXIMUM  $k_{eff}$  VALUES IN THE MPC-68M WITH LOW ENRICHED (3.3 wt%  $^{235}\text{U}$ ),  
CHANNELED BWR FUEL IN ALL CELLS

Rod Array inside the Channel	Maximum $k_{eff}$
3x3	0.2045
6x6	0.7229
8x8	0.8900
9x9	0.9219
10x10	0.9248
11x11	0.9065
12x12	0.8689
13x13	0.8161
14x14	0.7562
16x16	0.6653
17x17	0.6449

Note: The results do not include the bias for distributed enrichments discussed in Section 6.III.2.

Table 6.III.4.10

**MAXIMUM  $k_{eff}$  VALUES IN THE MPC-68M WITH MIXTURE OF UNDAMAGED BWR FUEL AND LOW ENRICHED (3.3 wt%  $^{235}\text{U}$ ), CHANNELED BWR FUEL**

Configuration	Rod Array	10x10A, 4.8 wt% $^{235}\text{U}$		10x10G, 4.75 wt% $^{235}\text{U}$	
		Maximum $k_{eff}$	Reactivity Effect	Maximum $k_{eff}$	Reactivity Effect
Undamaged Normal Fuel in all Cells	-	0.9339	Reference	0.9451	Reference
Checkerboard of CILC Fuel at 3.3 wt% $^{235}\text{U}$ and Undamaged Fuel	3x3	0.6218	-0.3121	0.6247	-0.3204
	6x6	0.8241	-0.1098	0.8281	-0.1170
	8x8	0.9110	-0.0229	0.9161	-0.0290
	9x9	0.9275	-0.0064	0.9329	-0.0122
	10x10	0.9297	-0.0042	0.9341	-0.0110
	11x11	0.9206	-0.0133	0.9264	-0.0187
	12x12	0.9054	-0.0285	0.9109	-0.0342
	13x13	0.8865	-0.0474	0.8913	-0.0538
	14x14	0.8666	-0.0673	0.8719	-0.0732
	16x16	0.8514	-0.0825	0.8563	-0.0888
17x17	0.8505	-0.0834	0.8561	-0.0890	

Note: The results do not include the bias for distributed enrichments discussed in Section 6.III.2.

**Dose Rate Improvement**

Following NRC approval, the requested exemption from the HI-STORM 100 CoC would allow Vermont Yankee to have more flexibility to load a cask, including the option to load higher enriched undamaged fuel assemblies with low-enriched, channeled BWR fuel. When evaluated against the Vermont Yankee fuel inventory during development of loading plans, this additional flexibility reduced estimated HI-TRAC contact dose rates to the operators by a factor of two across the loading campaign. Thus, NRC approval of this exemption request is expected to result in a reduction of cask dose rates by half, due to the improved flexibility in loading. The proposed change would also result in a corresponding lower dose rate at the site boundary.

**Regulatory Considerations**

The provisions of 10 CFR 72.7 allow specific exemptions from the requirements of 10 CFR 72 provided the exemptions are authorized by law, will not endanger life or property or the common defense and security, and are otherwise in the public interest. The specific exemptions requested herein from 10 CFR 72.212(a)(2), 10 CFR 72.212(b)(3), 10 CFR 72.212(b)(5)(i), 10 CFR 72.212(b)(11) and 10 CFR 72.214 to modify the requirements to comply with Note 19 of Table 2.1-3 in Appendix B of the HI-STORM 100 CoC Amendment Number 10 satisfy the criteria and requirements of 10 CFR 72.7. The requested exemption continues to meet all regulatory limits for the HI-STORM 100 system, and provides no danger to life, property, or the common defense and security. Additionally, as described above, the operator dose rates

during the loading campaign are expected to be significantly reduced, and therefore, it is considered to be in the public interest.

#### **Authorized by Law**

10 CFR 72.7 allows the NRC to grant exemptions from the requirements of 10 CFR Part 72, therefore granting the proposed exemption is consistent with the Atomic Energy Act of 1954, as amended, and the Commission's regulations. Thus, the exemption would be authorized by law.

#### **No Undue Risk to Public Health and Safety**

The requested exemption does not create a new accident precursor or result in an increase in the probability of any postulated accident. Nor will the requested exemption result in an increase in the consequences of postulated accidents. The requested exemption does not result in any change to the types or amounts of effluents that may be released offsite. There is no significant increase in occupational or public radiation exposure. Therefore, the requested exemption does not result in undue risk to public health and safety.

#### **Consistent with the Common Defense and Security**

The requested exemption does not alter the scope or overall configuration of loading and storage of spent fuel within the facility Protected Area and does not affect any other requirements related to the security of the facility. Therefore, the common defense and security is not impacted by the requested exemption.

#### **Special Circumstances**

While 10 CFR 72.7 does not specify a requirement for "special circumstances" similar to those required for exemptions from 10 CFR Part 50, the exemption request can be supported by using the special circumstances identified in 10 CFR 50.12(a)(2), as discussed below.

10 CFR 50.12(a)(2)(ii): Application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule.

The underlying purpose of 10 CFR 72.212 is to allow licensees to utilize dry fuel storage casks that have previously been found to be safe and appropriately analyzed for use by the cask designer, the cask user, and the NRC. As stated in the sections above, the change requested by this exemption has been analyzed and determined to meet the requirements of 10 CFR 72 including the regulatory limit for criticality, and has no impact on other functions of the system, such as thermal, structural, shielding, and confinement. The requested exemption decreases dose rates on the surfaces of canisters to be loaded at Vermont Yankee, and therefore achieves the underlying purpose of the rule which is the safe storage of spent nuclear fuel.

10 CFR 50.12 (a)(2)(iv): The exemption would result in benefit to the public health and safety that compensates for any decrease in safety that may result from the grant of the exemption.

As discussed above, the subject exemption request would result in significantly lower dose rates on the surface of the cask while satisfying the criteria and requirements of 10 CFR 72.7. Approval of this exemption request would result in lower dose to the site personnel during the loading campaign. It would also result in a lower overall dose at the site boundary.



Accordingly, approval of this exemption request would provide a benefit to site personnel as well as public health and safety without a reduction in safety margin.

## **Environmental Consideration**

Pursuant to the provisions of 10CFR 72.7, Vermont Yankee is requesting an exemption from certain requirements under the 10 CFR Part 72.212(a)(2), 72.212(b)(3), 72.212(b)(5)(i), 72.212(b)(11) and 72.214. Vermont Yankee has evaluated the proposed changes against the criteria for identification of licensing and regulatory actions requiring environmental assessment and provides a summary of its environmental considerations below.

### **Introduction**

The proposed exemption would modify certain requirements in Amendment 10 of the Holtec International (Holtec) CoC No. 72-1014 for the HI-STORM 100 System, Appendix B, Table 2.1-3, Note 19. If approved, the exemption will allow the loading of certain low enriched channeled fuel classified as "undamaged," per the CoC fuel in the same Multi-purpose Canister (MPC) as higher enriched fuel.

### **The Need for the Proposed Action**

Vermont Yankee plans to utilize the HI-STORM 100 System under CoC No. 72-1014, Amendment 10 for dry storage of spent nuclear fuel in MPC-68M canisters. Based upon the approved contents for storage under amendment 10, if Vermont Yankee were to load certain low-enriched, channeled BWR fuel in an MPC-68M, the rest of the assemblies in the MPC would also be limited to a low enrichment (3.3 wt% U-235 maximum planar-average initial enrichment). As Vermont Yankee prepared loading plans for transferring all spent fuel assemblies from the spent fuel pool into dry storage in support of decommissioning, Holtec determined that allowing for the storage of higher enriched fuel with the low enriched channeled undamaged fuel will result in significantly lower operational dose rates. These lower dose rates provide a safety benefit to the operators loading the spent fuel storage system.

As provided in the referenced technical justification for this exemption request, an evaluation of an MPC-68M has been performed with a mixture of low-enriched channeled BWR fuel and fuel up to its maximum enrichment limit. The analysis concluded that this loading condition meets the regulatory limit for criticality, and has no impact on other functions of the system, such as thermal, structural, shielding, and confinement.

The interaction of the loaded MPC with the environment is through the shielding, confinement, and thermal design functions. The shielding design function will continue to limit external dose to levels bounded by the Holtec Final Safety Analysis Report (FSAR). The existing FSAR thermal analyses that concluded that the confinement design functions of the fuel cladding and the MPC structure are adequate are unchanged by the proposed exemption. Therefore, the MPC design functions that interact with the environment are not significantly affected by the proposed exemption.

### **Environmental Impacts of the Alternatives to the Proposed Action**

Because there is no significant environmental impact associated with the proposed action, no considerations are provided for alternatives with equal or greater environmental impact. An alternative to the proposed action would be to not seek this exemption, which would include both real and potential radiological impacts. Without an exemption from the regulations, maintaining the requirement to load and store spent fuel in accordance with the restrictions contained in Amendment 10 of the CoC would result in additional radiological exposure, as

described above. The increased dose would be realized until such time as the same change were to be approved as part of a future amendment to the CoC, which may not occur prior to the start of Vermont Yankee's fuel loading schedule. None of the real or potential environmental impacts associated with not seeking the exemption would be incurred for the proposed action.

### **Environmental Summary**

The requested exemption does not increase the probability or consequences of accidents, no changes would be made to the types of effluents released offsite, and there would be no increase in occupational or public radiation exposure. The exemption would result in lower dose to operators and the public. Therefore, there are no significant radiological environmental impacts associated with the requested exemption. The requested exemption does not involve any construction activities, does not change the physical aspects of the dry fuel storage features at the facility, and would have no other significant non-radiological impacts. The requested exemption does not have the potential to create any significant impact on aquatic or terrestrial habitat in the vicinity of Vermont Yankee, which is licensed under 10 CFR Part 50 and located on previously disturbed land.

### **Summary**

In conclusion, pursuant to 10 CFR 72.7 Vermont Yankee requests an exemption from the requirements of 10 CFR 72.212(a)(2), 10 CFR 72.212(b)(3), 10 CFR 72.212(b)(5)(i), 10 CFR 72.212(b)(11) and 10 CFR 72.214 for the HI-STORM 100 Storage System. Specifically, the requested exemption would allow for a modification to certain requirements in Appendix B, Table 2.1-3, Note 19 of Amendment 10 to the Holtec CoC No. 72-1014 thus allowing for certain low enriched channeled fuel classified as "undamaged" per the CoC to be loaded in the same Multi-purpose Canister (MPC) as higher enriched fuel. This exemption is considered both technically justified and allowable under the 10 CFR Part 72 regulations.

### **References**

1. Letter, USNRC to Holtec International, "Certificate of Compliance No. 1014, Amendment No. 10 for the HI-STORM 100 Cask System (CAC No. L24979)", dated May 25, 2016 (ML16144A177)
2. Holtec Certificate of Compliance No. 1014, Amendment 10, dated May 31, 2016, Appendix A, Page 1.1-6 (ML16172A300)
3. Holtec Certificate of Compliance No. 1014, Amendment 10, dated May 31, 2016, Appendix B, Page 2-46 (ML16144A178)
4. Holtec International HI-STORM 100 Multipurpose Canister Storage System Amendment Request 1014-11" (Letter from Royston Ngwayah (Holtec) to Mark Lombard (NRC) dated January 29, 2016) (ML16029A529)
5. Holtec International – Transmittal of RSI Responses Supporting HI-STORM 100 LAR 1014-11, Enclosure 4, pages 20-21 of 45, dated June 2, 2016 (ML16159A344)
6. Holtec International – Supporting Information for License Amendment Request 11 (1014-11) to the HI-STORM 100 CoC, dated February 16, 2016 (ML16069A246), Enclosure 4 Criticality Calculation Package for LAR 1014-11 (HI-2012771 Rev 20) and Corresponding Computer Input/Output Data Files (DVD Media).