



Entergy Nuclear Operations, Inc.
Vermont Yankee
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Coley C. Chappell
Manager, Design and Programs

10 CFR 72.7

BVY 17-001

January 9, 2017

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

SUBJECT: Response to Request for Supplemental Information Related to 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, Entergy Nuclear Operations, Inc. to USNRC, "Exemption Request from certain requirements of 10 CFR 72.212 and 10 CFR 72.214," BVY 16-030, dated November 9, 2016 (ML16319A102)
2. E-Mail to T.B. Silko/Entergy from Yen-Ju Chen/DSFM re: "Regarding Need for Supplemental Information for Entergy's Exemption Request for Vermont Yankee ISFSI," dated December 13, 2016 (ML16349A249)

Dear Sir or Madam:

By letter dated November 9, 2016 (Reference 1), Entergy Nuclear Operations, Inc. (ENO) submitted a request for 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) 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.

During discussions with the NRC, a request for supplemental information (Reference 2) was determined to be needed regarding the estimated reduction in dose that would be realized by approval of Reference 1. The response to the Request for Supplemental Information is provided in Attachment 1. Referenced technical reports used to demonstrate the potential dose savings are provided in Attachments 2, 3 and 4. Attachment 5 to this letter is an affidavit prepared in accordance with 10 CFR 2.390 requesting that Attachments 2, 3 and 4 be withheld from public disclosure. Any questions regarding the withholding of proprietary information

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should be addressed to: Holtec International, Ms. Kimberly Manzione, Licensing Manager, One Holtec Drive, Marlton, NJ 08053.

When separated from Attachments 2, 3 and 4, the cover letter and Attachments 1 and 5 are decontrolled.

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

- Attachments:
1. Response to Request for Supplemental Information Related to Exemption Request from certain requirements of 10 CFR 72.212 and 10 CFR 72.214
 2. Holtec International Report No: HI-2146076, Revision 1, "Dose versus Distance from HI-STORM 100S Containing MPC-68 and MPC-68M for Vermont Yankee ISFSI"
 3. Holtec International Report No: HI-2146423, Revision 2, "HI-STAR 190 Source Terms and Loading Patterns"
 4. Selective Pages from Holtec International Report No: HI-2167202, Revision 0, "Fuel Compatibility and Loading Plan Report for Vermont Yankee"
 5. Holtec International Affidavit Pursuant to 10 CFR 2.390 to Withhold Information from Public Disclosure

cc: Mr. Daniel H. Dorman
Regional Administrator, Region 1
U.S. Nuclear Regulatory Commission
2100 Renaissance Blvd, Suite 100
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Mr. Jack D. Parrott, Sr. Project Manager
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Ms. Yen-Ju Chen, Sr. Project Manager
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Ms. June Tierney, Commissioner
Vermont Department of Public Service
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Montpelier, Vermont 05602-2601

Attachment 1

Vermont Yankee Nuclear Power Station

Response to Request for Supplemental Information Related to Exemption Request
from certain requirements of 10 CFR 72.212 and 10 CFR 72.214

**REQUEST FOR SUPPLEMENTAL INFORMATION
RELATED TO EXEMPTION REQUEST FROM CERTAIN REQUIREMENTS OF
10 CFR 72.212 AND 10 CFR 72.214
FOR VERMONT YANKEE NUCLEAR POWER STATION**

Supplemental Information Requested:

Request:

Please provide the technical justification behind the statement "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."

Response:

An analysis was conducted for Vermont Yankee (VY) by Holtec International to document why the exemption request is justified from a shielding perspective, and to estimate the resulting reduction in dose rates. The methodology involved calculating cask side dose rates from a single cask while adjusting the parameters of the fuel loaded based upon the available fuel at VY. Assumptions included the following:

- Casks #14 and #44 provided in Table 7.2 of Holtec International Report No: HI-2167202 (Attachment 4) are used in this comparison. These casks are representative of the loading plan.
- The burnup, enrichment and cooling time of the fuel assemblies used to calculate dose rates are averaged values from all assemblies in the respective cask regions.
- To simplify calculations, the burnup is rounded up with 5 GWD/MTU step, the enrichment is rounded down to one decimal place and cooling times are rounded down to whole years.

The VY Spent Fuel Pool contains a large number of potential Crud Induced Localized Corrosion (CILC) fuel – approximately 40% out of all assemblies. The average cooling time of the CILC assemblies is approximately 35 years and the average burnup is approximately 25 GWD/MTU. The remaining fuel has higher burnups (average burnup of approximately 35 GWD/MTU) and shorter cooling times (with an average of approximately 15 years), and higher initial enrichment (about 80% of the remaining fuel assemblies have an initial enrichment of 3.3 wt% or more). Since the CILC fuel assemblies are typically low burned and long cooled it is preferable to mix them with higher enriched and higher burned fuel in the same cask in order to reduce dose rates emanating from the cask, by self-shielding of low source term assemblies placed on the periphery of the basket.

As a result of applying CoC Amendment 10, Note 19 without the requested exemption, the VY loading plans would effectively contain two sets of casks:

- Set 1) 40% of casks containing only low source term CILC fuel; and
- Set 2) 60% casks containing higher source terms assemblies.

The relatively low burned and long cooled assemblies are ideal candidates to be used as a shielding barrier fuel on the periphery of the MPC basket, blocking the radiation from shorter cooled and higher burned fuel typically stored towards the center of the basket. However, the

higher burned fuel has higher enrichments, and with the current restriction cannot be mixed with the low source term CILC affected fuel.

In contrast, the requested exemption would allow for a more efficient fuel loading plan to be constructed where the assemblies with higher source terms can be mixed with low source term fuel assemblies. To estimate the dose rate reduction factor, the dose rates were calculated for proposed Casks #14 and #44 with the Note 19 restriction and with the Note 19 restriction as revised by the exemption request. Cask #14 belongs to casks in Set 1, as discussed above, and contains solely Undamaged Fuel Assemblies, limited to 3.3 wt% U-235 and affected by CILC. Cask #44 belongs to casks in Set 2 and is a representative cask containing higher source terms assemblies. Table 1 below summarizes the fuel loading for Casks #14 and #44. After the proposed exemption request, fuel from Cask #14 and Cask #44 can be mixed. As an example, fuel from the inner region of Cask #14 is swapped with fuel from the outer region of Cask #44.

Table 1: Fuel Parameters Used in the Calculations

Cask	Inner Region	Outer region
	Burnup/Enrichment/Cooling Time (GWD/MTU / wt% / years)	Burnup/Enrichment/Cooling Time (GWD/MTU / wt% / years)
Cask #14 (see Attachment 4)	30 / 2.8 / 28	20 / 2.6 / 39
Cask #44 (see Attachment 4)	45 / 3.8 / 7	45 / 3.6 / 14
Cask #14 after mixing of fuel	45 / 3.6 / 14	20 / 2.6 / 39
Cask #44 after mixing of fuel	45 / 3.8 / 7	30 / 2.8 / 28

Methodology for Calculation:

In order to demonstrate the dose reduction provided by the requested exemption, a comparative analysis was performed between Vermont Yankee's loading to the existing Amendment 10 (which includes the CILC fuel restriction) and loading with the restriction removed as requested in the exemption. This comparative analysis utilized the dose vs. distance methodology described in HI-2146076, Rev 1 (Attachment 2 to this letter). Note that the actual calculations in HI-2146076 were performed utilizing an older loading configuration that is no longer in place, however the calculation provides the methodology used in the current comparative analysis. Specifically, HI-2146076 documents a general methodology of how the dose analysis is separated into two distinct parts. The first part is the generation of the radiation source terms to represent the spent nuclear fuel at the appropriate burnup and cooling time. The second part is the radiation transport simulation to calculate the dose rates at various distances from a cask.

The radiation source terms were calculated using the methodology discussed in HI-2146423, Rev 2 (Attachment 3 to this letter). Specifically, it utilizes the SAS2H and ORIGEN-S modules (references 1 and 2 from the HI-2146423 document) from the SCALE 5.1 code system from Oak Ridge National Laboratory. This is a widely accepted means of generating radiation source terms from spent nuclear fuel. Note that this SCALE code system is a more recent version than the one discussed within HI-2146076.

The radiation transport simulation is performed with MCNP 4A (reference 6 from the HI-2146076 document) from Los Alamos National Laboratory. This is a state of the art Monte

Carlo code that offers coupled neutron-gamma transport using continuous energy cross sections in a full three-dimensional geometry.

Results of Calculation

The comparison of dose rates at distance from the HI-STORM 100 is shown in Table 2 below. The comparison shows that the dose rates from Cask #44 are reduced by approximately a factor of 2. While the dose rate of cask #14 would see an increase, a net reduction can be observed on the sum of dose rates from the two casks. These casks are considered representative of casks loaded across the whole campaign, and therefore a similar reduction in sum total dose across the campaign is expected. Note that this case is only an illustration of typical dose rate reduction, and further optimization may be performed for the entire loading plan with the revised CoC.

Table 2: Side Dose Rates at Approximately 100 m from the HI-STORM 100 Cask

Cask	Dose Rate (mrem/hr)
Cask #14 (see Attachment 4)	1.07E-04
Cask #44 (see Attachment 4)	2.06E-03
Cask #14 after mixing of the fuel	3.62E-04
Cask #44 after mixing of the fuel	8.07E-04

Attachment 5

Vermont Yankee Nuclear Power Station

Holtec International Affidavit Pursuant to 10 CFR 2.390 to Withhold Information
from Public Disclosure

AFFIDAVIT PURSUANT TO 10 CFR 2.390

I, Kimberly Manzione, being duly sworn, depose and state as follows:

- (1) I have reviewed the information described in paragraph (2) which is sought to be withheld, and am authorized to apply for its withholding.
- (2) The information sought to be withheld is Attachment 2, 3, and 4, which are Holtec Report Numbers HI-2146076R1, HI-2167202R0, and HI-2146423R2 which contain Holtec Proprietary information.
- (3) In making this application for withholding of proprietary information of which it is the owner, Holtec International relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4) and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10CFR Part 9.17(a)(4), 2.390(a)(4), and 2.390(b)(1) for "trade secrets and commercial or financial information obtained from a person and privileged or confidential" (Exemption 4). The material for which exemption from disclosure is here sought is all "confidential commercial information", and some portions also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

AFFIDAVIT PURSUANT TO 10 CFR 2.390

- (4) Some examples of categories of information which fit into the definition of proprietary information are:
- a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by Holtec's competitors without license from Holtec International constitutes a competitive economic advantage over other companies;
 - b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product.
 - c. Information which reveals cost or price information, production, capacities, budget levels, or commercial strategies of Holtec International, its customers, or its suppliers;
 - d. Information which reveals aspects of past, present, or future Holtec International customer-funded development plans and programs of potential commercial value to Holtec International;
 - e. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs 4.a and 4.b above.

- (5) The information sought to be withheld is being submitted to the NRC in confidence. The information (including that compiled from many sources) is of a sort customarily held in confidence by Holtec International, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by Holtec International. No public disclosure has been made, and it is not available in public sources. All disclosures to third parties, including any required transmittals to the NRC, have

AFFIDAVIT PURSUANT TO 10 CFR 2.390

been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

- (6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge. Access to such documents within Holtec International is limited on a "need to know" basis.
- (7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his designee), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside Holtec International are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.
- (8) The information classified as proprietary was developed and compiled by Holtec International at a significant cost to Holtec International. This information is classified as proprietary because it contains detailed descriptions of analytical approaches and methodologies not available elsewhere. This information would provide other parties, including competitors, with information from Holtec International's technical database and the results of evaluations performed by Holtec International. A substantial effort has been expended by Holtec International to develop this information. Release of this information would improve a competitor's position because it would enable Holtec's competitor to copy our technology and offer it for sale in competition with our company, causing us financial injury.

AFFIDAVIT PURSUANT TO 10 CFR 2.390

- (9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to Holtec International's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of Holtec International's comprehensive spent fuel storage technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology, and includes development of the expertise to determine and apply the appropriate evaluation process.

The research, development, engineering, and analytical costs comprise a substantial investment of time and money by Holtec International.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

Holtec International's competitive advantage will be lost if its competitors are able to use the results of the Holtec International experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to Holtec International would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive Holtec International of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing these very valuable analytical tools.

STATE OF NEW JERSEY)
)
COUNTY OF BURLINGTON)

SS:

That she has read the foregoing affidavit and the matters stated therein are true and correct to the best of her knowledge, information, and belief.

My Neighbor
Kimberly Manzione
Holtec International

Subscribed and sworn before me this 21st day of DECEMBER, 2016.

Erika Grandrimo
NOTARY PUBLIC
STATE OF NEW JERSEY
MY COMMISSION EXPIRES January 17, 2022