HOLTEC INTERNATIONAL

Holtec Center, 555 Lincoln Drive West, Marlton, NJ 08053
Telephone (856) 797-0900
Fax (856) 797-0909

Mr. John Goshen
c/o Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

February 25, 2011

Subject: Response to NRC Second Request for Additional Information on License Amendment Request No. 8 to Holtec International HI-STORM 100 Certificate of Compliance No. 1014

References:

[1] NRC Letter (Goshen) to Holtec (Morin), dated February 9, 2011
[2] Holtec Letter 5014692, dated November 24, 2010
[3] USNRC Docket No. 72-1014, TAC No. L24398

Dear Mr. Goshen:

By letter dated February 9, 2011 [1] NRC provided a second request for additional information (RAI) on License Amendment Request (LAR) #8 to Certificate of Compliance (CoC) 1014 [2]. This letter transmits the response to the RAI in Attachment 1.

In addition to the response to the RAI an updated thermal calculation is provided in Attachment 2 for an unrelated reason. Recently it has come to our attention that a coding error may exist in the version of the thermal-hydraulics code used to perform the thermal analysis for the MPC-68M. Since then we have alerted the code manufacturer and our users, although no immediate action is required since the code version under question is not used to support any approved licensing actions for CoC 1014.

This code version was used to predict peak cladding temperatures (PCT) in the MPC-68M for short-term operating conditions as well as PCT and component temperatures for normal conditions of storage, off-normal conditions and accident conditions. Holtec has re-run the calculation for vacuum drying of high burnup fuel which is the most limiting case of those analyzed with the least available margin to the limit. The effect on PCT is an increase of less than 5 °F and the resulting temperature is still less than the regulatory limit of 752 °F. This is a positive indicator that the safety case for other conditions already analyzed, which have significant margin to the limits, is not impacted. In fact, the margin that exists, even considering a possible 5 °F increase, is much more in the MPC-68M model than the already approved MPC-68 and MPC-32 models. The description of the MPC-68M thermal model for vacuum drying of high burnup fuel and the resulting temperatures are presented Appendix K to HI-2043317 Revision 13 which is provided in Attachment 2.

Attachment 3 is an affidavit requesting the information in Attachment 2 be withheld from the public

NMSS01

HOLTEC INTERNATIONAL
Holtec Center, 555 Lincoln Drive West, Marlton, NJ 08053
Telephone (856) 797-0900
Fax (856) 797-0909

in accordance with 10 CFR 2.390 due to its proprietary nature.

If you have any questions regarding this transmittal, please do not hesitate to contact me at 856-797-0900 x687.

Sincerely,

Tammy S. Morin
Licensing Manager
Holtec Technical Services, Holtec International

cc: Ms. Michelle Sampson, USNRC
Mr. Douglas Weaver, USNRC
Holtec Group 1

6.0 Criticality Evaluation

6-1 (Follow-up to Round 1 RAI 6-7) Clarify the enrichment for damaged fuel for the 10x10F.

When referring to damaged fuel calculations, SAR Section 6.III.4.1 states that for the 10x10F (4.7% enrichment) that the damaged fuel was evaluated at an enrichment of 4.0 wt%. However Tables 2.III.3 of the SAR and Table 2.1-3 of the TS (Attachment 5 to the November 4, 2010, submittal) state that the enrichment limit for damaged fuel is 4.7%. Please clarify the enrichment of the damaged fuel for the 10x10F and update the incorrect section(s) accordingly.

10 CFR 72.11(a) requires that the information provided by the applicant be complete and accurate in all material respects.

Response to 6-1:

We regret the error in proposed FSAR Section 6.III and proposed CoC. For the 10x10F fuel assembly array/class the damaged fuel was evaluated at an enrichment of 4.6 wt% U-235.

The enrichment for the 10x10F fuel assembly array/class is corrected as shown in the attached pages. We suggest that Table 2.1-3 for the TS also be changed to reflect the same enrichment value and have attached the affected pages to this RAI response.

Unrelated to this RAI, note that in Table 6.III.4.7 the value for k_{eff} for the 10x10A fuel assembly array class for the 100% internal and external water density has been corrected from 0.9348 to 0.9351. This does not affect the conclusion of this study. This page from the proposed FSAR is also attached to this response.

TABLE 6.III.1.2

REPRESENTATIVE k_{eff} VALUES FOR MPC-68M IN THE HI-STORM 100 OVERPACK

Fuel Assembly Class	**Maximum Allowable Planar-Average Enrichment (wt% ^{235}U)**	**Maximum k_{eff}**
10x10A	4.8	0.*3754*

TABLE 6.III.1.3

BOUNDING MAXIMUM k_{eff} VALUES FOR THE MPC-68M WITH UP TO 16 DFCs

Fuel Assembly Class	**Maximum Allowable Planar-Average Enrichment (wt% ^{235}U)**	**Maximum k_{eff}**
All BWR Classes except 8x8F, 9x9E/F, 10x10F and 10x10G	4.8	0.*9408*
8x8F, 9x9E/F and 10x10G	4.0	0.*9131*
10x10F	4.*6*	0.*9362*

Note: The results presented in Tables 6.III.1.2 and 6.III.1.3 above have an additional bias of 0.0021 applied to the 10x10 fuel assembly classes to conservatively account for any potential distributed enrichment effects. See Section 6.III.2.

For damaged fuel and fuel debris in the MPC-68M the same conservative approach is used as in the main part of this chapter, see discussion in Section 6.4.4, specifically 6.4.4.2. Important aspects of this approach that ensure its conservatisms are as follows:

- *All damaged fuel and fuel debris must be in damaged fuel containers (DFCs), and located in specifically designated cells on the periphery of the basket as specified in Table 2.1.22.*
- *A conservative model is used that bounds both damaged fuel and fuel debris. In other words, damaged fuel is always conservatively modeled as fuel debris.*
- *The model consists of regular arrays of fuel rods without cladding. The rods pitch (array size) is varied to determine the optimum moderation condition.*
- *Intact and damaged fuel/fuel debris in the same basket have the same enrichment limit, which may be different from the enrichment limit for intact fuel only.*
- *The results for loading with intact fuel only in Table 6.III.1.1 utilize different enrichment limits for different assembly classes, to ensure that the maximum k_{eff} is always below 0.95. It is therefore not possible to establish a single bounding assembly class/enrichment combination to be used in all analyzes with damaged fuel/fuel debris. Therefore, and in order to optimize the enrichment for the loading of intact and damaged fuel/fuel debris for each assembly class, intact assemblies are grouped by enrichment limit, and the intact assembly with the highest maximum k_{eff} in each group is used for the calculations together with damaged fuel/fuel debris. These are:*
  - *Intact assemblies of 4.5 and 4.6 wt%: Assembly class 10x10G. For the calculations with intact and damaged fuel, an enrichment of 4.0 wt% is used.*
  - *Intact assembly of 4.7 wt%: Assembly class 10x10F. For the calculations with intact and damaged fuel, an enrichment of 4.6 wt% is used.*
  - *Intact assembly of 4.8 wt%: Assembly class 10x10A. For the calculations with intact and damaged fuel, an enrichment of 4.8 wt% is used.*
- *Consistent with the results in the main part of this chapter for the MPC-68, array sizes of 10x10 and 11x11 show the optimum moderation condition. This is confirmed for intact assembly classes 10x10A and 10x10G by evaluating all arrays from 3x3 to 17x17 rods. For assembly class 10x10F it is only confirmed that it is bounded by the cases with the 10x10A class (see Table 6.III.4.1).*

6.III.4.2 Fuel Parameters and Parameter Variations

In the main part of the FSAR, extensive analyses of fuel dimensional variations have been performed. These calculations demonstrate that the maximum reactivity corresponds to:

- *maximum active fuel length,*
- *maximum fuel pellet diameter,*
- *maximum fuel rod pitch,*
- *minimum cladding outside diameter (OD),*
- *maximum cladding inside diameter (ID),*
- *minimum guide tube/water rod thickness, and*
- *maximum channel thickness (for BWR assemblies only)*

TABLE 6.III.4.1

MAXIMUM k_{eff} VALUES IN THE MPC-*68*M WITH INTACT (UNDAMAGED) AND DAMAGED FUEL/FUEL DEBRIS

	Maximum k_{eff},		
Bare Rod Array inside the DFC	**Assembly Classes 8x8F, 9x9E/F and 10x10G** ***(4.0 wt%)***	**Assembly Class 10x10F** ***(4.6 wt%)***	**All other assembly classes** ***(4.8 wt%)***
3x3	0.8985	n/c[†]	0.9267
6x6	0.9032	n/c	0.9295
8x8	0.9070	n/c	0.9344
9x9	0.9087	n/c	0.9371
10x10	0.9110	n/c	0.9387
11x11	0.9105	0.9341	0.9381
12x12	0.9099	n/c	0.9373
13x13	0.9084	n/c	0.9353
14x14	0.9075	n/c	0.9352
16x16	0.9064	n/c	0.9335
17x17	0.9042	n/c	0.9328

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

[†] n/c = not calculated

Table 6.III.4.7

MAXIMUM k_{eff} VALUES IN THE MPC-68M FOR EXTERNAL FLOODING

Internal Water Density (%)	*External Water Density (%)*	*7x7B (4.8%)*	*8x8F (4.5%)*	*9x9C (4.8%)*	*10x10A (4.8%)*	*10x10G (4.6%)*
100	*100*	*0.9243*	*0.9245*	*0.9254*	*0.9351*	*0.9372*
100	*70*	*0.9238*	*0.9250*	*0.9259*	*0.9353*	*0.9388*
100	*50*	*0.9235*	*0.9239*	*0.9249*	*0.9336*	*0.9380*
100	*20*	*0.9234*	*0.9245*	*0.9259*	*0.9342*	*0.9383*
100	*10*	*0.9234*	*0.9245*	*0.9257*	*0.9351*	*0.9390*
100	*05*	*0.9238*	*0.9247*	*0.9258*	*0.9346*	*0.9387*
100	*01*	*0.9230*	*0.9256*	*0.9261*	*0.9341*	*0.9377*

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

Table 2.1-3 (page 4 of 5)
BWR FUEL ASSEMBLY CHARACTERISTICS (Note 1)

Fuel Assembly Array/Class	**10x10A**	**10x10B**	**10x10C**	**10x10D**	**10x10E**	***10x10F***	***10x10G***
Clad Material	ZR	ZR	ZR	SS	SS	*ZR*	*ZR*
Design Initial U (kg/assy.) (Note 3)	≤ 188	≤ 188	≤ 179	≤ 125	≤ 125	*≤ 192*	*≤ 188*
Maximum PLANAR-AVERAGE INITIAL ENRICHMENT-*(MPC-68, 68F, and 68FF)* (wt.% ^{235}U) (Note 14)	≤ 4.2	≤ 4.2	≤ 4.2	≤ 4.0	≤ 4.0	*Note 17*	*Note 17*
Maximum PLANAR-AVERAGE INITIAL ENRICHMENT (MPC-68M) (wt.% ^{235}U) (Note 16)	*≤ 4.8*	*≤ 4.8*	*≤ 4.8*	*Note 18*	*Note 18*	*≤ 4.7 (Note 15)*	*≤ 4.6 (Note 15)*
Initial Maximum Rod Enrichment (wt.% ^{235}U)	≤ 5.0	≤ 5.0	≤ 5.0	≤ 5.0	≤ 5.0	*≤ 5.0*	*≤ 5.0*
No. of Fuel Rod Locations	92/78 (Note 8)	91/83 (Note 9)	96	100	96	*92/78 (Note 8)*	*96/84*
Fuel Rod Clad O.D. (in.)	≥ 0.4040	≥ 0.3957	≥ 0.3780	≥ 0.3960	≥ 0.3940	*≥ 0.4035*	*≥ 0.387*
Fuel Rod Clad I.D. (in.)	≤ 0.3520	≤ 0.3480	≤ 0.3294	≤ 0.3560	≤ 0.3500	*≤ 0.3570*	*≤ 0.340*
Fuel Pellet Dia. (in.)	≤ 0.3455	≤ 0.3420	≤ 0.3224	≤ 0.3500	≤ 0.3430	*≤ 0.3500*	*≤ 0.334*
Fuel Rod Pitch (in.)	≤ 0.510	≤ 0.510	≤ 0.488	≤ 0.565	≤ 0.557	*≤ 0.510*	*≤ 0.512*
Design Active Fuel Length (in.)	≤ 150	≤ 150	≤ 150	≤ 83	≤ 83	*≤ 150*	*≤ 150*
No. of Water Rods (Note 11)	2	1 (Note 6)	5 (Note 10)	0	4	*2*	*5 (Note 10)*
Water Rod Thickness (in.)	≥ 0.030	> 0.00	≥ 0.031	N/A	≥ 0.022	*≥ 0.030*	*≥ 0.031*
Channel Thickness (in.)	≤ 0.120	≤ 0.120	≤ 0.055	≤ 0.080	≤ 0.080	*≤ 0.120*	*≤ 0.060*

Table 2.1-3 (page 5 of 5)
BWR FUEL ASSEMBLY CHARACTERISTICS

Notes:

1. All dimensions are design nominal values. Maximum and minimum dimensions are specified to bound variations in design nominal values among fuel assemblies within a given array/class.
2. Deleted.
3. Design initial uranium weight is the nominal uranium weight specified for each assembly by the fuel manufacturer or reactor user. For each BWR fuel assembly, the total uranium weight limit specified in this table may be increased up to 1.5 percent for comparison with users' fuel records to account for manufacturer tolerances.
4. ≤ 0.635 wt. % 235U and ≤ 1.578 wt. % total fissile plutonium (239Pu and 241Pu), (wt. % of total fuel weight, i.e., UO2 plus PuO2).
5. This assembly class contains 74 total rods; 66 full length rods and 8 partial length rods.
6. Square, replacing nine fuel rods.
7. Variable.
8. This assembly contains 92 total fuel rods; 78 full length rods and 14 partial length rods.
9. This assembly class contains 91 total fuel rods; 83 full length rods and 8 partial length rods.
10. One diamond-shaped water rod replacing the four center fuel rods and four rectangular water rods dividing the assembly into four quadrants.
11. These rods may also be sealed at both ends and contain Zr material in lieu of water.
12. This assembly is known as "QUAD+." It has four rectangular water cross segments dividing the assembly into four quadrants.
13. For the SPC 9x9-5 fuel assembly, each fuel rod must meet either the 9x9E or the 9x9F set of limits for clad O.D., clad I.D., and pellet diameter.
14. For ~~those~~ MPC-*68, 68F, and 68FF* ~~s~~ loaded with both INTACT FUEL ASSEMBLIES and DAMAGED FUEL ASSEMBLIES or FUEL DEBRIS, the maximum PLANAR AVERAGE INITIAL ENRICHMENT for the INTACT FUEL ASSEMBLIES is limited to 3.7 wt.% ^{235}U, as applicable.
15. *Fuel assemblies classified as damaged fuel assemblies are limited to 4.6 wt.% ^{235}U for the 10x10F array/class and 4.0 wt.% ^{235}U for the 10x10G array/class.*
16. *For MPC-68M loaded with both INTACT FUEL ASSEMBLIES and DAMAGED FUEL ASSEMBLIES or FUEL DEBRIS, the maximum PLANAR AVERAGE INITIAL ENRICHMENT for the INTACT FUEL ASSEMBLIES is limited to the enrichment of the damaged assembly.*
17. *This fuel assembly array/class is not allowable contents in MPC-68, 68F, or 68FF.*
18. *This fuel assembly array/class is not allowable contents in MPC-68M.*

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Document ID 5014718
Non-Proprietary Attachment 3

AFFIDAVIT PURSUANT TO 10 CFR 2.390

I, Tammy S. Morin, 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 are Attachment 2 to Holtec Letter 5014718 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 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.

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Document ID 5014718
Non-Proprietary Attachment 3

AFFIDAVIT PURSUANT TO 10 CFR 2.390

STATE OF NEW JERSEY)
) ss:
COUNTY OF BURLINGTON)

Ms. Tammy S. Morin, being duly sworn, deposes and says:

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.

Executed at Marlton, New Jersey, this 28th day of February, 2011.

Tammy S. Morin
Holtec International

Subscribed and sworn before me this 28 day of February, 2011.

Maria C Massi

MARIA C. MASSI
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires April 25, 2015