HOLTEC INTERNATIONAL

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

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk

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

December 18, 2007

Reference:
1. USNRC Docket No. 71-9261 (HI-STAR 100), TAC L24029
2. Holtec Project 5014
3. Holtec Letter 5014605, dated October 5, 2006
4. Holtec Letter 5014631, dated August 3, 2007

Subject: Supplement to License Amendment Request (LAR) 9261-5 to HI-STAR 100 CoC

Dear Sir:

In Reference [3] Holtec submitted a License Amendment Request (LAR) 9261-5 for the HI-STAR 100 Certificate of Compliance. Reference [4] contained Holtec responses to a request for additional information (RAI) by the SFST staff. Since Reference [4] was submitted, a minor change was made to a licensing drawing included in the original LAR to improve manufacturability. Holtec requests the attached revised drawing be included for review as part of the LAR 9261-5. The attachments to this letter provide the changes and justification for those changes as follows:

Attachment 1: Change and Justification for the Drawing Revision.
Attachment 2: Drawing 4082, Revision 4, "HI-STAR HB Overpack"
Attachment 3: Proposed Revision 13b of SAR Section 1.I

Please contact us if you have any questions.

Sincerely,

Tammy Morin
Project Manager, LAR 9261-5
Acting Licensing Manager, Holtec International

cc: Ms. Kimberly Hardin, NRC
Mr. Robert Nelson, NRC
Dr. Edwin Hackett, NRC

Document ID: 5014641

NMSS01

NMSS

HOLTEC INTERNATIONAL

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

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Document ID 5014641
Attachment 1

Attachment 1 to Holtec Letter 5014641
Change and Justification for the Drawing Revision
(Total 1 Page)

Description of Drawing Change (Revision 3 to 4): Sheet 5 of drawing 4082 in view D-D, the cut out of the rim of the top flange near both trunnions has been replaced by machined flat surfaces.

Justification for Change: The change was made for ease of manufacturing.

Structural: The structural integrity of the top flange is slightly improved, since there is a smaller reduction in material in the area around the trunnions. The existing structural qualification of the top flange remains bounding, and no further changes to the structural calculations are required.

Criticality: No effect.

Thermal: No effect.

Containment: No effect.

Shielding: Although no credit is taken in the analysis, the proposed change will slightly improve the shielding provided by the top flange in the area around the trunnions since there is a smaller reduction in material. Existing calculations are bounding therefore no changes to the shielding chapter are required.

Operations: No effect.

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

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Document ID 5014641
Attachment 2

Attachment 2 to Holtec Letter 5014641
Drawing 4082, Revision 4, "HI-STAR HB Overpack"
(Total 8 Pages, including this cover sheet)

Document ID: 5014641

Figure Withheld Under 10 CFR 2.390

HOLTEC INTERNATIONAL HOLTEC CENTER 555 LINCOLN DRIVE WEST MARLTON, NJ 08053	CLIENT: PG&E		
	DESCRIPTION: HI-STAR HB OVERPACK		
PROJECT NO. 1125	DRAWING NO. 4082	SHEET 1	TOTAL SHEETS 7
I.D. NO. 3500120394	FILE PATH: N:\DRAWINGS\1125\4082		

Figure Withheld Under 10 CFR 2.390

HOLTEC INTERNATIONAL
HOLTEC CENTER
555 LINCOLN DRIVE WEST
MARLTON, NJ 08053

CLIENT: PG&E

DESCRIPTION: HI-STAR HB OVERPACK ELEVATION VIEW

SIZE	DRAWING NO.	SHEET	REV
D	4082	2	4

Figure Withheld Under 10 CFR 2.390

HOLTEC INTERNATIONAL
HOLTEC CENTER
555 LINCOLN DRIVE WEST
MARLTON, NJ 08053

CLIENT	PG&E
DESCRIPTION	HI-STAR HB OVERPACK DETAIL OF TOP FLANGE AT 0° & 180°
SIZE	D
DRAWING NO.	4082
SHEET	3
REV	4
SCALE	NTS

Figure Withheld Under 10 CFR 2.390

HOLTEC INTERNATIONAL

HOLTEC CENTER
555 LINCOLN DRIVE WEST
MARLTON, NJ 08053

COMPANION DRAWINGS

CLIENT	PG&E
DESCRIPTION	HI-STAR HB OVERPACK CLOSURE PLATE BOLT HOLE & BOLT
SIZE	D
DRAWING NO.	4082
SHEET	4
REV	4
SCALE	NTS
FILE PATH	[illegible]

Figure Withheld Under 10 CFR 2.390

HOLTEC INTERNATIONAL HOLTEC CENTER 555 LINCOLN DRIVE WEST MARLTON, NJ 08053	CLIENT: PG&E
	DESCRIPTION: HI-STAR HB OVERPACK TOP PLAN VIEW "D" – "D"
COMPANION DRAWINGS	SIZE: D · DRAWING NO.: 4082 · SHEET: 5 · REV: 4
	SCALE: NTS · FILE PATH:

Figure Withheld Under 10 CFR 2.390

HOLTEC INTERNATIONAL HOLTEC CENTER 555 LINCOLN DRIVE WEST MARLTON, NJ 08053	CLIENT: PG&E			
	DESCRIPTION: HI-STAR HB OVERPACK MID-PLANE SECTION "E" - "E"			
COMPANION DRAWINGS	SIZE: D	DRAWING NO.: 4082	SHEET: 6	REV: 4
	SCALE: NTS	FILE NAME: H:\DRAWINGS\1123\4082		

2 1

Figure Withheld Under 10 CFR 2.390

HOLTEC INTERNATIONAL HOLTEC CENTER 555 LINCOLN DRIVE WEST MARLTON, NJ 08053	CLIENT	PG&E
	DESCRIPTION	HI-STAR HB OVERPACK TEST, VENT AND DRAIN PORT DETAILS
COMPANION DRAWINGS	SIZE: D	DRAWING NO. 4082 · SHEET 7 · REV 4
	SCALE: NTS	FILE PATH: [illegible]

HOLTEC
INTERNATIONAL

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

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Document ID 5014641
Attachment 3

Attachment 3 to Holtec Letter 5014641
Proposed Revision 13b of SAR Section 1.I
(Total 11 Pages, including this cover sheet)

SUPPLEMENT 1.I

GENERAL DESCRIPTION OF THE HI-STAR 100 SYSTEM FOR HUMBOLDT BAY

1.I.0 GENERAL INFORMATION

The HI-STAR 100 System has been expanded to include options specific for use at PG&E's Humboldt Bay (HB) plant for dry storage and future transportation of spent nuclear fuel (SNF)[1.0.8]. HB fuel assemblies are considerably shorter in length than the typical BWR fuel assemblies. As a result, the HI-STAR 100 system now includes an overpack assembly and MPC for use at HB; the HI-STAR 100 Version HB (also called HI-STAR HB) and the MPC-HB. Note that the HB fuel has a cooling time of more than 25 years and relatively low burnup. The heat load and nuclear source terms of this fuel are therefore substantially lower than the design basis fuel described in the main part of this chapter. Consequently, peak cladding temperatures and dose rates are below the regulatory limits with a substantial margin. Nevertheless, all major dimensions and features, such as diameter, wall thickness, flange design, top and bottom thicknesses, are maintained identical to the standard design. Therefore, from a structural perspective, the HI-STAR HB will be even more robust than the standard overpack, due to its shorter length. Information pertaining to the HI-STAR HB System is generally contained in the "I" supplements to each chapter of this SAR. Certain sections of the main SAR are also affected and are appropriately modified for continuity with the "I" supplements. Unless superseded or specifically modified by information in the "I" supplements, the information in the main SAR is applicable to the HI-STAR System for use at HB.

1.I.1 INTRODUCTION

The HI-STAR 100 System as deployed at Humboldt Bay will consist of a HI-STAR HB overpack, an MPC-HB that includes a fuel basket assembly and enclosure vessel specific to HB, and impact limiters. The HB specific components are described below and key parameters for HI-STAR HB are presented in Table 1.I.1. Section 1.I.3 provides the HI-STAR HB design code applicability and details any alternatives to the ASME Code if different than HI-STAR 100. All discussion is supplemented by a set of drawings in Section 1.I.4.

1.I.2 PACKAGE DESCRIPTION

1.I.2.1 Packaging

1.I.2.1.1 Gross Weight

Table 2.I.2.1 summarizes the maximum calculated weights for the HI-STAR HB overpack, impact limiters, and each MPC loaded to maximum capacity with design basis SNF. Table 2.I.2.1 also provides the location of the center of gravity of the fully loaded package.

1.I.2.1.2 Materials of Construction, Dimensions, and Fabrication

Humboldt Bay specific materials of construction along with outline dimensions for important-to safety items are provided in the drawings in Section 1.1.4.

1.1.2.1.2.1 HI-STAR HB Overpack

The HI-STAR HB overpack is a heavy-walled, steel cylindrical vessel identical to the standard HI-STAR, except that the outer and inner heights are approximately 128 and 115 inches, respectively. Unlike the HI-STAR 100, the HI-STAR HB overpack does not contain radial channels vertically welded to the outside surface of the outermost intermediate shell.

1.1.2.1.2.2 MPC-HB

MPC-HB is similar to the MPC-68F except it is approximately 114 inches high. Key parameters of the MPC-HB are given in Table 1.1.2. The MPC-HB is designed to transport up to 80 Humboldt Bay BWR spent nuclear fuel assemblies meeting the specifications in Table 1.1.4. Damaged SNF and fuel debris must be placed into a Holtec damaged fuel container or other authorized canister for transportation inside the MPC-HB and the HI-STAR HB overpack. Figure 1.1.1 provides a sketch of the container authorized for transportation of damaged fuel and fuel debris in the HI-STAR HB System.

1.1.2.2 Operational Features

The sequence of basic operations necessary to load fuel and prepare the HI-STAR HB system for transport is identical to that of HI-STAR 100. The supporting drawings for HB can be found in Section 1.1.4.

1.1.2.3 Contents of Package

This section delineates the authorized contents permitted for shipment in the HI-STAR HB System, including fuel assembly types; non-fuel hardware; neutron sources; physical parameter limits for fuel assemblies and sub-components; enrichment, burnup, cooling time, and decay heat limits; location requirements; and requirements for canning the material, as applicable.

1.1.2.3.1 Determination of Design Basis Fuel

The HI-STAR HB package is designed to transport Humboldt Bay fuel assemblies. The HB fuel assembly designs evaluated are listed in Table 1.1.3. Table 1.1.4 provides the fuel characteristics determined to be acceptable for transport in the HI-STAR HB System. Each "array/class" listed in this table represents a bounding set of parameters for one or more fuel assembly types. The array/classes are defined for HB in Section 6.1.2. Table 1.1.5 lists the fuel assembly designs that are found to govern for the qualification criteria. Tables 1.1.4 and 1.1.7 provide the specific limits for all material authorized to be transported in the HI-STAR HB System.

1.I.2.3.2 Design Payload for Intact Fuel

The fuel characteristics specified in Table 1.I.4 have been evaluated in this SAR and are acceptable for transport in the HI-STAR HB System.

1.I.2.3.3 Design Payload for Damaged Fuel and Fuel Debris

Limits for transporting HB damaged fuel and fuel debris are given in Table 1.I.7. Damaged HB fuel and fuel debris must be transported in the Holtec designed Humboldt Bay Damaged Fuel Container (DFC) as shown in Figure 1.I.1.

1.I.2.3.4 Structural Payload Parameters

The main physical parameters of an SNF assembly applicable to the structural evaluation are the fuel assembly length, envelope (cross sectional dimensions), and weight. In order to qualify for transport in the HI-STAR HB MPC, the SNF must satisfy the physical parameters listed in Table 1.I.7. The center of gravity for HB, reported in Chapter 2.I, is based on the maximum fuel assembly weight. Upper fuel spacers (as appropriate) in the form of welded I-beams, approximately 4 inches high, maintain the axial position of the fuel assembly within the MPC basket and, therefore, the location of the center of gravity. The upper spacers are designed to withstand normal and accident conditions of transport. An axial clearance of approximately 2 inches is provided to account for the irradiation and thermal growth of the fuel assemblies.

1.I.2.3.5 Thermal Payload Parameters

Table 1.I.7 provides the maximum heat generation for all fuel assemblies authorized for transportation in the HI-STAR HB System.

1.I.2.3.6 Radiological Payload Parameters

The design basis dose rates are met by the burnup level, cooling time, and minimum enrichment presented in Table 1.I.6 for HI-STAR HB.

1.I.2.3.7 Criticality Payload Parameters

The neutron absorber's minimum ^{10}B areal density loading for MPC-HB is specified in Table 1.I.2.

1.I.2.3.8 Non-Fuel Hardware and Neutron Sources

None.

1.I.2.3.9 Summary of Authorized Contents

Table 1.I.1 summarizes the key system data for the HI-STAR HB. Table 1.I.2 summarizes the key parameters and limits for the MPC-HB. Tables 1.I.4 and 1.I.7 and other tables referenced from these tables provide the limiting conditions for all material to be transported in the HI-STAR HB.

1.I.3 <u>DESIGN CODE APPLICABILITY</u>

Design code applicability for the HI-STAR HB is identical to HI-STAR 100 as presented in Section 1.3, except that the internal surfaces of the intermediate shells will not be coated with a silicone encapsulant due to its lower heat loads.

1.I.4 <u>DRAWINGS</u>

Drawing Number/Sheet	**Description**	**Rev.**
4082	*Licensing Drawing for HI-STAR HB Overpack Assembly*	*4~~3~~*
4102	*Licensing Drawing for MPC HB Enclosure Vessel*	*1*
4103	*Licensing Drawing for MPC HB Fuel Basket Assembly*	*3~~2~~*
4113	*Licensing Drawing for Damaged Fuel Container*	1

1.I.5 <u>COMPLIANCE WITH 10CFR71</u>

Same as in Section 1.5.

1.I.6 <u>REFERENCES</u>

Same as in Section 1.6.

Table 1.I.1

SUMMARY OF KEY SYSTEM DATA FOR HI-STAR HB

PARAMETER	*VALUE (Nominal)*	
Types of MPCs in this Supplement	*1*	*MPC HB*
MPC capacity	*MPC HB*	*- Up to 80 intact ZR Humboldt Bay fuel assemblies.* *- Up to 28 Damaged Fuel Assemblies/Fuel Debris in DFCs located in the peripheral basket cells, remaining cells loaded with intact ZR Humboldt Bay fuel assemblies; or,* *- Up to 40 Damaged Fuel Assemblies/Fuel Debris in DFCs arranged in a checkerboard pattern with 40 intact ZR Humboldt Bay fuel assemblies*

Table 1.1.2
KEY PARAMETERS FOR MPC-HB

PARAMETER	***VALUE (Nominal)***
Unloaded MPC weight (lb)	*See Table 2.1.2.1*
Fixed neutron absorber (Metamic) ^{10}B loading density (g/cm^2)	*0.01*
Pre-disposal service life (years)	*40*
Design temperature, max. /min. (°F)	*725°/-40°*
Design Internal pressure (psig) *Normal Conditions* *Off-normal Conditions* *Accident Conditions*	 *100* *100* *200*
Total heat load, max. (kW)	*2*
Maximum permissible peak fuel cladding temperature (°F)	*752* *(Normal conditions)* *1058* *(Accident conditions)*
MPC internal environment Helium filled (psig)	*≥ 0 and ≤ 48.8 psig at a reference temperature of 70°F*
MPC external environment/overpack internal environment Helium filled initial pressure (psig, at STP)	*≥ 10 and ≤ 14*
Maximum permissible reactivity including all uncertainty and biases	*<0.95*
End closure(s)	*Welded*
Fuel handling	*Opening compatible with standard grapples*
Heat dissipation	*Passive*

Table 1.1.3

HUMBOLDT BAY FUEL ASSEMBLIES EVALUATED TO DETERMINE DESIGN BASIS SNF

Assembly Class	***Array Type***	
Humboldt Bay	*All 6x6*	*All 7x7*

Table 1.1.4
HUMBOLDT BAY FUEL ASSEMBLY CHARACTERISTICS

Fuel Assembly Array/Class	*6x6D*	*7x7C*
Clad Material	*ZR*	*ZR*
Design Initial U (kg/assy.)	*≤ 78*	*≤ 78*
Initial Maximum Rod Enrichment (wt.% ^{235}U)	*≤ 4.0 (see Note 1)*	*≤ 4.0~~5.5~~*
Maximum planar-average initial enrichment (wt.%^{235}U)	*≤ 2.6*	*≤ 2.6*
No. of Fuel Rod Locations	*36*	*49*
Fuel Clad O.D. (in.)	*≥ 0.5585*	*≥ 0.4860*
Fuel Clad I.D. (in.)	*≤ 0.5050*	*≤ 0.426*
Fuel Pellet Dia. (in.)	*≤ 0.4880*	*≤ 0.4110*
Fuel Rod Pitch (in.)	*≤ 0.740*	*≤ 0.631*
Active Fuel Length (in.)	*≤ 80*	*≤ 80*
No. of Water Rods	*0*	*0*
Channel Thickness (in.)	*≤ 0.060*	*≤ 0.060*

Note 1: Two 6x6D assemblies contain one high power test rod with an initial enrichment of 5.5%.

Table 1.I.5

DESIGN BASIS FUEL ASSEMBLY FOR EACH DESIGN CRITERION

Criterion	***MPC-HB***
Reactivity	*6x6D and 7x7C*
Shielding (Source Term)	*6x6D*
Fuel Assembly Effective Planar Thermal Conductivity	*7x7C*
Fuel Basket Effective Axial Thermal Conductivity	*6x6D*

Table 1.I.6

HUMBOLDT BAY FUEL ASSEMBLY COOLING, AVERAGE BURNUP, AND MINIMUM ENRICHMENT LIMITS

Post-irradiation Cooling Time (years)	***Assembly Burnup (MWD/MTU)***	***Assembly Minimum Enrichment (wt. % ^{235}U)***
$\geq$ 29	*$\leq$ 23,000*	*$\geq$ 2.09*

Table 1.I.7
LIMITS FOR MATERIAL TO BE TRANSPORTED IN MPC-HB

PARAMETER	***VALUE (Note 1)***	
Fuel Type (Note 2)	*Uranium oxide, HB BWR intact fuel assemblies meeting the limits in Table 1.I.4 for the applicable array/class, with or without Zircaloy channels*	*Uranium oxide, HB BWR damaged fuel assemblies or fuel debris meeting the limits in Table 1.I.4 for array/class 6x6D or 7x7C with or without Zircaloy channels, placed in HB Damaged Fuel Containers (DFCs)*
Cladding Type	*ZR*	*ZR*
Maximum Initial Enrichment	*As specified in Table 1.I.4 for the applicable array/class*	*As specified in Table 1.I.4 for the applicable array/class*
Post-irradiation Cooling Time, Average Burnup, and Minimum Initial Enrichment per Assembly	*As specified in Table 1.I.6.*	*As specified in Table 1.I.6.*
Decay Heat Per Assembly	*≤ 50 Watts*	*Fuel debris up to a maximum of one equivalent fuel assembly is allowed (Note 4)*
Fuel Assembly Length	*≤ 96.91 in. (nominal design)*	*≤ 96.91 in. (nominal design)*
Fuel Assembly Width	*≤ 4.70 in. (nominal design)*	*≤ 4.70 in. (nominal design)*
Fuel Assembly Weight	*≤ 400 lbs (including channels)*	*≤ 400 lbs, (including channels and DFC)(Note 3)*
Quantity per MPC	*Up to 80 HB BWR intact fuel assemblies*	*Up to 28 DFCs loaded in the peripheral cells of the basket with 52 intact assemblies in the remainder (figure 6.I.3)* ***or*** *Up to 40 DFCs with 40 intact assemblies loaded in a checkerboard pattern (figure 6.I.4)*
Other Limitations	*Stainless steel channels are not permitted.*	

Table 1.I.7 (cont.)
LIMITS FOR MATERIAL TO BE TRANSPORTED IN MPC-HB

Notes:

1. *A fuel assembly must meet the requirements of any one column and the other limitations to be authorized for transportation.*
2. *Fuel assemblies with channels may be stored in any fuel cell location.*
3. *The total quantity of damaged fuel permitted in a single DAMAGED FUEL CONTAINER is limited to the equivalent weight and special nuclear material quantity of one intact assembly.*
4. *Fuel debris in the form of loose debris consisting of zirconium clad pellets, stainless steel clad pellets, unclad pellets or rod segments up to a maximum of one equivalent fuel assembly is allowed.*