Entergy

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Fred Dacimo
Site Vice President
Administration

October 03, 2007

Re: Indian Point, Unit No.1
Docket No. 50-003
NL-07-117

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop O-P1-17
Washington, DC 20555-0001

Subject: **Reply to Request for Additional Information (RAI) Regarding Indian Point 1 License Amendment Request (LAR) for Fuel Handling Building Crane**

References: (1) Letter: F. Dacimo, Entergy to USNRC; "License Amendment Request (LAR)-Unit 1 Fuel Handling Building Crane", License No. DPR-5; Docket No. 50-003, NL-07-033; dated February 22, 2007, ADAMS Accession No ML070740552.

(2) Letter: T. Smith, USNRC to F. Dacimo, Entergy; " Regarding Letter Dated February 22, 2007, Entergy Nuclear Operations Inc., Requested an Amendment to Indian Point Unit 1 Provisional Operating License"; Docket 50-003; Dated September 7, 2007; ADAMS Accession No. ML072480497.

Dear Sir or Madam;

In Reference (1), Entergy Nuclear Operations, Inc. (ENO) submitted a License Amendment Request (LAR) to the Indian Point Unit 1 Provisional Operating License regarding the use of the Fuel Handling Building crane in support of the Dry Fuel Storage project.

Reference (2) is a Request for Additional Information (RAI) in order for the USNRC to complete its review of the LAR. The responses to the questions are provided in Attachments 1 and 2.

Questions (1)(b), 1(c), and 1(d) from the Structural Mechanics and Materials Branch requested the submittal of calculations, including the LS_DYNA input and output files, for three cask drop analyses performed by Holtec International, Inc.

These documents, which are proprietary information, are provided by Holtec on a compact disk (CD-ROMs) as Enclosure 1.

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This submittal is supported by an affidavit signed by Holtec, the owner of the design. The affidavit sets forth the basis on which the information may be withheld from public disclosure by the Commission and address with specificity the consideration listed in paragraph (b)(4) of section 2.390 of the Commission's regulations. Accordingly, it is respectfully requested that the information that is proprietary to Holtec be withheld from public disclosure in accordance with 10 CFR 2.390 of the Commission's regulations. Holtec authorization letter dated September 21, 2007 (ID# 1535017) with the accompanying affidavit, Proprietary Information Notice (ID# 1535018), is provided in Attachment 3.

Correspondence with respect to the copyright on proprietary aspects of the items above or the supporting affidavit should reference ID # 1535018 and be addressed to Scott Kozink, Dry Fuel Project Manager, Holtec Center, 555 Lincoln Drive West, Marlton, NJ 08053.

The additional supporting information provided in this letter does not alter the conclusions of the no significant hazards evaluation that supports the license amendment request. The are no new commitments identified in this submittal. If you have any questions or require additional information, please contact Robert Walpole, Manager, Licensing, at 914-734-6710.

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

Executed on 10/03/07
Date

Sincerely,

Fred R. Dacimo
Vice President – Operations
Indian Point Energy Center

Attachment 1:	Additional Information for IPEC Unit 1 Fuel Handling Building crane License Amendment Request .
Attachment 2:	Figures and Tables
Attachment 3:	Holtec Authorization Letter dated September 21, 2007 (ID# 1535017), with accompanying affidavit and Proprietary Notice, (ID# 1535017).
Enclosure 1:	Holtec Calculations and Input Data (CD-ROM compact disk)

cc: (w/o enclosure)

Mr. John P. Boska,
NRR Senior Project Manager

Mr. Samuel J. Collins,
Regional Administrator, Region 1

Mr. Theodore B. Smith,
Reactor Decommissioning Branch, Project Manager

Mr. Paul Eddy,
Public Service Commission

Mr. Paul D. Tonko, President
NYSERDA

Unit 2 & 3 IPEC NRC Resident Inspector's Office

ATTACHMENT 1 TO NL-07-117

ADDITIONAL INFORMATION FOR IPEC UNIT 1
FUEL HANDLING BUILDING CRANE
LICENSE AMENDMENT REQUEST

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT UNIT NO. 1
DOCKET NO. 50-003

Piping and Nondestructive Examination Branch

I. Section 4.3 Crane Structural Steel:

(a) This section of the analysis states that the trolley-to-end truck bolting was replaced to assure the adequacy of the bolting material to resist the calculated seismic stresses. Describe in detail how the material for the replaced bolting was selected to meet the functional and strength requirements.

Response: *The crane drawings do not identify the subject bolt material, so two assumed materials (ASTM A-7 and ASTM A-325) were considered that would have been available during crane assembly. A-7 was found to not satisfy design requirements but A-325 was; the highest ratio to allowable for A-325 bolting was determined to be 0.49. Since visual inspection could not confirm use of A-325, the bolts were replaced using A-325 bolting as the replacement. Although this bolting is subjected to some level of tension, shear is the primary loading and fatigue would not be a significant factor.*

(b) For the welds at the Crane, identify the welding codes/standards that are used to qualify the welding procedures and welders.

Response: *The original crane specification (MP-5830, dated 7/11/1958) required fabrication welding to be in conformance with latest applicable ASTM specifications. No significant structural modifications have been made on the crane since original fabrication. The crane was manufactured by Milwaukee Crane almost 50 years ago. A thorough search of the Indian Point historical records and contact with the vendor could not locate any weld records or information beyond the original purchase specification requirements listed above. The 125% proof test, the rigorous seismic analysis and the cask drop consequence analyses were performed, in part, to compensate for this lack of original design information.*

Any minor post-installation welding on the crane structure has been done in accordance with Indian Point site procedures. Current procedures applicable to such efforts are ENN-DC-3001 (General Welding Procedure – AWS Code Welding), ENN-DC-321 (Control of Welding and Brazing Procedure Specifications) and ENN-DC-322 (Control of Welder Qualification). The applicable welding code applied by reference within these procedures is AWS D1.1 (Structural Welding Code – Steel).

(c) This section of the analysis states that an engineering review of the crane's past inspection and maintenance history was performed. As a result of this review, critical structural areas were identified and inspected. Discuss the criteria that are used to identify the critical structural areas and describe the details of the inspection performed.

Response: *Critical components were identified based on (1) analysis results of the integrated crane and building structural model showing locations of high* *loading (e.g., bridge girder bolting to end trucks); (2) locations of significance from a primary load path standpoint (e.g., main hook); (3) locations of significance from a basic structural mechanics/strength of materials standpoint (e.g., bridge girder welds at mid-span cross-section extremes); and (4) locations of significance based on structural engineering experience (e.g., end truck bolting securing wheel bearing housings). In addition to the crane inspections described in response to (2)(a) and (2)(b) below, a broader baseline NDE inspection involving both the crane and the supporting building structure was performed during July and August 2006. This inspection involved all aspects of the later NDE inspection associated with the proof load test (see response to (2)(b)(ii) and (2)(b)(iii) below) as well as the trolley rail clips and bridge rail clips and associated welding/bolting. Primarily as a result of this inspection – where numerous rejections were identified involving the truck rail clips – all bridge rail clip bolting was replaced (see further discussion below). The NDE inspections comprised of performing VT, MT and UT of the identified inspection locations. The Inspections were performed using Entergy procedures (ENN-NDE-10.01, VT-1 Examination, ENN-NDE-9.30, Magnetic Particle Examination (MT), ENN-NDE-9.05, Ultrasonic Thickness Examination and ENN-NDE-10.08, Visual Examination of Welds). The qualification of the Level II Inspector was reviewed and approved by Entergy in accordance with ENN-NDE-1.00, Administrative Controls for Non-destructive Examinations. A summary of these baseline NDE inspection results is provided in Table 2 of Attachment 2. The recommended repairs are shown in Table 3 of Attachment 2 and were implemented prior to the 125% proof load test.*

a. This section of the analysis states that all bridge rail tie-down bolting were replaced due to the concern of potential cracking. Provide additional information regarding the following:

   (i) Describe the conditions of the referenced bolting that raised concern of potential cracking.

   Response: *Some initial inspections identified two failed bolts. These bolts and two others that were not failed were removed and examined. The two that were not failed were found to contain cracks. All four bolts were determined to have been subjected to intergranular stress corrosion cracking (SCC) at locations of high tensile stress. Further investigation indicated that the bolting (consistent with the original specification) was copper alloy 655 (current UNS C65500). The nuts used for installation were ASTM A-7. Apparently to facilitate rail tie-down clip installation, the nuts were welded to the underside of the supporting building girder.*

   Further inspections identified bolting in several locations along the rails that were loose. As a result of the inspections and material examinations, all rail clip tie-down bolting was removed and replaced with ASTM A-307 bolting.

   (ii) Identify whether or not follow-up examination performed on the replaced bolting to confirm the suspected cracking condition? Discuss the results if it was performed. Provide justification if it was not performed.

Response: *Follow-up examination and results are discussed above. As indicated, all bridge rail tie-down bolts were replaced.*

(iii) Discuss augmented inspections that were performed on other bolting that may have similar concern for potential cracking.

Response: *No other inspections were performed. This bolt material type is not used at any other connection associated with the crane or FHB Structural Steel.*

2. Section 4.4 Crane Inspections and Tests:

(a) This section of the analysis states that the IP-1 FHB 75 ton crane receives pre-use inspections, operational inspections and an annual inspection. Describe in detail regarding those inspections, especially the most recent annual inspection completed in August 2006. The information should include the following: the components, bolting and welds that were inspected, the inspection methods, the extent of inspection, inspection results, and any repair performed as a result of the inspections.

Response: *(Background) Although crane use has been intermittent since Unit 1 ceased operation in 1974 and the crane could potentially be considered as "not in regular use", crane inspections have occurred both on an individual use basis in accordance with Entergy procedures (RW-SQ-4.510, "Crane Operation and Rigging for Radwaste" and SAO-251, "Conduct of Maintenance"), and on a more periodic basis. Prior to 2002, periodic inspections were performed quarterly by Simmers Crane Design & Services Co. Beginning in 2002, inspections were begun on an annual basis and were performed by Whiting Services, Inc. Inspections by both Simmers and Whiting were documented via standard crane inspection checklists intended to address the various aspects of inspection required by OSHA Standard No. 1910.179, "Overhead and Gantry Cranes," and recommended by ANSI B30.2. Individual use inspections are required by RW-SQ-4.510 prior to each use or once per shift (when in regular use).*

The most recent inspections occurred prior to and following the proof load test (see responses to (b) below). Whiting Services, Inc. performed pre- and post-proof load test inspections of the crane on 3/2/2007 and 3/14/2007, respectively. The inspections were based on Whiting Services interpretation of OSHA 2206-29CFR1910, Section 179, and the related original manufacturers specification. These requirements meet the inspection requirements outlined within ANSI/ASME B30.2 Chapter 2-2. Items inspected follow an extensive Whiting checklist intended to address all pertinent aspects of the cited OSHA standard and of B30.2.

Both the pre- and post-proof load test inspections identified a couple of regular maintenance items (Safety Code 2) that were not corrected prior to the test but which were repaired in August of 2007. One item noted involved the main hoist rotary limit switch. The limit switch was not rendered inactive; however, the engagement of the bar on the switch was less than desirable. The *recommended limit switch repairs cited in the March inspection reports were successfully completed during August of 2007.*

The checklist from the post load test inspection on 3/14/2007 is included as Table 1 of Attachment 2.

(b) This section of the analysis states that a non-destructive examination (NDE) inspection will be performed following the proof test to verify the condition of critical structural components. In Table 4, the licensee also stated that a full load proof test will be performed on the crane prior to first lift of the transfer cask with fuel at the minimum operating temperature. Provide detailed information regarding the following:

(i) Please describe the proof test that will be performed on the subject crane and compare this test with that performed in the past.

Response: *The proof test was performed on 3/6/2007. The test was performed within the Chemical Services Building, remote from the spent fuel pools but with the trolley location selected to mimic, as closely as reasonably practical, the position when lifting the dry casks from the Cask Load Pool in the Fuel Handling Building. The lift load test block used was 188,495 lbs, or 125.6% of the 150,000 lbs (75 ton) rated crane load. The rigged load was comprised of stamped crane counterweights consisting of eight (8) 10 metric ton weights and one (1) 5.5 metric ton "pup" weight. The weights were supplied by Bay Crane of Long Island City, NY. The counter weights were engineered steel weights specifically designed to parts of an OSHA-approved mobile crane assembly. As such, the stamped weights need to be accurate to permit the crane to perform safely and to verify that transport and erection rigging can be safely carried out. The rigged test block was lifted approximately 1" off floor cribbing set up as part of the test. The lift was very smooth with no indication of out-of-plumb alignment. There was no sign or noise indication of distress from the crane, motor components, or building steel at any time during or after the test. The test block was held in position for over five minutes with no indication of drift. Following the hold of the load, the load was returned to the cribbing, and the rigging disassembled. Temperatures of both the FSB structural steel and the crane girder steel were recorded during the test and these values will be the lower bound temperatures permitted by procedure during the actual dry cask lifts (i.e. 68 F for the crane bridge girders and 57 F for the building columns).*

No crane girder displacements were measured during the test since this is not explicitly required by ANSI B30.2. It was additionally concluded at the time of the test not to attempt a measurement because of industrial safety concerns in the vicinity of the test rig. It is a requirement of ASME NOG-1 to assure via calculations that mid-span displacements do not exceed specific limits. This check was performed as part of the crane evaluation using the developed finite element model of the crane and building structure. The specific limit given in NOG-1 is 1/1000 of the girder span, or 0.764" in this case, for operating loads not including the girder deadweight or any impact load. The calculated displacement on this basis was 0.65" for a ratio to allowable of 0.88.

The procurement specification for the crane did not directly specify or otherwise provide details for a crane test to confirm the required 75-ton load rating. The specification did require conformance with New York state safety standards and "any other codes applying to this type of equipment with New York codes governing." At the time, USAS B30.2-1943 (reaffirmed 1956) would have been applicable such that testing would most likely have been done to 125% of the load rating, although details of such testing are unknown. Because of the non-operational status of Unit 1, there have been no on-going tests that have been performed or required since the plant was shut down.

(ii) Identify the critical structural components including bolting and welds that will be inspected by NDE after the proof test.

Response: *The following components were inspected by NDE: Main hook, east/west end girder and truck welds, east/west end trolley and girder bolting, east/west end truck and locator bolting, east/west end truck tie welds, bridge girder welds and end truck wheel bolting.*

(iii) Describe what NDE will be performed on each critical structural components and to what extent.

Response: *NDE used was as follows:*

Component	*NDE*	*Extent*
Main hook	*MT, VT*	*All accessible areas MT'd & VT'd*
Girder/truck welds	*MT, VT*	*All welds between girders and angle used to bolt to end trucks MT'd & VT'd*
Truck/girder bolting	*VT*	*All bolts between girder support angle and end trucks VT'd*
Truck/locator bolting	*VT*	*All bolts connecting end trucks to end truck wheel bearing housings VT'd*
Truck tie welds	*MT*	*All welds connecting truck ties (lugs) to end trucks MT'd & VT'd*
Bridge girder welds	*MT*	*Selected web-to-web and web-to-flange welds on all four girders MT'd*
End truck wheel bolting	*VT*	*All bolts connecting trolleys to trolley wheel bearing housings VT'd*

A thorough description of the procedures used and the qualifications of the Level II inspector was provided in response to Question 1 (c) above. All of the post-proof test inspections were acceptable.

(iv) Describe the inspection procedure, equipment and personnel that will be used for the subject inspection and compare with that of ASME Code, Section XI requirements.

<u>Response:</u> *VT's were performed based on Entergy Procedure ENN-NDE-10.08, Rev. 0. MT's were performed based on Entergy Procedure ENN-NDE-9.30, Rev. 0. The VT's were performed using optical aids (flashlight, 6" scale, mirror). The MT's were performed using Magnaflux Model Y-6 (yoke contacts). Integrated Technologies, Inc. of Waterford, CT, performed all inspections. The qualifications of the Level II inspector were reviewed and approved in accordance with Entergy Procedure ENN-NDE-1.00. Although the cited procedures include provisions for inspections in accordance with Section XI, the inspected components are not within the scope of Section XI.*

(v) Describe the criteria that are used to determine a component to be a critical component.

<u>Response:</u> *Critical components were identified based on (1) analysis results of the integrated crane and building structural model showing locations of high loading (e.g., bridge girder bolting to end trucks); (2) locations of significance from a primary load path standpoint (e.g., main hook); (3) locations of significance from a basic structural mechanics/strength of materials standpoint (e.g., bridge girder welds at mid-span cross-section extremes); and (4) locations of significance based on structural engineering experience (e.g., end truck bolting securing wheel bearing housings).*

3. Section 4.5 Crane Seismic Qualification:

(a) This section of the analysis states that the crane and supporting structure were determined to remain below material yield when subject to the maximum load lift combined with safe shutdown earthquake (SSE) loads. Describe how the material yield strength was determined for the critical structural components and discuss the safety margins that are incorporated into the load calculations.

<u>Response</u>: *Original design documents do not generally identify structural materials used for the building or crane (typically identified as "structural steel"). Based on the time of fabrication and construction (c.1958 – 1960), ASTM A-7 would have been the most likely material used for building steel and primary structural members of the crane. For A-7, a yield value of 33 ksi is used for qualification. There was another material of slightly lower yield strength – ASTM A-373, 32 ksi – that was also available during the period of crane fabrication. This value is used as the basis for primary crane structural member qualification. Crane drawings do identify other materials for certain crane elements where A-7 or A-373 would not provide the appropriate product form. The main drum shaft, trolley axles and truck axles are identified on crane drawings as AISI 1045, with no material treatment or condition identified. Review indicates that hot rolled provides the lowest yield (45 ksi) and this is used for qualification. The hoist sheave pins are identified on crane drawings as AISI 1020, without material treatment or condition consistently identified. The lowest yield found (30 ksi) is used for qualification. ASTM allowables are based on the AISC Code 6th Edition; AISI allowables are based on the ASM manual "Engineering Properties of Steel."*

Explicit safety margins for crane components are those maintained by satisfaction of the allowable stresses given in NOG-4300 ("Design Criteria") of ASME-NOG-1 for loads associated with normal operating and extreme environmental conditions as defined in NOG-1. Loads are applied consistent with NOG-1 definitions; the maximum calculated ratio to allowable for any crane component is 0.96. For building steel, safety margins are those maintained by satisfaction of allowable stresses given in the AISC Manual of Steel Construction. For loading applied consistent with NOG-1 definitions, the maximum calculated ratio to allowable for any building steel is 0.85. A more detailed summary of individual component stress ratios is provided in the response to Mechanical and Civil Branch Question 6.

Mechanical and Civil Engineering Branch (Evaluating structural adequacy of the crane)

(1) Section 3.1 Fuel Handling Building 75 Ton Crane Design and Licensing Considerations:

(a) The fourth paragraph of this section of the analysis states that only the main hoist (with a rated load of 75 tons) of the FHB crane is used to lift the transfer casks. What preventive measures/controls will the licensee have in place to ensure that the auxiliary hoists (rated load of 15 tons and 3 tons)are not used inadvertently in the transfer cask handling operations?

Response: *Unit 1 cask loading operations will be controlled by specific cask loading procedures (1-DCS-028-GEN Unit 1 MPC Loading and Sealing Operations, 1-DCS-035-GEN Unit 1 MPC Unloading and1-DCS-025-GEN Air Pad Operation) which will clearly require the use of the main hoist for the transfer cask and cask lid lifts. Additionally, the Holtec designed and fabricated special lifting device has been specifically designed to mate with the main hoist sister hook. The subject lifting device is not compatible with the smaller auxiliary hoists.*

(2) Section 3.2 Fuel Building Loading Operations Summary:

(a) The third paragraph of this section of the analysis states that the combined maximum lift weight, including rigging and lift yoke will not exceed 75 tons, which is the design rated load of the IP-1 FHB 75 ton crane. Please provide the following"

(i) Confirm whether or not the weight of the hook block is included in the design rated load and the maximum lift weight.

Response: *The 75 ton rated load is exclusive of the lower hook block. The weight of the lower block assembly (including the sister hook) is 7,294 pounds as specified on Milwaukee Crane drawing 1691-A-M. This load was added to, and lumped with, the 75 ton rated load in our structural and seismic analyses.*

(ii) Provide the actual maximum lift weight expected to be lifted during spent fuel cask handling operations using the IP-1 FHB 75 ton crane.

(iii) Please provide a breakdown of this load in terms of weights of the loaded fuel, canister, transfer cask, lifting yoke, hook block, rigging, etc. and demonstrate that the total load does not exceed 75 tons. Indicate if these weights are measured or calculated/estimated; and

(iv) Describe the minimum factor of safety associated with the 75 ton design rated load for the IP-1 FHB Crane. If the weights used are calculated or estimated, indicate how this factor of safety could be impacted by possible variations in the actual load.

Response: *Maximum load lift tabulation:*

	LIFT OUT OF POOL	***LIFT ONTO AIR PAD***
Hi Trac:	*Calculated (pounds)*	*Calculated (pounds)*
Transfer cask body	*62,636*	*62,636*
Pool lid & O-ring	*8,150*	*8,150*
Top lid		*1,243*
Water Jacket		*6,419*
Misc	*85*	*85*
MPC:		
Shell	*9,315*	*9315*
Lid	*9,650*	*9650*
Misc	*140*	*500*
Fuel (32 @ 660)	*21,120*	*21,120*
DFCs (32 @189)	*6,048*	*6,048*
Water (In MPC and Hi Trac annulus)	*13,700*	
Lift Yoke	*2,300*	*2300*
Total lift	*134,387 (67.2 tons)*	*127,466 (63.7 tons)*

This calculated weight provides approximately a 10% margin to the rated load. It should be noted that for the heaviest item, the transfer cask body, the actual delivered weight was less than our calculated bounding weight estimate by over 2 tons (i.e. 58,240 pounds compared to the calculated weight of 62,636 pounds). Using the actual weight for the transfer cask body increases the margin to the rated load to greater than 13%.

An upper bound weight of 75 tons has been used in our structural and seismic analyses. The 125% proof test, which was completed in March of 2007, was performed with stamped test weights totaling 188,495 pounds. The margins listed above, coupled with the fact that we will be loading only 5 casks, provides significant assurance that the crane capacity is adequate to perform the required lifts.

(3) Section 4.3 Crane Structural Steel:

(a) Since the FHB 75 ton crane is of an older vintage (designed and procured in 1958 and installed in 1962), how were age related degradation effects were considered and evaluated for the crane structural steel during the licensee's review and inspection of the crane in preparation for the planned dry cask loading effort?

Response: *The crane is located indoors and has never experienced outdoor environmental conditions that could contribute to age-related degradation. Additionally, crane lifts rarely exceeded 30 tons throughout its life. This coupled with the need to handle only five casks during the dry cask campaign minimizes any other fatigue related concerns.*

(b) Please list the welds that were selected as critical and subjected to NDE inspection. Please confirm specifically if the following welds were included and inspected as critical welds:

(i) The welds of the truck structure that supports and aligns the crane bridge and trolley wheels on their respective runway rails; and

(ii) The welds that align the wheel trucks relative to the bridge girders and

(iii) Welds in the bridge girders and trolley load girder.

Response: *Welds subjected to NDE inspection following the 125% proof load test included end girder to truck welds, truck tie welds and bridge girder welds. The inspections were performed by a Certified Level II inspector using approved Site procedures. The qualifications/certifications of the inspector were reviewed and approved in accordance with Site procedures. All of the inspection results were acceptable with no discrepancies noted.*

(i) The support of the bridge girders is provided primarily via bearing on the top surface of the trucks with resultant load transfer via bearing to the truck axles and wheels. Truck welds provide stability rather than primary load transfer. Truck wheel alignment is via bolting between the wheel axle bearing housings and the truck structure. Additionally, alignment is aided by each end truck pair remaining connected to each other with a pinned link beam attached to the inside truck ends via ¾" thick lugs welded to the truck assembly. The bolting and the lug welds were inspected. The inspection results (VT and MT) were all acceptable.

(ii) Alignment of the bridge girders to the trucks is achieved primarily via vertical clip angles (4x4x¾) that are welded to either side of each bridge girder and bolted to the inside face of the truck. This welding (and the bolting) was inspected. The inspection results (MT and VT) were all acceptable.

(iii) Welds in the bridge girders were inspected at several locations on all four girders (web-to-gussets, web-to-flanges). The inspection results (MT) were all acceptable. No specific welds were inspected on the trolley. The trolley supports bear directly on the inner bridge girders and there are no accessible welds of any structural significance.

(4) Section 4.4 Crane Inspections and Tests:

(a) Please discuss the procedure and/or standard that will be used for performing the full load proof test of the crane.

(b) Staff notes that the FHB 75 ton crane proposed to be used for IP-1 dry cask handling operations is an older vintage (designed and procured in 1958 and installed in 1962) partly refurbished crane and the limiting dry spent fuel cask load that will be handled is at or close to the design rated load of 75 tons, with possible variation (increase) due to dynamic effects during cask load handling. Please discuss your basis for concluding that use of 100% of the design rated load of 75 tons as the proof test load for the crane should suffice to provide a proper verification of the structural adequacy of the crane for dry spent fuel cask handling operations.

Response: *Proof load test was performed to 125.6% of rated load (188,495 lbs) with no adverse results. The load test is described in detail in Entergy Engineering Evaluation IP2-06-34195. The higher 125% proof testing exceeds that required by more recent editions of ANSI B30.2 and is in agreement with the testing specified in NUREG-0612.*

The proof test was performed on 3/6/2007. The test was performed within the Chemical Services Building, remote from the spent fuel pools but with the trolley location selected to mimic, as closely as reasonably practical, the position when lifting the dry casks from the Cask Load Pool in the Fuel Handling Building. As stated above, the lift load test block used was 188,495 lbs, or 125.6% of the 150,000 lbs (75 ton) rated crane load. The rigged load was comprised of stamped crane counterweights consisting of eight (8) 10 metric ton weights and one (1) 5.5 metric ton "pup" weight. The weights were supplied by Bay Crane of Long Island City, NY. The counter weights were engineered steel weights specifically designed to parts of an OSHA-approved mobile crane assembly. As such, the stamped weights need to be accurate to permit the crane to perform safely and to verify that transport and erection rigging can be safely carried out. The rigged test block was lifted approximately 1" off floor cribbing set up as part of the test. The lift was very smooth with no indication of out-of-plumb alignment. There was no sign or noise indication of distress from the crane, motor components, or building steel at any time during or after the test. The test block was held in position for over five minutes with no indication of drift. Following the hold of the load, the load was returned to the cribbing, and the rigging disassembled. Temperatures of both the FSB structural steel and the crane girder steel were recorded during the test and these values will be the lower bound temperatures permitted during the actual dry cask lifts (i.e. 68° F for the crane bridge girders and 57 F for the building columns).

No crane girder displacements were measured during the test since this is not explicitly required by ANSI B30.2. It was additionally concluded at the time of the test not to attempt a measurement because of industrial safety concerns in the vicinity of the test rig. It is a requirement of ASME NOG-1 to assure via calculations that mid-span displacements do not exceed specific limits. This check was performed as part of the crane evaluation using the developed finite element model of the crane and building structure. The specific limit given in NOG-1 is 1/1000 of the girder span, or 0.764" in this case, for operating loads not including the girder deadweight or any impact load. The calculated displacement on this basis was 0.65" for a ratio to allowable of 0.88.

(5) Section 4.5 Crane Seismic Qualification

(a) This section of the analysis states that an evaluation was performed which confirmed that the crane structure and its supporting structure are qualified to hold the maximum critical load during a seismic event. Please provide the following:

(i) Describe the methodology used for seismic qualification of the crane including the use of computer codes and models, if any, and the limiting loads considered;

(ii) Define the boundary of the crane system considered in the analysis and provide an explanation that the crane load has no impact outside of this boundary;

(iii) Describe what assumptions, if any, specific to the crane configuration were made for evaluating the structural response to a seismic event. Clarify whether these assumptions were realistic or resulted in conservative modeling of the crane seismic response; and

(iv) Please discuss the response spectra used and its appropriateness as input for the crane seismic evaluation. Also indicate the approach used (time domain, frequency domain) for applying the seismic load to the crane structural model.

Response: *The crane was evaluated for earthquake using response spectra methods and the computer program SAP2000 Version 7.4. The computer model includes the crane and three northern-most bays of the Unit 1 fuel handling building (FHB). As seen in Figure 1 in Attachment 2, all load movement will occur within a single bay of the FHB, with no north-south movement of the crane required. East-west and vertical interactions between the bridge crane and building are captured by including the three northern-most bays of the FHB within the SAP model (one bay on either side of the intended lift area). All primary structural steel of these three bays of the FHB is included in the model. Concrete panels on the roof and east wall are also directly included. Fascia concrete panels on the north wall are included only for weight and mass effects* *since they provide no significant structural capacity to the building. Although limited moment capacity is available at the FHB column connections to the floor at the 70'-6" elevation, all these connections are assumed to act as pinned connections only. The north-south effects of the remaining (unmodeled) portion of the building to the south is captured by including representative north-south mass (i.e., the mass only acts in the north-south direction) at four points: base of the roof and base of the crane rail support on the east and west columns at column line 4 (south-most plane of the building model). In the east-west direction, loads are reacted almost entirely by the frames bounding any particular bay on the north and south side because of the much stiffer load path.*

No response spectra were specifically generated for the Unit 1 site during original design. However, ground spectra for Unit 2 are available. Since the Unit 1 FHB is founded on rock and is immediately adjacent to the Unit 2 site, the Unit 2 ground spectra are used herein for assessment of the FHB and bridge crane in its various positions. Based on comparison of OBE and SSE spectra and input requirements of ASME-NOG-1, SSE controls and OBE assessment is not done. The damping value used for the SSE analysis is 7%. This value is consistent with ASME-NOG-1, which primarily applies to the crane but also to the crane rails and their supports. The value is consistent with other Seismic Class III structures and is the same as the value used for the Unit 2 Fuel Storage Building seismic evaluation as stated in the Unit 2 FSAR.

Three trolley/hook positions were assessed since these envelop all others. The hook is considered loaded in all three cases since the load is so significant (equal to the crane original design capacity). The three cases are summarized below:

CASE 1 – Trolley at approximate mid-span, located directly over the cask load pool. Hook loaded at 75 tons (conservatively assumed weight of the cask and lift yoke) and positioned with the bottom of the cask just above the bottom of the cask load pool at approximate El. 32'.

CASE 2 – Trolley at approximate mid-span, located directly over the cask load pool. Hook loaded at 75 tons (conservatively assumed weight of the cask and lift yoke) and positioned with the bottom of the cask just above the cask load pool curb at approximate El. 71'.

CASE 3 – The trolley near the east end of the bridge, located directly above the cask preparation area. Hook loaded at 75 tons (conservatively assumed weight of the cask and lift yoke) and positioned with the bottom of the cask just above the Fuel Handling Building floor at approximate El. 71'.

The following load combinations are considered:

Crane operational loads

$PC1 = \quad Pdb + Pdt + Plr$

$PC2U = \quad Pdb + Pdt + Plr + Pv_{up}$

PC2D = $Pdb + Pdt + Plr + Pv_{down}$

PC4 = $Pdb + Pdt + Plr + Phl$

Extreme Environmental Loads

PC10 = Pdb + Pdt + Pcs + Pe'

Note: PC10 consists of three different conditions depending on trolley and hook position as described above. These conditions are:

SR29 (trolley at mid-span, hook loaded and down)

SR21: (trolley at mid-span, hook loaded and up)

SR23: (trolley at end, hook loaded and up)

Where

Pdb = *Bridge dead load*

Pdt = *Trolley dead load*

Plr = *Rated load*

Pv_{up} = *Vertical impact load, up*

Pv_{down} = *Vertical impact load, down*

Phl = *Longitudinal horizontal impact load*

Pcs = *Credible critical load with SSE*

Pe' = *SSE loads*

The rated load is taken as 75 tons. The credible critical load with SSE is assumed the same as the rated load. For seismic, three directions are considered to act simultaneously, with the directional results combined by SRSS per NOG-4153.10(c) of ASME-NOG-1. Modal combinations are done using the SAP-resident general modal combination technique, which accounts for closely spaced modes. Zero period accelerations are accounted for by the SAP-resident Residual Mass method, consistent with the general requirements of NOG-4153.9.

A summary of the critical area results is provided in our response to the following RAI question (6).

(b) Explain the treatment of the load on the hook in the seismic analysis for both horizontal and vertical seismic excitation effects. How were seismically induced pendulum and swinging effects of the load considered in the analysis and design evaluation of the crane? Please provide justification for any seismic effects not considered.

Response: *The load on the hook is addressed consistent with ASME-NOG-1, which states that "increase in horizontal load due to pendulum effect need not be considered due to the relatively small displacement of the load." Vertically, the mass below the hook experiences seismic input via the cables (modeled as cable-sized beam elements), with response appropriate for the mass below the hook and frequency based on tensile stiffness of the cables and mass below the hook. Resulting cable loads are significantly below deadweight loads such that uplift is not credible. Vertical and horizontal impact loads of 15% and 10% respectively are applied at the underside of the trolley and combined with other loads consistent with ASME-NOG-1. The horizontal impact load was only applied in the direction parallel to the crane girders since that is the sole direction of movements during cask handling operations involving the crane.*

The cables were modeled using a normal steel modulus (29E6 psi) with individual cable area equivalent to 1" diameter cable. An appropriate equivalent cable modulus (based on the reduced area) would be a little over half this value and would thus decrease the frequency of the cable/load system (with the load in the lowered position) by approximately 35%. The first significant vertical mode for the model occurs at 2.84 Hz (with load at mid-span of crane girders), with the response being a combination of the cables/load and girders (building contribution not significant in this mode). This value is on the so-called flexible side of the spectral peak (peak occurs at about 3.3 Hz) such that a decrease in frequency (i.e., from the cables being softer) would decrease the corresponding acceleration for this mode, which is the primary contributor to vertical response in the cables. All subsequent modes are well off the peak on the rigid side of the peak with much lower mass contribution such that individual increases in modal responses would be more than offset by the decrease in the third mode response. In summary, the modeled cable/load system is stiffer than the actual conditions and the predicted response is conservative.

(6) Section 4.5 Crane Seismic Qualification:

(a) The second paragraph of this section of the analysis states that "The crane and supporting structure were determined to remain below yield when subject to the maximum load lift combined with the SSE, ..." Staff notes that, although this criteria is acceptable for structural steel members when buckling limit states do not govern, the criteria is not appropriate for the structural steel members for which buckling considerations govern the design. Please provide the following:

(i) Clarify the acceptance criteria used for structural steel members of the crane, the wire ropes and other important load carrying components of the FHB crane system considering the governing failure limit states. Include references to the applicable code.

(ii) Please list the maximum force/stress levels in the important members/components of the crane and its supporting structure (including bolting, welds, wire ropes and foundations) under the critical load combination with seismic SSE loading, and the corresponding acceptance criteria with basis, and the factors of safety.

(iii) Please provide the factor of safety provided in the design/selection of lifting devices (including slings) attached to the load block?

Response: *The evaluation of the various crane elements is done consistent with NOG-4300, "Design Criteria," of ASME-NOG-1, including Section NOG-4330 on buckling. SAP performs automatic AISC checks of beam members, of which very few are used to represent any of the basic crane elements. The bulk of the crane elements are modeled using shell elements for which SAP calculates element biaxial and shear stresses on each surface (top and bottom) of each shell element. These stresses are used to determine membrane (tension or compression), bending and principal stresses within a particular element or averaged across an appropriate element group. The stresses thus determined are used for comparison with the allowables cited in NOG-4300.*

For the remainder of the model that represents the building structure, the resident AISC checks in SAP are used as basis for comparison with NOG-4300 criteria, which are generally more restrictive than AISC.

For the hoisting ropes, the criteria of CMAA-70 (Ref. 17) are used. In section 4.1.1 therein, the capacity should be based on the rated crane capacity load plus the load block weight divided by the number of parts of rope. This result should not exceed 20% of the wire rope breaking strength.

Summary of results:

Wire Rope (allowable based on safety factor of 5 on rope breaking strength):

Ratio to allowable = 0.82 (based on CMAA-70 load criteria)

Ratio to allowable = 0.96 (including seismic load [not reqd by CMAA-70])

Trolley (worst case location)

Ratio to allowable = 0.86 (seismic comb, tension; based on 24.9 ksi and 0.9 x 32 ksi allowable)

Ratio to allowable = 0.55 (seis comb, buckling; based on 12.8 ksi, Design Factor for Buckling = 1.31 and critical comparison stress of about 30 ksi)

<u>Crane Bridge Girders</u> (worst case location)

Ratio to allowable = 0.81 (oper comb, compression; based on 13 ksi and 0.5 x 32 ksi allowable; controls over seis comb, which has ratio to allowable of 0.65)

Ratio to allowable = 0.96 (oper comb, buckling; based on Design Factor for Buckling = 2.00 and critical comparison stress of about 28 ksi; controls over seis comb, which has ratio to allowable of 0.86)

<u>Girder Bolts to End Trucks</u> (based on ASTM A325 replacement bolting, worst case location)

Ratio to allowable = 0.16 (oper cond, tension; based on 5.4 ksi stress and 34.6 ksi allow; controls over seis cond, which has ratio to allowable of 0.15)

Ratio to allowable = 0.49 (oper cond, shear; based on 14.6 ksi stress and 30 ksi allow; controls over seis cond, which has ratio to allowable of 0.36)

<u>End Trucks</u> (worst case location)

Ratio to allowable = 0.92 (seis cond, tension; based on 26.5 ksi stress and 0.9 x 32 ksi allow)

<u>Crane Rail Clamps and Bolting</u> (worst case location)

Ratio to allowable = 0.85 (seis condition for clamps)

Ratio to allowable = 0.71 (seis condition for bolting)

<u>Crane Rail Girder</u> (worst case location)

Ratio to allowable = 0.64 (seis condition, using AISC but no increase in allow for seismic)

<u>Building Columns</u> (worst case location)

Ratio to allowable = 0.84 (seis condition for buckling using AISC)

<u>Column Footings</u> (worst case location, using ACI)

Ratio to allowable = 0.27 (seis condition for anchor bolt shear of 41 kips)

Ratio to allowable = 0.44 (seis condition for foundation base shear of 72 kips)

Ratio to allowable = 0.15 (seis condition for foundation base flexure of 19 kip-ft)

Ratio to allowable = 0.21 (seis condition for baseplate bearing stress = 382 psi)

Ratio to allowable = 0.31 (seis condition for rock bearing stress = 174 psi)

The Holtec designed and fabricated lift yoke was designed and tested in accordance with the requirements of ANSI N14.6-1993

(7) Section 4.6 Tornado Wind and Missile Loads:

(a) Describe what procedures and administrative controls would be followed prior to commencement of each cask loading operations in the IP-1 FHB building using the IP-1 FHB 75 ton crane to ensure that fuel handling is stopped and the FHB doors are closed in the event of imminent severe weather.

(b) Describe what actions will be taken if severe weather becomes imminent after a cask loading operation using the crane has commenced?

Response: *Site specific cask loading procedures will instruct cask loading personnel to contact the Control Room prior to initiating cask movement activities (Procedures 1-DCS-028-GEN, 1-DCS-035-GEN Unit 1MPC Unloading and 1-DCS-025-GEN) to verify that severe weather is not imminent.*

The transfer cask is moved into the FHB on air pads and the exterior door will be closed prior to any crane-related lifting activities. Cask lifts consist of a vertical lift (approximately 37') out of the cask load pool followed by a single trolley movement to the east of about 22'. This trolley movement is conducted with the cask being less than 4" above the FHB concrete floor slab. If severe weather becomes imminent after a cask lift has commenced, the load will be placed in a safe condition either back on the cask load pool floor slab or on the FHB El. 70' slab.

(8) Quality Assurance Program:

(a) With respect to the electrical refurbishment of the FHB crane indicated in Section 4.2 and replacement of the bridge rail tie-down bolting and the trolley-to-end truck bolting indicated in Section 4.3, please discuss the Quality Assurance (QA) program that was used in these refurbishment/replacement work activities performed on the crane.

(b) Please identify if the QA program used meets the criteria in Appendix B of 10 CFR 50? If not, discuss any deviations.

Response: *The 75 ton FHB crane was designed, fabricated and installed prior to the advent of the current safety classifications and before the advent of the 10CFR50 Appendix B Quality Assurance requirements. It is currently classified as Non-Class A. (i.e. not safety related)*

The electrical refurbishment was performed under the auspices of a Nuclear Grade Design Package (ER Response No. 06-2-100) and the replacement components met the requirements of CMAA Specification #70, ASME/ANSI B30.2 and/or NEC-610. The installation and subsequent functional testing was performed under the oversight of Unit 1 Project Engineering personnel.

The referenced structural and seismic analyses were prepared, reviewed and approved in accordance with an approved Appendix B program. Similarly, the cask drop consequence analyses were also performed in accordance with approved Appendix B programs.

The bolt replacement efforts were performed in accordance with the Site's work control program and the final installation was once again inspected by Project Engineering personnel.

Since the Unit 1 75 ton FHB crane is not safety related and is not completely single failure proof, a bounding series of cask drop consequence analysis have been performed in accordance with the requirements of NUREG-0612 Section 5.1.2(4). The results of these cask drop consequence analyses were shown to be acceptable and are thoroughly reported in the body of the License Amendment Request.

Structural Mechanics & Materials Branch

(1) Section 4.7.1 Cask Loading Design Features and Section 4.7.2 Postulated Load Drops

(a) Section 4.7.1 states that "The design of the HI-TRAC-100D Version IP1 transfer cask and the MPC *precludes fuel damage* (emphasis added) if the loads are less than 64.8 g's. (Ref 1)." Section 4.7.2 states that "It has been demonstrated that the fuel assembly deceleration limit for a vertical drop is 64.8 g's as reported in HI-STORM FSAR (Final Safety Analysis Report) Section 3.5." As part of their technical review, NRC staff performed an in-depth evaluation of the HI-STORM-100 FSAR Section 3.5. The evaluation found problems with the methods used by Holtec to calculate the 64.8 g deceleration load limit. This has resulted in Holtec's withdrawal of Section 3.5 from the HI-STORM-100, Amendment 4 FSAR, as well as, two other FSARs currently being reviewed by NRC staff. Therefore, some basis other than the analysis in Section 3.5, must be provided for acceptance of the drop loads (impact decelerations) specified in the licensee's analysis. Please provide an additional analysis of the IP-1 stainless steel clad fuel demonstrating that fuel damage will not occur for the load drops specified in Section 4.7.2 for the HI-TRAC-100D Version IP1 transfer cask and MPC (Multi-Purpose Canister).

Response:

Background

Holtec's fuel integrity analysis model in the HI-STORM FSAR dates back to the mid-90s when this problem was first analyzed by Lawrence Livermore National Laboratory (LLNL), and later by Sandia National Laboratory (SNL). The value of 64.8 g's deceleration load limit actually is a direct citation from the LLNL report [1]. Holtec's model in the HI-STORM FSAR was developed during the licensing process and was treated as an improvement over the LLNL model of the time. It received the regulatory imprimatur on both HI-STORM and HI-STAR dockets.

In the past few years, USNRC personnel have carried out substantially improved analyses using both classical and LS-DYNA-based models. Their work is published in technical papers and in NUREG-1864 [2]. NUREG-1864 provides sufficient information to serve as an alternative to the (now withdrawn) methodology in the HI-STORM FSAR. The relevance of NUREG-1864 work is immeasurably increased in the context of the IP-1 evaluation because the reference system used in the NUREG is the HI-STORM system.

Physical Problem

Demonstrate that IP-1 fuel will not fail under the following two vertical drop scenarios:

(i) Drop of the MPC bearing HI-TRAC on the pool deck (reinforced concrete slab).

(ii) Uncontrolled lowering of the HI-TRAC transfer cask containing the loaded MPC-32 in the fuel pool striking the impact limiter located on the pool slab.

Underlying Concepts

The material on fuel damage presented in NUREG-1864 provides the following premise and results:

1. *The most "vulnerable" fuel assembly is one that has the minimum critical classical buckling load of a simply supported tube (see page C-1 of [2]).*

2. *High burnup Zircaloy fuel is conservatively assumed to fail at 1% flexural strain.*

3. *No fuel damage will occur if HI-/TRAC transfer cask drop on a concrete slab from a 20-foot height, and the maximum strain exceeds the 1% assumed limit by only 10% (maximum strain = .011) if the loaded HI-TRAC drops from 40 feet onto the same concrete slab (see Table C.3 loc. Cit.).*

4. *The major parameters that influence the damage of a fuel rod are:*

   a. *Its ability to bend and deflect sideways, which depends on the spacing between the rods and that between the rod assemblage and the storage cell.*

   b. *The inertia load at impact, which depends on the hardness of the contact interface.*

<u>Evaluation</u>

The critical buckling load is defined in [2] as:

$$\alpha_{cr} = \frac{\pi^2}{L^2} \frac{E_c\, I_c}{(W_c + W_f)}$$

where:

	α_{cr}	=	*critical inertia load magnitude for rod buckling (g)*
	L	=	*axial length of the fuel rod between two neighboring transverse spacer grids*
	$E_c I_c$	=	*flexural rigidity of the cladding tube column*
	W_c	=	*total weight of the fuel rod cladding*
	W_f	=	*total weight of the fuel pellets in the fuel rod*

The IP-1 fuel has a much larger critical load compared to the Analysis Basis fuel in NUREG-1864 (PWR 15x15) (hereinafter designated as the "NUREG-1864 Reference fuel", as can be ascertained by the variables that go into establishing the critical buckling load.

Comparing PWR 15x15 with IP-1 Fuel		
Item	***NUREG-1864 15 x 15 PWR Fuel****	***14 x 14 Analysis Basis IP-1 Fuel***
Material	***Zircaloy***	***Stainless Steel***
Cladding O.D., (inch)	*0.43*	*0.3415*
Cladding thickness, (inch)	*0.0265*	*0.012*
Total Weight of a Fuel Rod (lb.)	*7.011*	*3.351*
Distance between grid straps, (inch)	*20.5*	*10.66*
Reference burnup	*> 45 GWD/MTU*	*< 30 GWD/MTU)*
Young's Modulus of fuel, E for Calculation of α_{cr}	*9.8E+06 (Table C.1 of [2])*	*>24E+06*
α_{cr}, *g's from Eq. C.1 in [2]*	*22*	*105*
Maximum available Lateral Movement of Rod (inch)	*1.2 [2, page C-6]*	*0.984*

* *The NUREG-1864 Reference Fuel*

The metrics in the above table indicate that results for the NUREG-1864 Reference fuel will bound results for the IP-1 Analysis Basis fuel (i.e., the IP-1 fuel has lower burnup, has fuel rods of lower total weight, has a larger critical buckling load, and requires a smaller lateral movement before contact with the fixed wall of the storage cell.

Therefore, structural integrity of the Analysis Basis IP-1 fuel rods can be directly asserted by comparison with the results from analyses performed in NUREG-1864 using the Reference fuel; it is concluded that:

1. *The 4" drop on the concrete slab condition is enveloped by the 20-foot drop condition mentioned above by a large margin.*

2. *The 40-foot drop on the impact limiter in water will certainly result in more than 10% reduction in strain, considering that: (i) The IP-1 fuel will have less than half the kinetic energy, (ii) has less lateral movement space because of the fuel channel around it, and (iii), The impact limiter is sized to absorb virtually all of the kinetic energy.*

Therefore, on the basis of physical reasoning, the drop scenarios for IP-1 fuel are enveloped by those mentioned above in NUREG-1864.

The above assertion is further reinforced by the fact that the austenitic stainless steel irradiated to a low fluence in the low flux IP-1 reactor is considerably more ductile than HBF Zircaloy fuel.

[1] Chun, R., Witte, M., Schwartz, M., "Dynamic Impact Effects on Spent Fuel Assemblies", UCID-21246, LLNL, Livermore CA, 1987.
[2] USNRC NUREG -1864, A Pilot Probabilistic Risk assessment of a Dry Cask Storage at a Nuclear Power Plant, March 2007.

(b) Provide the calculations, including the LS-DYNA input and output files, for the inclined loaded vertical transfer cask drop into the cask load pool discussed in Section 4.7.2 (b).

(i) The summary description of the analysis provided in Section 4.7.2 (b) is not clear and further explanation for the justification of "Key additional assumptions" needs to be provided.

Response: *Holtec Report HI-2063572, Revision 3, is included, together with the LS-DYNA input and output files for the inclined loaded vertical transfer cask drop into the load pool discussed in LAR Section 4.7.2 (b). The requested files and the report are provided and the directory listing of the files provided is maintained in subdirectories of*

G:\Projects\1535\AIS\RAI Response\IP1 RAI-2 FILES

The LS-DYNA files are located in the subdirectories indicated for each revision of the report (various simulations were performed in earlier revisions and were not changed as the report was revised upward). The Rev 2 subdirectory is empty as there were no LS-DYNA files associated with this revision of the report.

The justification of the "Key Additional Assumption" is as follows:

HI-2063572 contains simulations performed using Visual Nastran and using LS-DYNA. In both of the simulation models, the possibility exists that the cask will contact the cask pit wall as it falls through water to the base of the cask pit. Therefore, the simulation models included contact and friction components that would come into play if actual contact occurred. The Visual

Nastran model was used to study straight and inclined drops directly onto the impact limiter at the bottom of the cask pit. The LS-DYNA model was used to study drops where the cask first impacted the edge of the floor near the cask pit and then dropped into the cask pit. In both cases, the possibility of cask-to-cask pit wall contact was included in the model (the results from the Visual Nastran simulations demonstrated that no contact with the walls occurred in a direct drop so the exact model of cask-to-cask pit contact used was of no consequence). To simulate friction behavior, a coefficient of friction of 0.5 was used. In addition to simulation of friction behavior, an appropriate simulation model for the normal component of the contact force was needed to complete the model. The LS-DYNA contact algorithm assumed that 20% of critical damping was a reasonable value to characterize impact damping between the rigid cask surrounding walls or operating floor as the cask dropped through the pit or impacted the top edge of the pit.

Finally, the characterization of the fluid in the pool is part of the analyses involving water in the spent fuel pool. The characterization employed by Holtec in based on the methodology and equations provided in ASCE 4-98 [3].

Section C3.1.6 of ASCE 4-98 provides a simple description of the hydrodynamic effects on submerged bodies. Although the particular case analyzed is for two concentric cylinders, the results can be generalized. Note that there is nothing in the derivation that limits the results to vibrating bodies.

From ASCE 4-98, the equation for a moving body, submerged in fluid, in a rigid container is (Eq. C3.1-11)

$$(M_1 + M_{11})\ \ddot{X}_1 + K_1 X_1 = \ddot{u}_g (M_1 + M_{11} + M_{12})$$

where a = radius of moving cylindrical body
b = radius of rigid cylindrical body surrounding the moving body
K_1 = stiffness associated with moving body
$\ddot{u}_g$ = specified input acceleration applied to base of rigid cylindrical body
X_1 = displacement of moving body relates to surrounding rigid body

For the cylindrical body, the mass terms are defined in ASCE 4-98 as:

$$M_{11} = \pi a^2 L\rho \left(\frac{b^2 + a^2}{b^2 - a^2}\right);\ M_{12} = -2\pi a^2 L\rho \left(\frac{b^2}{b^2 + a^2}\right)$$

L = length of moving cylinder; ρ = density of water
M_1 = structural mass of moving body

Note that $\pi^2 a^2 L\rho = m$ = mass of water displaced by the moving body
Since $M_{11} + M_{12} = -m$, then the equation of motion simplifies to:

$$(M_1 + m\alpha)\ \ddot{X}_1 + K_1 X_1 = -\ddot{u}_g\ (M_1 - m)$$

In the case of seismic excitation, $\ddot{u}_g$ *(t) is the input seismic motion in the direction of the moving body. In the case of a falling body* $\ddot{u}_g$ *(t) = g (gravitational acceleration).*

Note:

$\alpha \rightarrow C/(b-a)$ if $b \rightarrow a$ (i.e., there is a small annular gap with fluid and the gap is closing so as to "squeeze" the fluid), and

$\alpha \rightarrow 1$ if $b/a >> 1.0$ (i.e., an isolated body submerged in a large body of fluid).

Therefore, the minimum value of the mass term "$m\alpha$" (the hydrodynamic mass) is m (denoted as the virtual mass when it adds to the structural mass), while the realistic maximum value achieves a large value (proportional to the inverse of the annular gap). For the analysis in HI-2063572, the effect of fluid squeezing out from under the cask as the cask approaches the bottom surface is conservatively neglected (i.e., $\alpha = 1$).

[3] ASCE 4-98, Seismic Analysis of Safety-Related Nuclear Structures and Commentary, American Society of Civil Engineers, 2000.

(c) Provide the calculations for the drop case in Section 4.7.2 (c) where the loaded transfer cask tips into the cask load pool and impacts the west wall.

(i) The results in Section 4.7.2 state that "The calculated decelerations are less than the 64.8 g limit for the fuel and are, therefore, acceptable." This drop scenario induces both axial and lateral deceleration loads on the fuel cladding, yet no discussion of the lateral deceleration loads has been provided. What are these deceleration loads and what are the allowable axial and lateral deceleration limits for the stainless steel cladding?

Response: *The calculations for the inclined loaded vertical transfer cask drop into the load pool discussed in LAR Section 4.7.2 (c) are provided in HI-2063572 and the associated LS-DYNA files provided in response to RAI-1(b). The decelerations reported are the net decelerations (two components); the net decelerations are primarily reported to demonstrate that the fuel will not experience decelerations in excess of 45 g's (see Table 2 in HI-2063572), and that the impact load will not lead to a gross collapse of the cask pit walls. For this case, where the cask tips over and rotates onto the wall, from the physics of the problem most of the net deceleration experienced by the fuel is lateral, rather than axial. The response to RAI-1(a) provided above demonstrates that the IP-1 stainless clad fuel rods can withstand in excess of 45 g's axially.*

(d) Provide the calculations for the MPC lid drop onto the MPC discussed in Section 4.7.2 (d) and the basis for the simplifying assumption that the water's "change in density is... proportional to the lid velocity."

(i) Section 4.7.2 (d) notes that one of the key assumptions used in the analysis is that "The water is considered approximately incompressible in that the change in density is assumed to be proportional to the lid velocity; the proportionality constant affords a simple way to account for the expected reduction in water velocity escaping through the lid-to-shell gap as the water density increases." NRC staff needs to understand the basis for this assumption, and how it affects the results.

Response: *The calculation for the MPC lid drop discussed in LAR Section 4.7.2 (d) is found in Holtec Reports HI-2063597 and HI-2063606, Rev. 1, which are provided to the staff as part of this RAI response. In particular, the basis for the assumption and its application to the determination of results are found on pages A-8 to A-11 in Attachment A of the HI-2063597.*

For completeness of the response, the LS-DYNA input and output files associated with HI-2063606 are also included as part of this response.

Upon reflection, the current description of the "key assumption" could be reworded to more accurately describe the simplification invoked in the analysis. The proposed new wording for the last bulleted key assumption would be:

"The continuity equation can be written in terms of the MPC lid velocity, the rate of change of density with time, and the fluid velocity in the small annular gap between the lid and the MPC shell. To determine a simple and conservative expression for the velocity of the fluid in the gap, without the necessity of a solution of the non-steady continuity equation, the rate of change in fluid density with time is assumed to be proportional to the lid velocity; the proportionality constant, "C" is such that C =0 represents the solution of the continuity equation if the change in density with time is ignored, and C=1 represents the condition of no flow in the annular gap."

Finally, it is also noted that the hydrodynamic squeezing effect that occurs when fluid is moving in a very narrow channel with two surfaces closing on one another (see response to RAI-1(b)) is conservatively neglected.

ATTACHMENT 2 TO NL-07-117

FIGURES AND TABLES

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT UNIT NO. 1
DOCKET NO. 50-003

Figure 1
Load Transfer Path with Crane

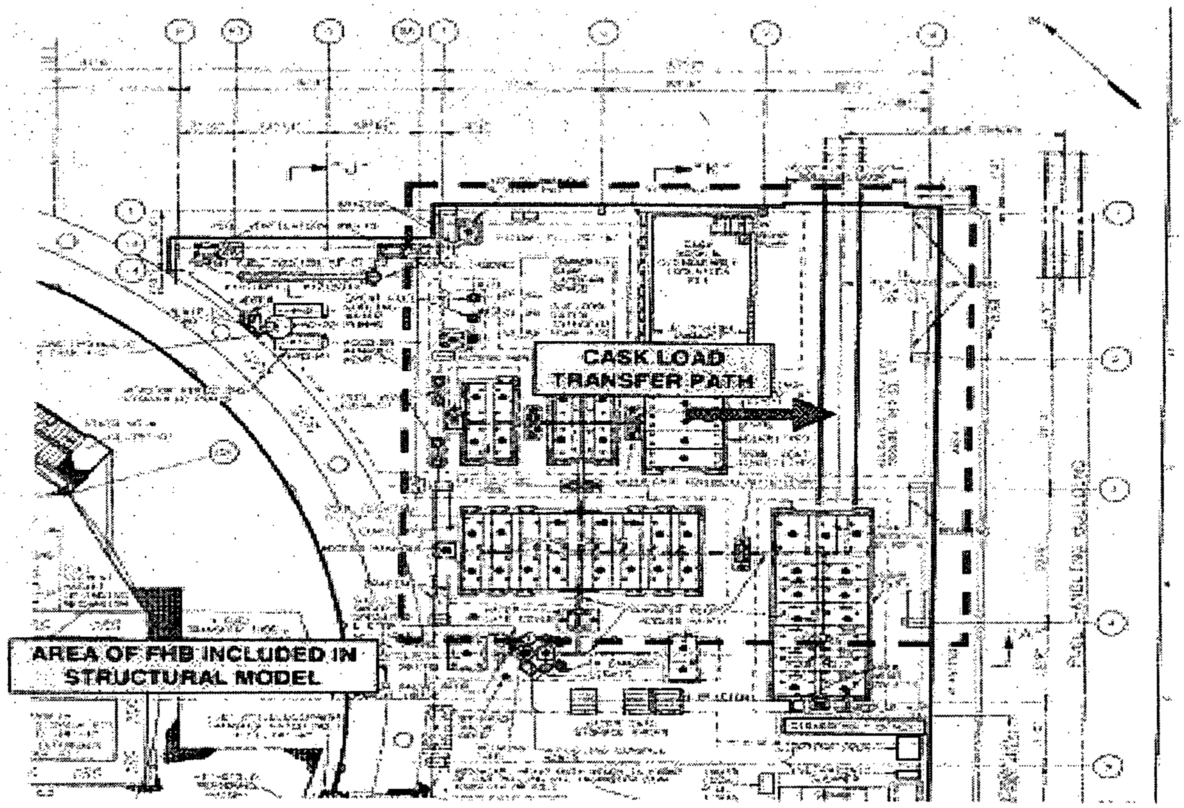

TABLE 1

Whiting Services, Inc.
1979 Parker Court, Suite C, Stone Mountain, GA 30087

CRANE INSPECTION REPORT

POST LOAD TEST

Prepared For: INDIAN POINT 1 **Address:** BUCANNON NY

Contact: BILL HENRIES **Phone:** ______ **Fax:** ______

NOTE: This inspection is based on Whiting Services interpretation of OSHA 2206-29CFR1910, Section 179, and related original manufacturer's specifications.

Service Order:		**Inspected By:**	MIKE WILKINS
Inspection Date:	MARCH 14 2007	**Location:**	CSB 70'
Manufacturer:	MILWAUKEE	**Serial #:**	1691
Capacity:	15/75	**Other:**	CASK HANDLING
Bridge Type:	DOUBLE GIRDER	**Hoist Type:**	WIRE ROPE
Trolley Type:	TOP RUNNING	**Control Type:**	PENDANT

Action Codes:
S = Satisfactory
C = Cleaning Required
L = Lubrication Required
A = Adjustment Required
R = Repair Required
M = Requires Monitoring or Survey
N = Not Accessible, See Exploration
U = Unsatisfactory, Requires Replacement
N/A = (Not Applicable)

Safety Codes:
S = Satisfactory, no attention required at time of inspection.

2 = Regular Maintenance required to ensure continued reliable operation.

3 = Priority Maintenance. Act promptly to prevent a maintenance problem.

4 = Immediate attention required to correct a hazardous safety condition.

Since the inherent limitations of a visual field inspection preclude it from indicating certain defects that could be revealed only through more intensive and costly inspection methods, Whiting services must necessarily disclaim liabilities for any loss or damage whatsoever arising from its failure to disclose or repair defects in the equipment inspected.

TABLE 1 (C0NTINUED)

Crane Serial Number: 1691

1.	**Mainline**	Action Code	Safety Code	Budget Parts	Budget Labor	Comments
A.	General Condition	S	S			
B.	Buttons & Contacts	S	S			
C.	Wiring	S	S			
E.	**LOCKOUTS INSTALLED?**			YES	X	NO (during inspection)

2. Pendant Station

A.	Case & Covers	S	S			
B.	Push Button Inserts/Boots/Labels	S	S			
C.	Strain Chain & Cord Grips	S	S			
D.	Pendant Cable	S	S			
E.	Festooning/Trolleys	S	S			
F.						

3. Radio Control N/A

A.	General Condition of Radio Panel					
B.	Transfer Switch & Connectors					
C.	General Condition of Transmitter					
D.	Antenna					
E.						

4. Main Hoist Hook

A.	Nut	S	S			
B.	Thrust Bearing	S	S			
C.	Throat Opening	S	S			
D.	Safety Latch	NA				
E.	Material Loss	S	S			
F.	Bend or Twist	S	S			
G.	Mag. Particle NDE (Optional)	NA				
H.						

5. Main Hoist Bottom Block

A.	Weldment & Frame	S	S			
B.	Sheave Pin (Visual)	S	S			
C.	Grease Fittings	S	S			
D.	Sheaves & Bearings	S	S			
E.	Equalizer Pin & Retainers-Visual	S	S			
F.	Equalizer Sheaves & Bearings	S	S			
G.						

6. Main Hoist Wire Rope

A	Dead Ends	S	S			
B.	Broken Strands/Kinks/Deformed	S	S			
C.	Measured Diameter	S	S			
D.	Corrosion	S	S			
E.						

TABLE 1 (CONTINUED)

Crane Serial Number: 1591

7.	**Auxiliary Hoist Hook**	**Action Code**	**Safety Code**	**Budget Parts**	**Budget Labor**	**Comments**
A.	Nut	S	S			
B.	Thrust Bearing	S	S			
C.	Throat Opening	S	S			
D.	Safety Latch	R	2			SPRING BAD
E.	Material Loss	S	S			
F.	Bend or Twist	S	S			
G.	Mag. Particle NDE (Optional)	NA				
H.						

8. Auxiliary Hoist Bottom Block

A.	Weldment & Frame	S	S			
B.	Sheave Pin (Visual)	S	S			
C.	Grease Fittings	S	S			
D.	Sheaves & Bearings	S	S			
E.	Equalizer Pin & Retainers-Visual	S	S			
F.	Equalizer Sheaves & Bearings	S	S			
G.						

9. Auxiliary Hoist Wire Rope

A.	Dead Ends	S	S			
B.	Broken Strands/Kinks/Deformed	S	S			
C.	Measured Diameter	S	S			
D.	Corrosion	S	S			
E.						

10. Accessories

A.	Crane Lights	S	S			
B.	Status Lights	NA				
C.	Warning Horn/Lights	S	S			
D.						

11. Cab N/A

A.	Cab & Supports					
B.	Ladder & Hatch					
C.	Door & Windows					
D.	Bridge Brake & Master Cylinder					
E.	Dead Man Switch					
F.	Horn Button - Cab Light					
G.	Main On/Off Buttons					
H.	Main Disconnect Switch					
I.	Air Conditioner/Heater - Filters					
J.	Fire Extinguisher					
K.	Miscellaneous Accessories					
L.						

TABLE 1 (C0NTINUED)

Proof Test Summary Report of Indian Point Unit 1 Fuel Handling Building Crane
Attachment B: Pre-Proof Test B30.2 Inspection Report

Crane Serial Number: 1591

12.	Bridge	Action Code	Safety Code	Budget Parts	Budget Labor	Comments
A.	Platform & Supports	S	S			
B.	Railings & Ladders	S	S			
C.	End Truck to Girder Bolts	S	S			
D.	Girder #1 Camber (Visual)	S	S			
E.	Girder #2 Camber (Visual)	S	S			
F.	Crane Alignment (Visual)	S	S			
G.	Crane Alignment (Laser - Optional)	NA				
H.	Machinery Girder (Visual)	S	S			
I.	Idler Girder (Visual)	S	S			
J.	Bridge Rail & Fasteners	S	S			
K.	Trolley End Stops	S	S			
L.	Bridge to Leg Connection (Gantry)	NA				
M.	Bumpers - Condition/Alignment	S	S			
N.	Bumper Safety Cable	S	S			
O.	Rail Sweeps	S	S			
P.	Bridge Capacity Plates	S	S			
Q.						

13. Left Bridge End Truck

A.	Drive Wheel Tread	S	S			
B.	Drive Wheel Flange	S	S			
C.	Idler Wheel Tread	S	S			
D.	Idler Wheel Flange	S	S			
E.	Wheel Bearings	S	S			
F.	Axles	S	S			
G.	Lube/Grease Seals	S	S			
H.	External Reduction Gearset	S	S			
I.	Gearing Cover	S	S			
J.	Truck Structural Connection	S	S			
K.						

14. CENTER BRIDGE MOTOR

A.	Motor Slip Rings/Commutator	NA				
B.	Motor Brushes - Holders - Springs	NA				
C.	Motor Bearings & Oil Seals	S	S			
D.	Motor Bolts/Hardware/Mounting	S	S			
E.						

15. CENTER BRIDGE GEARCASE

A.	General Condition	S	S			
B.	Gearings	S	S			
C.	Bearings/Bushings	S	S			
D.	Oil Seals	S	S			
E.	Lubrication	S	S			
F.	Drive Shaft & Couplings	S	S			
G.	Drive Shaft Support Brgs./Bushings	S	S			

TABLE 1 (C0NTINUED)

Crane Serial Number: 1691

16.	CENTER BRIDGE BRAKE	Action Code	Safety Code	Budget Parts	Budget Labor	Comments
A.	Wheel Brake - Brake Drums	S	S			
B.	Friction Discs	S	S			
C.	Shoes/Linings	NA				
D.	Coil Gap & Coil	S	S			
E.	Condition of Pins	NA				
F.	Bushings & Linkage	NA				
G.	Bolts & Hardware	S	S			
H.	Hydraulic	NA				
I.	General Condition	S	S			
J.						

17. Right Bridge End Truck

A.	Drive Wheel Tread	S	S			
B.	Drive Wheel Flange	S	S			
C.	Idler Wheel Tread	S	S			
D.	Idler Wheel Flange	S	S			
E.	Wheel Bearings	S	S			
F.	Axles	S	S			
G.	Lube/Grease Seals	S	S			
H.	External Reduction Gearset	S	S			
I.	Gearing Cover	S	S			
J.	Truck Structural Connection	S	S			
K.						

18. Right Bridge Motor N/A

A.	Motor Slip Rings/Commutator					
B.	Motor Brushes-Holders-Springs					
C.	Motor Bearings & Oil Seals					
D.	Motor Bolts/Hardware/Mounting					
E.						

19. Right Bridge Gear Case N/A

A.	General Condition					
B.	Gearings					
C.	Bearings/Bushings					
D.	Oil Seals					
E.	Lubrication					
F.	Drive Shaft & Couplings					
G.	Drive Shaft Suppt.Brgs/Bushings					
H.						

TABLE 1 (C0NTINUED)

Proof Test Summary Report of Indian Point Unit 1 Fuel Handling Building Crane
Attachment B: Pre-Proof Test B30.2 Inspection Report

Crane Serial Number: 1691

20.	N/A Right Bridge Brake	Action Code	Safety Code	Budget Parts	Budget Labor	Comments
A.	Wheel Brake - Brake Drums					
B.	Friction Discs					
C.	Shoes/Linings					
D.	Coil Gap & Coil					
E.	Condition of Pins					
F.	Bushings & Linkage					
G.	Bolts & Hardware					
H.	Adjustment					
I.	General Condition					
J.						

21. Bridge Controller N/A

A.	General Condition					
B.	Tips					
C.	Insulation & Wiring					
D.	Inter./Spring Control					
E.						

22. Trolley Controller N/A

A.	General Condition					
B.	Tips					
C.	Segments					
D.	Insulation & Wiring					
E.	Inter./Spring Control					
F.						

23. Main Hoist Controller N/A

A.	General Condition					
B.	Tips					
C.	Segments					
D.	Insulation & Wiring					
E.	Inter./Spring Control					
F.						

24. Auxiliary Hoist Controller N/A

A.	General Condition					
B.	Tips					
C.	Segments					
D.	Insulation & Wiring					
E.	Inter./Spring Control					
F.						

TABLE 1 (C0NTINUED)

Proof Test Summary Report of Indian Point Unit 1 Fuel Handling Building Crane
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Crane Serial Number: 1691

25.	Crane Controls	Action Code	Safety Code	Budget Parts	Budget Labor	Comments
A.	Bridge Contactors	NA				FREQ DRIVE
B.	Trolley Contactors	NA				FREQ DRIVE
C.	Hoist Contactors	NA				FREQ DRIVE
D.	General Condition	S	S			
E.	Bridge Resistor Bank & Wiring	S	S			
F.	Trolley Resistor Bank & Wiring	S	S			
G.	Main Hoist Resistor Bank & Wiring	S	S			
H.	Auxiliary Resistor Bank & Wiring	S	S			
I.	Bridge Span Wires-Conductor Bar	NA				
J.	Bridge Festoon	S	S			
K.	Trolley Collectors	NA				
L.						
M.						

26. Trolley

A.	Trucks & Framework (Visual)	S	S			
B.	Railings & Ladders	NA				
C.	Bumpers - Condition & Alignment	S	S			
D.	Bumpers - Safety Cables	S	S			
E.	Sweeps	S	S			
F.	Drive Wheel Tread	S	S			
G.	Drive Wheel Flange	S	S			
H.	Idler Wheel Tread	S	S			
I.	Idler Wheel Flange	S	S			
J.	Wheel Bearings	S	S			
K.	Axles	S	S			
L.	Lubrication	S	S			
M.	Oil & Grease Seals	S	S			
N.						

27. Trolley Motor

A.	Motor Slip Rings/Commutator	NA				
B.	Bearings & Oil Seals	S	S			
C.	Brushes - Holders - Springs	NA				
D.	Bolts & Hardware - Mounting	S	S			
E.						

28.	Trolley Gear Case					
A	General Condition	S	S			
B	Gearing	S	S			
C.	Bearings & Bushings	S	S			
D.	Oil Seals	S	S			
E.	Lube Level & Condition	S	S			
F.	Shaft & Couplings	S	S			
G.	Shaft Support Bearings & Bushings	S	S			

TABLE 1 (C0NTINUED)

Crane Serial Number: 1891

29.	Trolley Brake	Action Code	Safety Code	Budget Parts	Budget Labor	Comments
A.	Wheel Brake - Brake Drums	S	S			
B.	Friction Discs	S	S			
C.	Shoes/Linings	NA				
D.	Coil Gap & Coil	S	S			
E.	Condition of Pins	NA				
F.	Bushings & Linkage	NA				
G.	Bolts & Hardware	S	S			
H.	Adjustment	S	S			
I.	General Condition	S	S			
J.						

30. Main Hoist Motor

A.	Motor Slip Rings/Commutator	NA				
B.	Bearings & Oil Seals	S	S			
C.	Brushes - Holders - Springs	NA				
D.	Bolts & Hardware - Mounting	S	S			
E.						

31. Main Hoist Gear Case

A.	General Condition	S	S			
B.	Gearing (Visual)	S	S			
C.	Bearings & Bushings	S	S			
D.	Load Brake (If Applicable)	NA				
E.	Load Brake Visual	NA				
F.	Load Brake Action	NA				
G.	Shaft & Couplings	S	S			
H.	Lube Level & Condition	S	S			
I.	Shaft & Couplings	S	S			
J.						

32. Main Hoist Brake

A.	Wheel Brake - Brake Drums	S	S			3 BRAKES-2SHOE AND 1 DISC
B.	Friction Discs	S	S			
C.	Shoes/Linings	S	S			
D.	Coil Gap & Coil	S	S			
E.	Condition of Pins	S	S			
F.	Bushings & Linkage	S	S			
G.	Bolts & Hardware	S	S			
H.	Adjustment	S	S			
I.	General Condition	S	S			
J.						

TABLE 1 (CONTINUED)

Crane Serial Number: 1681

33.	Main Hoist Limit Switches	Condition Code	Safety Code	Budget Parts	Budget Labor	Comments
A.	Weight Limit	S	S			
B.	Upper Rotary Limit	R	2			COUPLING MISALIGNED
C.	Lower Limit	R	2			
D.						

34. Main Hoist Upper Block

A.	Weldments Frame	S	S			
B.	Sheave Pin (Visual)	S	S			
C.	Sheaves	S	S			
D.	Sheave Bearing & Bushings	S	S			
E.	Equalizer Framework	S	S			
F.	Equalizer Pin & Retainer	S	S			
G.	Equalizer Sheave & Bar	S	S			
H.	Equalizer Sheave Bearings	S	S			
I.						

35. Main Hoist Drum

A.	Lands & Grooves	S	S			
B.	Pinion	S	S			
C.	Gear	S	S			
D.	Gear Covering	S	S			
E.	Bearings & Supports	S	S			
F.	Lubrication	S	S			
G.						

36. Auxiliary Hoist Motor

A.	Motor Slip Rings/Commutator	NA				
B.	Bearings & Oil Seals	S	S			
C.	Brushes - Holders - Springs	NA				
D.	Bolts & Hardware - Mounting	S	S			
E.						

37. Auxiliary Hoist Gear Case

A.	General Condition	S	S			
B.	Gearing (Visual)	S	S			
C.	Bearings & Bushings	S	S			
D.	Load Brake (Applicable)	NA				
E.	Load Brake Visual	NA				
F.	Load Brake Action	NA				
G.	Oil Seals	S	S			
H.	Lube Level & Condition	S	S			
I.	Shaft & Couplings	S	S			
J.						

TABLE 1 (C0NTINUED)

Crane Serial Number: 1691

38.	Auxiliary Hoist Brake	Action Code	Safety Code	Budget Parts	Budget Labor	Comments
A.	Wheel Brake - Brake Drums	S	S			3 BRAKES-2 SHOE 1 DISC
B.	Friction Discs	S	S			
C.	Shoes/Linings	S	S			
D.	Coil Gap & Coil	S	S			
E.	Condition of Pins	S	S			
F.	Bushings & Linkage	S	S			
G.	Bolts & Hardware	S	S			
H.	Adjustment	S	S			
I.	General Condition	S	S			
J.						

39. Auxiliary Hoist Limit Switches

A.	Weight Limit	S	S			
B.	Upper Rotary Limit	S	S			
C.	Lower Limit	S	S			
D.						

40. Auxiliary Hoist Upper Block

A.	Weldment & Frame	S	S			
B.	Sheave Pin (Visual)	S	S			
C.	Sheaves	S	S			
D.	Sheave Bearings & Bushings	S	S			
E.	Equalizer Framework	S	S			
F.	Equalizer Pin & Retainers-Visual	S	S			
G.	Running Equalizer Sheave	S	S			
H.	Equalizer Bearings	S	S			
I.						

41. Auxiliary Hoist Drum

A.	Lands & Grooves	S	S			
B.	Pinion	S	S			
C.	Gear	S	S			
D.	Gear Covering	S	S			
E.	Bearings & Supports	S	S			
F.	Lubrication	S	S			
G.						

42. Runway

A.	Rail Head	S	S			
B.	Fasteners	S	S			
C.	Splices	S	S			
D.	Rail Straightness (Visual)	S	S			
E.	Runway End Stops	S	S			
F.	Conductors	S	S			
G.	Feeders - Expansion Joints	S	S			

TABLE 1 (C0NTINUED)

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Attachment B: Pre-Proof Test B30.2 Inspection Report

H.	Hangers - Supports	S	S			
I.	Bridge Collectors	S	S			
	Crane Serial Number:	1691				

	N/A Laser Services	Action Code	Safety Code	Budget Parts	Budget Labor	Comments
43.						
A.	Rail Straightness					
B.	Span Differential					
C.	Elevation					
D.	Rail-to-Rail Elevation					
E.	Bridge Squareness					
F.						
G.						

	N/A Other Services					
44.						
A.	Review Spare Parts					
B.	Load Test (See Attached)					
C.						
D.						

"4" IMMEDIATE ATTENTION	0
"3" PRIORITY MAINTENANCE	0
"2" REGULAR MAINTENANCE	3

Notes:

TABLE 2

TABLE 5-1: SUMMARY OF NDE INSPECTION FINDINGS

Item	Att. C Item Number	Description	Finding	Inspection Type	Att. D Page
1		Main Hook JA1691	Acceptable	MT	D-5
2	1	NE/Outside clip	Acceptable	MT	D-6
3	1	NE/Inside clip	Acceptable		
4	1	SE/Inside clip	Acceptable		
5	1	SE/Outside clip	Acceptable		
6	4	South tie weld	Acceptable		
7	4	North tie weld	Acceptable		
8	2	Bridge girder angle bolting	Acceptable	UT	D-7
9	3	East truck locator bolting	Acceptable		
10	1	Inside & outside spider gusset. wheel A	Acceptable	VT welds	D-8
11	1	Inside & outside spider gusset. wheel B	Acceptable		
12	1	Inside & outside spider gusset. wheel C	Acceptable		
13	1	Inside & outside spider gusset. wheel D	Acceptable		
14	1	North east outside angle clip	Acceptable		
15	1	North east inside angle clip	Acceptable		
16	1	South east outside angle clip	Acceptable		
17	1	South east inside angle clip	Acceptable		
18	4	North east tie weld	Acceptable		
19	4	South east tie weld	Acceptable		
20	3	East truck bolting	Acceptable	VT	D-9
21	7	Rail clip 7B	Acceptable	MT	D-11
22	7	Rail clip 8A	Acceptable		

TABLE 2 (CONTINUED)

Item	Att. C Item Number	Description	Finding	Inspection Type	Att. D Page
23	7	Rail clip 12A	Acceptable		
24	7	Rail clip 14A	Acceptable		
25	7	Rail clip 16B	Acceptable		
26	7	Rail clip 18A	Acceptable		
27	1	Trolley weld spider gusset NE OS	Acceptable	VT weld	D-12
28	1	Trolley weld spider gusset NE IS	Acceptable		
29	1	Trolley weld spider gusset NW OS	Acceptable		
30	1	Trolley weld spider gusset NW IS	Acceptable		
31	1	Trolley weld spider gusset SWOS	Acceptable		
32	1	Trolley weld spider gusset SW IS	Acceptable		
33	1	Trolley weld spider gusset SE IS	Acceptable		
34	1	Trolley weld spider gusset SE OS	Acceptable		
35	8	East truck locator bolting (continued)	Acceptable	UT	D-13
36	8	Trolley truck locator bolts	Acceptable		
37	8	Trolley wheel alignment bolting	Acceptable	VT	D-14
38	2	West bridge girder to end trolley bolting	Acceptable	UT	D-17
39	3	West truck locator bolts	Acceptable		
40	1	Wheel A IS and OS spider gussets	Acceptable	VT weld	D-18
41	1	Wheel B IS only	Acceptable		
42	1	Wheel C IS only	Acceptable		
43	1	Wheel D IS and OS spider gusset	Acceptable		
44	1	NW OS angle clip	Acceptable		
45	1	NW IS angle clip	Acceptable		
46	1	SW OS angle clip	Acceptable		
47	1	SW IS angle clip	Acceptable		
48	4	NW tie weld	Acceptable		
49	4	SW tie weld	Acceptable		

TABLE 2 (CONTINUED)

Item	Att. C Item Number	Description	Finding	Inspection Type	Att. D Page
50	7	Rail clip 7C	Acceptable	MT	D-19
51	7	Rail clip 9D	Acceptable		
52	7	Rail clip 10C	Acceptable		
53	7	Rail clip 11D	Acceptable		
54	7	Rail clip 16C	Acceptable		
55	7	Rail clip 18D	Acceptable		
56	1	NW OS clip	Acceptable	MT	D-20
57	1	NW IS clip	Acceptable		
58	1	SW IS clip	Acceptable		
59	1	SW OS clip	Acceptable		
60	4	North tie weld	Acceptable		
61	4	South tie weld	Acceptable		
62	3	West truck listing	Acceptable	VT	D-21
63	5	Bridge girder web to web weld A1H	Acceptable	MT	D-23
64	5	Bridge girder web to web weld A2H	Acceptable		
65	5	Bridge girder web to web weld B1H	Acceptable		
66	5	Bridge girder web to web weld B2H	Acceptable		
67	5	Bridge girder web to web weld B3H	Acceptable		
68	5	Bridge girder web to web weld B4H	Acceptable		
69	5	Bridge girder web to web weld C1H	Acceptable		
70	5	Bridge girder web to web weld C2H	Acceptable		
71	5	Bridge girder web to web weld C3H	Acceptable		
72	5	Bridge girder web to web weld D1H	Acceptable		
73	5	Bridge girder web to web weld D2H	Acceptable		
74	5	Bridge girder web to web weld D3H	Acceptable		
75	6	Bridge girder web to flange weld A1V	Acceptable	MT	D-24
76	6	Bridge girder web to flange weld B1V	Acceptable		

TABLE 2 (CONTINUED)

Item	Att. C Item Number	Description	Finding	Inspection Type	Att. D Page
77	6	Bridge girder web to flange weld B2V	Acceptable		
78	6	Bridge girder web to flange weld C1V	Acceptable		
79	6	Bridge girder web to flange weld C2V	Acceptable		
80	6	Bridge girder web to flange weld D1V	Acceptable		
81	6	Girder web to web welds, girder to flange A1H	Acceptable		
82	6	Girder web to web welds girder to flange A2H	Acceptable		
83	6	Girder web to web welds girder to flange A1V	Acceptable		
84	6	Girder web to web welds girder to flange C1H	Acceptable		
85	6	Girder web to web welds girder to flange C2H	Acceptable	VT weld	D-25
86	6	Girder web to web welds girder to flange C3H	Acceptable		
87	6	Girder web to web welds girder to flange C1V	Acceptable		
88	6	Girder web to web welds girder to flange C2V	Acceptable		
89	6	Girder web to web welds girder to flange B1H	Acceptable		
90	6	Girder web to web welds girder to flange B2H	Acceptable		
91	6	Girder web to web welds girder to flange B3H	Acceptable		
92	6	Girder web to web welds girder to flange B1V	Acceptable		
93	6	Girder web to web welds girder to flange B2V	Acceptable	VT weld	D-26
94	6	Girder web to web welds girder to flange D1H	Acceptable		
95	6	Girder web to web welds girder to flange D2H	Acceptable		
96	6	Girder web to web welds girder to flange D3H	Acceptable		
97	6	Girder web to web welds girder to flange D1V	Acceptable		
98	9	Bay 2 east hold down clip nickel copper bolting	Acceptable	UT	D-29
99	9	Carbon steel rivets	Acceptable		
100	7	East rail hold down clip fillet weld Bay 2 3-4 A & B	Rejected	VT weld	D-32
101	7	East rail hold down clip fillet weld Bay 2 4-5 A & B	Rejected		
102	7	East rail hold down clip fillet weld Bay 2 5-6 A & B	Rejected		
103	7	East rail hold down clip fillet weld Bay 2 6-7 A & B	Rejected		

TABLE 2 (CONTINUED)

Item	Att. C Item Number	Description	Finding	Inspection Type	Att. D Page
104	7	East rail hold down clip fillet weld Bay 2 7-8 A & B	Rejected		
105	7	East rail hold down clip fillet weld Bay 2 8-9 A & B	Rejected		
106	7	East rail hold down clip fillet weld Bay 3 4-5 A & B	Rejected	VTweld	D-33
107	7	East rail hold down clip fillet weld Bay 3 5-6 A & B	Rejected		
108	7	West rail hold down clip fillet weld Bay 3 2-3 A & B	Rejected	VTweld	D-34
109	7	West rail hold down clip fillet weld Bay 3 3-4 A & B	Rejected		
110	7	West rail hold down clip fillet weld Bay 3 7-8 A & B	Rejected		
111	7	West rail hold down clip fillet weld Bay 3 8-9 A & B	Rejected		
112	7	South trolley rail clip weld 14 C & D	Acceptable	VTweld	D-35
113	7	South trolley rail clip weld 15 C & D	Acceptable		
114	7	South trolley rail clip weld 16 C & D	Acceptable		
115	7	South trolley rail clip weld 17 C & D	Acceptable		
116	7	South trolley rail clip weld 18 C & D	Acceptable		
117	7	South trolley rail clip weld 19 C & D	Acceptable		
118	7	South trolley rail clip weld 20 C & D	Acceptable		
119	7	South trolley rail clip weld 21 C & D	Acceptable		
120	7	South trolley rail clip weld 22 C & D	Acceptable		
121	9	Copper nickel bolting east 12A & B	Acceptable	UT	D-41
122	9	Copper nickel bolting east 19A & B	Acceptable		
123	9	Copper nickel bolting west 10A & B	Damaged		
124	9	Copper nickel bolting west 17A & B	Acceptable		
125	9	East rail hold down clip bolting Bay 8 Bolts 12A & B thru 19 A & B except bolts B14 and B15	Acceptable	VT	D-42
126	9	East rail hold down clip bolting Bay 8 Bolts B14 and B15	Missing		
127	9	West rail hold down clip bolting Bay 8 Bolts 10A & B thru 17 A & B except bolts B16 and B17	Acceptable	VT	D-43

TABLE 2 (CONTINUED)

Item	Att. C Item Number	Description	Finding	Inspection Type	Att. D Page
128	9	West rail hold down clip bolting Bay 8 Bolts B16 and B17	Missing	VT	D-43
		Building girder top plate rivets and rail clip bolting		VT	D-27
129	9	Bolt A1 lock washer	Not compressed		
130	9	Bolt B7	Not seated		
131	9	Bolt B8	Not seated		
132	9	Bolt B9	Not seated		
133	9	Bolt B10	Not seated		
134	9	Bolt A11	Missing		
135	9	Bolt B11 lock washer	Broken washer		
136	9	Bolt B13	Not seated		
137	9	Bolt B16 lock washer	Broken washer		
138	9	Bolt B17 lock washer	Not compressed		
139	9	Bolt B21	Missing		
		BAY 8 East Rail			D-40
140	9	Bolts A & B 12	Acceptable	UT & VT	
141	9	Bolts A & B 13	Acceptable		
142	9	Bolts A 14	Acceptable		
143	9	Bolt B14	Missing		
144	9	Bolt A15	Acceptable		
145	9	Bolt B15	Missing		

TABLE 2 (CONTINUED)

Item	Att. C Item Number	Description	Finding	Inspection Type	Att. D Page
146	9	Bolts A & B 16	Acceptable		
147	9	Bolts A & B 17	Acceptable		
148	9	Bolts A & B 18	Acceptable		
149	9	Bolts A & B 19	Acceptable		
		BAY 5 West Rail			
150	9	Bolt A10	Pot. Cracked	UT & VT	
151	9	Bolt B10	Acceptable		
152	9	Bolt A11	Pot. Cracked		
153	9	Bolt B11	Acceptable		
154	9	Bolts A & B 12	Acceptable		
155	9	Bolts A & B 13	Acceptable		
156	9	Bolts A &B 14	Acceptable		
157	9	Bolts A & B 15	Acceptable		
158	9	Bolt A16	Acceptable		
159	9	Bolt B16	Missing		
160	9	Bolt A17	Acceptable		
161	9	Bolt B17	Missing		
		BAY 2 West Side			
162	9	Bolt A7	Not seated	VT	D-30
163	9	Bolt A8	Not seated		
164	9	Bolt B7	Not seated		
165	9	Bolt A9	Not seated		
166	9	Bolt A17, B17, A18, and B18	Missing		
167	9	Bolt B19	Not seated		
168	9	Bolt A21	Not seated		
169	9	Span between existing hold down clips	Excessive		

TABLE 2 (CONTINUED)

NDE Inspection Report of Indian Point Unit 1
Fuel Handling Building Bridge Crane

Item	Att. C Item Number	Description	Finding	Inspection Type	Att. D Page
170	9	A-19 - 22 & B19 - 22	Corrosion		D-38
171	9	D16 & D18	Non-metallic filler		D-15
172	9	East Crane Bay 3 Bolt A1	Not sealed	VT	D-30
173	9	West Side Bay 3 A1 & A2 clips	Corrosion		D-31
174	9	B22	Not sealed		
175	9	Clips	Bad welds		
176	9	Bay 3 East Rail Hold down B-22	Not sealed	VT	D-36

TABLE 3

NDE Inspection Report of Indian Point Unit 1
Fuel Handling Building Bridge Crane

TABLE 5-2: NDE FINDINGS – RECOMMENDED REPAIRS

Item	Description	Finding	Recommended Repair / Disposition
100	East rail hold down clip fillet weld Bay 2 3-4 A & B	Rejected	Repair weld to required size fillets or replace original clips with bolting
101	East rail hold down clip fillet weld Bay 2 4-5 A & B	Rejected	
102	East rail hold down clip fillet weld Bay 2 5-6 A & B	Rejected	
103	East rail hold down clip fillet weld Bay 2 6-7 A & B	Rejected	
104	East rail hold down clip fillet weld Bay 2 7-8 A & B	Rejected	
105	East rail hold down clip fillet weld Bay 2 8-9 A & B	Rejected	
106	East rail hold down clip fillet weld Bay 3 4-5 A & B	Rejected	
107	East rail hold down clip fillet weld Bay 3 5-6 A & B	Rejected	
108	West rail hold down clip fillet weld Bay 3 2-3 A & B	Rejected	
109	West rail hold down clip fillet weld Bay 3 3-4 A & B	Rejected	
110	West rail hold down clip fillet weld Bay 3 7-8 A & B	Rejected	
111	West rail hold down clip fillet weld Bay 3 8-9 A & B	Rejected	
123	Copper nickel bolting west 10A & B	Damaged	Replace bolt with 1" x 5" long B98 C65500 STD H01 quarter-hand bolt with hardened steel lock washer or equivalent. Torque to 90 ±10 LBF-FT
126	East rail hold down clip bolting Bay 8 Bolts B14 and B15	Missing	Replace bolt with 1" x 5" long B98 C65500 STD H01 quarter-hand bolt with hardened steel lock washer or equivalent. Torque to 90 ±10 LBF-FT
128	West rail hold down clip bolting Bay 8 Bolts B16 and B17	Missing	Replace bolt with 1" x 5" long B98 C65500 STD H01 quarter-hand bolt with hardened steel lock washer or equivalent. Torque to 90 ±10 LBF-FT
	Building girder top plate rivets and rail clip bolting		
129	Bolt A1 lock washer	Not compressed	Torque bolt to 90 ± 10 LBF-FT
130	Bolt B7	Not seated	
131	Bolt B8	Not seated	
132	Bolt B9	Not seated	
133	Bolt B10	Not seated	

Note: All bolting was replaced with A307 bolts.

TABLE 3 (CONTINUED)

Item	Description	Finding	Recommended Repair / Disposition
134	Bolt A11	**Missing**	Replace bolt with 1" x 5" long B98 C65500 STD H01 quarter-hard bolt with hardened steel lock washer or equivalent. Torque to 90 ±10 LBF-FT
135	Bolt B11 lock washer	**Broken washer**	Remove bolting and visually inspect bolting. If bolt is acceptable re-install bolt and new hardened steel lock washer and torque bolting to 90 ±10 LBF-FT
136	Bolt B13	**Not seated**	Torque bolt to 90 ± 10 LBF-FT
137	Bolt B16 lock washer	**Broken washer**	Remove bolting and visually inspect bolting. If bolt is acceptable re-install bolt and new hardened steel lock washer and torque bolting to 90 ±10 LBF-FT
138	Bolt B17 lock washer	**Not compressed**	Torque bolt to 90 ± 10 LBF-FT
139	Bolt B20	**Missing**	Replace bolt with 1" x 5" long B98 C65500 STD H01 quarter-hard bolt with hardened steel lock washer or equivalent. Torque to 90 ±10 LBF-FT
	BAY 8 East Rail		
143	Bolt B14	**Missing**	Replace bolt with 1" x 5" long B98 C65500 STD H01 quarter-hard bolt with hardened steel lock washer or equivalent. Torque to 90 ±10 LBF-FT
145	Bolt B15	**Missing**	Replace bolt with 1" x 5" long B98 C65500 STD H01 quarter-hard bolt with hardened steel lock washer or equivalent. Torque to 90 ±10 LBF-FT
	BAY 8 West Rail		
150	Bolt A10 (Note: Refer to reference 19 for explanation to bolt identification)	**Cracked**	Replace bolt with 1" x 5" long B98 C65500 STD H01 quarter-hard bolt with hardened steel lock washer or equivalent. Torque to 90 ±10 LBF-FT
152	Bolt A11 (Note: Refer to reference 19 for explanation to bolt identification)	**Cracked**	Replace bolt with 1" x 5" long B98 C65500 STD H01 quarter-hard bolt with hardened steel lock washer or equivalent. Torque to 90 ±10 LBF-FT

TABLE 3 (CONTINUED)

Item	Description	Finding	Recommended Repair / Disposition
160	Bolt B16	Missing	Replace bolt with 1" x 5" long B98 C65500 STD H01 quarter-hard bolt with hardened steel lock washer or equivalent. Torque to 90 ±10 LBF-FT
161	Bolt B17	Missing	Replace bolt with 1" x 5" long B98 C65500 STD H01 quarter-hard bolt with hardened steel lock washer or equivalent. Torque to 90 ±10 LBF-FT
	BAY 2 West Side		
162	Bolt A7	Not seated	Torque bolt to 90 ± 10 LBF-FT
163	Bolt A8	Not seated	
164	Bolt B7	Not seated	
165	Bolt A9	Not seated	
166	Bolt A17, B17, A18, and B18	Missing	Replace bolt with 1" x 5" long B98 C65500 STD H01 quarter-hard bolt with hardened steel lock washer or equivalent. Torque to 90 ±10 LBF-FT
167	Bolt B19	Not seated	Torque bolt to 90 ± 10 LBF-FT
168	Bolt A21	Not seated	
169	Span between existing hold down clips	Excessive	Install hold down clips 2 feet on center
170	A-19 – 22 & B19 - 22	Corrosion	Remove existing clips and clean area of corrosion. Replace clips.
171	D16 & D18	Non-metallic filler	Accept "As-Is". See Section 5.0.
172	East Crane Bay 3 Bolt A1	Not seated	Torque bolt to 90 ± 10 LBF-FT
173	West Side Bay 3 A1 & A2 clips	Corrosion	Remove existing clips and clean area of corrosion. Replace clips.
174	B22	Not seated	Torque bolt to 90 ± 10 LBF-FT
175	Clips	Bad welds	See Reference 9.
176	Bay 3 East Rail Hold down B-22	Not seated	Torque bolt to 90 ± 10 LBF-FT

Note: See references 17 and 18 for non-conforming conditions on bolted joints and welding deficiencies, respectively.

ATTACHMENT 3 TO NL-07-117

HOLTEC AUTHORIZATION LETTER
SEPTEMBER 21, 2007
WITH ACCOMPANING AFFIDAVIT AND PROPRIETARY NOTICE

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT UNIT NO. 1
DOCKET NO. 50-003

HOLTEC INTERNATIONAL

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

September 21, 2007

Mr. Paul Peloquin
Project Manager Unit 1 Dry Cask Storage
Indian Point Energy Center
450 Broadway-MSB
P.O. Box 249
Buchanan, NY. 10511-0249

Document ID: 1535018

Subject: NRC Requested Information for IP1 LAR Unit 1 Fuel Handling Building Crane

Dear Mr. Peloquin:

Holtec is pleased to approve the release of the following proprietary information to the NRC:

Attachment 1: Holtec Reports HI-2063606 Rev 1, HI-2063597 Rev 0, HI-2063572 Rev 3 on optical storage media (two copies).
Attachment 2: Computer files associated with Attachment 1 on optical storage media (two copies).

We require that you include this letter along with the attached affidavit pursuant to 10CFR2.390 with your submittal.

Please do not hesitate to contact me if you have any questions.

Sincerely,

Tammy Morin
Licensing Project Manager

Enclosures: Four (4) Compact Disks & One (1) Affidavit Pursuant to 10CFR2.390

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Document ID 1535018
Non-Proprietary Attachment

AFFIDAVIT PURSUANT TO 10 CFR 2.390

I, Dr. Stefan Anton, 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 Holtec reports and Holtec input and output data files contained in Attachments 1 and 2 to Holtec letter Document ID 1535018, containing 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.

AFFIDAVIT PURSUANT TO 10 CFR 2.390

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

Dr. Stefan Anton, being duly sworn, deposes and says:

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

Executed at Marlton, New Jersey, this 21st day of September, 2007.

Stefan Anton

Dr. Stefan Anton
Holtec International

Subscribed and sworn before me this 21st day of September, 2007.

Maria C. Massi

MARIA C. MASSI
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires April 25, 2010

ENCLOSURE 1 TO NL-07-117

HOLTEC CALCULATIONS AND INPUT DATA

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT UNIT NO. 1
DOCKET NO. 50-003

ENCLOSURE 1 TO NL-07-117

HOLTEC CALCULATIONS AND INPUT DATA

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