From:	Peterson, Alyse L (NYSERDA)
To:	Guzman, Richard
Cc:	Tifft, Doug
Subject:	[External_Sender] Re: IP3 Crane LAR -- additional informal questions
Date:	Tuesday, January 19, 2021 9:25:39 AM

Hi Rich,

Just checking in on your progress with this. Can we look at setting up a date for our initial planned call?

Also, we've reviewed Entergy's (NL-20-078) response to RAI. It provides some limited additional information but in the absence of the three proprietary enclosures (1-3) Entergy references, the remainder of the response provides little technical information that the State can use to complete our review. Even where technical information is provided, it is presented in general terms to avoid revealing specific details. We continue to do our best to review without the proprietary enclosures. The RAI response did touch on some of our questions (whole or in-part) but raised a few new ones. I've outlined both the answered/ partially-answered questions & the new questions below. Hopefully they're clear. Let me know if not.

Stay well,

Alyse

Previous Questions - Some of the responses touched on our previous questions. The following addresses those questions with the additional information in blue.

1. **What temperature range was considered for the structural analysis?**

   Changes in ambient temperature could adversely affect the calculated factor of safety of the crane structure. These changes could come from climate control system failures or opening/closing of large doors in the building. When temperatures change, structural components will change length, potentially increasing the maximum stress experienced by structural components. NUREG 0554 Sections 2.3 and 2.4 require establishing operating environmental parameters.

   Enclosure 4, page 3 of 16, first full paragraph says only that environmental limits have been defined but does not help ensure the limits bound the potential use of the system.

2. **What temperature range is considered acceptable for the hydraulic fluid and how is this temperature monitored by the control system?**

   Changes in ambient temperature or oil temperature could adversely affect the performance of hydraulic systems; these changes could come from climate control system failures, opening/closing of large doors in the building, or lack of consideration for hydraulic system heat buildup. When operating temperatures change, orifice and valve performance can change from calibrated parameters as these items physically expand or contract with temperature. Similarly, oil viscosity changes with temperature potentially changing the anticipated flow rates of hydraulic systems. NUREG 0554 Sections 2.3 and 2.4 require establishing operating environmental parameters.

   Enclosure 4, page 3 of 16, first full paragraph says only that environmental limits have been defined but does not help ensure the limits bound the potential use of the system.

3. **Is there an Owner or site-specific material handling standard that would specify the minimum design margin for the lifted load at Indian Point 3?**

   OSHA's "Investigation of the March 31, 2013 Temporary Overhead Crane Collapse at Arkansas Nuclear One Power Plant in London/Russellville, AR" dated August 2013 (https://www.osha.gov/doc/engineering/pdf/2013_r_04.pdf) documented the cause of a temporary overhead crane failure. One finding was that in performing the temporary crane design the engineers failed to comply with Entergy Nuclear Management Manual EN-MA-119 which required the crane to be designed for 125% of the lifted load and then tested to 125% of the design load. Design to this margin could have prevented the ensuing collapse at ANO. According to the Holtec LAR, the crane is designed to lift 100 tons (section 2.1.1), with the intended lifted load weighing 98 tons.

   More detail has been provided throughout the document.

4. **What is the design vertical hook travel distance?**

   It is not possible to evaluate what length of strand and lifted load might participate in any seismically induced swinging from information in the LAR.

   This is supposedly addressed in the proprietary information.

5. **Do the locking wedges teeth have any adverse effects on the strand integrity over time? Is there a design life for the strands (e.g. 100 lifts at full capacity)? Is there a design life for the collets related to this? If there is a useful design life, how will usage of the crane be tracked and recorded, so that usage does not exceed the design limits. What measures will be implemented when the crane reaches its intended design life and what evaluations will be undertaken at that time if more lifts need to be performed after its useful design life?**

   The strand jack holds the load by using locking wedges (collets, see LAR Figure 3) to clamp the strands in place. The illustration shows the collets as having roughened surfaces or even small teeth that bite into the strand when loaded.

   Enclosure 4, page 14 of 16, Note 1 addresses but does not fully resolve this question.

6. **Will that same inspection process be implemented at Indian Point as was used at HBPP and how will the inspection process be accomplished given there is no permanent work platform in the area of the strand basket?**

   It is common practice to perform a visual inspection of lifting and rigging equipment prior to each use. The Humboldt Bay davit crane license amendment (ADAMS Accession Number ML053000192) states that the licensee would inspect the strands before each lift.

   Enclosure 4, page 13 of 16, table 2 addresses but does not resolve this issue and defers the maintenance manual.

7. **Will any of the strand jack components require routine inspection? If so, how frequently and how will this be accomplished without a permanent work platform from which to inspect?**

   A review of commercially available lifting strand jacks (for example see Dorman Technology, Enerpac, or Mammoet product web pages) shows that strand jacks typically have numerous hydraulic valves, lines, fittings, and other sensors/controls fitted directly to the cylinder housing.

   Enclosure 4, page 13 of 16, table 2 addresses this issue but does not explain how inspections will be performed.

8. **Was lateral torsional buckling considered? Were local buckling modes of failure considered in the calculation?**

   LAR Section 3.1.1. states the "the finite element method to calculate normal beam stresses" was used for analysis. Similarly, steel structures supporting concentrated loads must be evaluated for local buckling failures of beam flanges and webs.

   Enclosure 4, page 3 of 16, second full paragraph provides some information.

9. **Was low cycle fatigue evaluated during HI-LIFT crane design?**

   NUREG 0554 Section 2.7 requires that cranes be evaluated for structural fatigue of members and joints.

   Enclosure 4, page 3 of 16, second full paragraph suggests that only "mechanical" elements are designed for fatigue (versus "structural" elements).

10. **Has the 200% MCL design and test requirement from NUREG 0554 been implemented in the HI-LIFT design? If not, why?**

    NUREG 0554 Section 4.3 requires head and load blocks to be designed for 200% of the MCL. The load block in this case is the bottom assembly attached to the ends of the strands (the exact form not specified in LAR) and the head block would be analogous to the strand jack.

    Enclosure 4, page 3 of 16, bottom paragraph says this answer is yes.

NEW Questions Related To Entergy NL-20-078

1. **Were structural elements designed with respect to low cycle fatigue?**

   Enclosure 4, page 3 of 16, second full paragraph. Entergy differentiates between structural and mechanical components of the crane. There is a clear statement that mechanical elements are designed with respect to fatigue, but no similar statement is provided for structural elements. Of particular concern is low cycle fatigue which can develop when structural members experience high magnitude stress reversals as would be expected for the HI-LIFT.

2. **What design changes were made to the HI-LIFT design that required issuing a Revision 2 of the Specifications and Drawings?**

   In the original LAR (Entergy NL-20-021) no revision number was shown on drawings or other data. In Entergy NL-20-078 the Enclosures clearly reference Revision 2, but do not describe what design changes may have been implemented for HI-LIFT between the time of the original LAR and the current RAI response. This suggests the design is less complete than the LAR would lead the reader to believe.

3. **Will the strand jack, guide, and strand management device need to be removed and placed on the ground for each inspection event (i.e., before every lift)?**

   NL-20-078, Enclosure 4, page 13 of 16, provides Table 12which identifies inspection tasks and frequency. It describes numerous inspections that must be performed for the strand jack and associated components. Enclosure 4, Page 8 of 16, second paragraph states the strand jack and associated components are installed on a common, removeable frame.

Given the lack of personnel work surfaces around the crane, this suggests it might be removed for inspection events.

4. Do HI-LIFT design documents provide details about the attachment of this removeable strand jack assembly, including attachment points for lifting and rigging?

Entergy NL-20-021 provides Figure 1: HI-LIFT ISO View. This illustration does not show any means by which to lift and rig the strand jack assembly.

5. How is the strand jack assembly attached to the HI-LIFT center beam?

NL-20-078, Enclosure 4, page 9 of 16, first paragraph states "Given the lack of credible load cases that would cause movement of the strand jack, the strand jack mounting system can be regarded as a defense-in-depth device from a structural perspective, allowing the mounting system to be optimized for operations." This suggests the method of attachment is not fixed.

6. How many strands or strand wedges can fail before HI-LIFT cannot support 125% of MCL?

NL-20-078 Enclosure 4, page 11 of 16, bottom paragraph states "The load is shared among all strands and wedges such that any single mechanical failure of a strand or wedge does not result in any significant loss of load capacity and would not impact the load holding ability of the strand jack." This statement is made without providing any justification or details about the margin against failure.

7. How will personnel access the HI-LIFT components to perform required pre-lift inspections?

NL-20-078 Enclosure 4, page 13 of 16, Table 2 lists inspections required for monitoring the condition of the HI-LIFT. It would appear that many of the inspections require access to parts of the HI-LIFT not accessible from the SFP building floor.

8. Provide justification for the statement that seawater is more deleterious to the strand jack than borated water.

NL-20-078, Enclosure 4, page 16 of 16 attempts to answer the NRC's question regarding the interaction of HI-LIFT materials with borated water from the SFP. Entergy makes the statement "Spent Fuel Pool water is less deleterious than seawater" without providing any tests, studies, or other justification. Moreover, this portion of the document describes the steel strands as unlubricated. This raises additional questions regarding the formation of corrosion, even under the action of demineralized cleaning water only.

From: Guzman, Richard <Richard.Guzman@nrc.gov>
Sent: Friday, December 11, 2020 2:20 PM
To: Peterson, Alyse L (NYSERDA) <Alyse.Peterson@nyserda.ny.gov>
Cc: Tifft, Doug <Doug.Tifft@nrc.gov>
Subject: RE: IP3 Crane LAR -- additional informal questions

Hi Alyse,

I wanted to give you an update on my intended plan for providing response to the informal questions. While I indicated a few weeks back, per your request, that I would try to send you piecemeal answers to some of the factual "low hanging fruit" questions, I will not be able to turn this around until early January at the earliest. The staff is still working to complete its review of the licensee's LAR and open RAIs by January. As I mentioned before, it is more ideal from a process standpoint to have the staff complete its evaluation (i.e., close out any remaining RAIs w/licensee and have draft safety evaluation) before we provide a final response to the questions. However, based on the # of informal questions, I agree it is more sensible to handle these questions on a piecemeal basis as opposed to waiting until closer to the time of issuance (est. April) to discuss all 80+ questions on a conference call. At least one of the challenges I'm coming across for responding to many of these questions, particularly the ones that are requesting specific technical factual information, is how to be responsive to the question without disclosing proprietary information.

Let me know if you have any concerns w/the shift to January for the 1st partial response.

Thanks,

Rich Guzman
Sr. PM, Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Office: O-9C7 | Phone: (301) 415-1030
Richard.Guzman@nrc.gov

From: Peterson, Alyse L (NYSERDA) <Alyse.Peterson@nyserda.ny.gov>
Sent: Thursday, October 22, 2020 9:23 AM
To: Guzman, Richard <Richard.Guzman@nrc.gov>
Cc: Tifft, Doug <Doug.Tifft@nrc.gov>
Subject: [External_Sender] IP3 Crane LAR -- additional informal questions

Good morning Rich,
As we discussed yesterday, below is a second batch of informal questions on the proposed HI-LIFT crane license amendment request (LAR) for Indian Point Unit 3. I understand that your expert reviewers are still in the process of reviewing the LAR themselves and may not be able to answer some of our questions yet. So that we can continue our due diligence review of the proposal, we would greatly appreciate your assistance with as many of the questions as possible now and then we can tackle the remainder when your reviewers are able.

Please note: the questions below have not been posed to Entergy. We have worked with Entergy over the past months to get answers to two previous sets of questions on the proposed crane but found their responses so minimal that the effort was unproductive. As you know, Entergy has designated portions of both the original LAR documentation and their October 2, 2020 response to NRC's RAI as proprietary and withheld the information contained in them from the State. This includes factual information on the proposed design, installation, and operation of the crane that is necessary for the performance of a comprehensive safety review of the proposal. Our direct request to Entergy for the withheld documentation was denied and their responses to our targeted questions have been limited to the information already contained in the non-proprietary documents we already had in hand. Entergy's refusal to provide the State with the withheld documentation constrains the State's ability to comprehensively review the proposal and is in direct conflict with their written statement that: "In accordance with 10 CFR 50.91, "Notice for public comment; State consultation," paragraph (b), a copy of this application, with attachments, is being provided to the designated State Officials." This statement is inaccurate and is misleading to the public and to NRC.

Many thanks again to you and your staff for your assistance.
Alyse

Alyse Peterson, P.E.
Senior Advisor
State Liaison Officer Designee
Nuclear Coordination and Radioactive Waste Policy
NYSERDA
17 Columbia Circle | Albany, NY 12203-6399
P: 518-862-1090 x3274 | F: 518-862-1091 | E: alyse.peterson@nyserda.ny.gov

Informal NY State Questions on the IP Unit 3 March 24, 2020 LAR for Installation & Use of a New Auxiliary Lifting Device

General Questions

1. How much clear space is available between the cask and the crane components and the cask and the SFP wall?
2. How much clear space is available to accommodate load eccentricities under seismic conditions?
3. For certification of the crane as single failure proof, please provide the matrix and Holtec's rationale.
4. Please clarify why the HI-LIFT crane would be qualified as single failure proof whereas the HBPP davit crane was not.
5. What temperature range was considered for the structural analysis?
6. What temperature range is considered acceptable for the hydraulic fluid and how is this temperature monitored by the control system?
7. Do the referenced original analyses for the fuel pool floor and walls bound the cask size, configuration, locations, and lifted heights proposed in the LAR?
8. Is there an Owner or site-specific material handling standard that would specify

the minimum design margin for the lifted load at Indian Point 3?

9. Please confirm the fully loaded cask weight. If the weight is 80% or greater than the rating of the Hi-LIFT crane, will the lifts be deemed to be 'critical lifts' and apply the associated plans and safety protocols?

Strand Jack

1. How does the strand jack provide uniformity of load amongst the strands?
2. What is the factor of safety if one strand breaks? Will loss of a strand cause the load to become unbalanced and tilt, potentially leading to cask contact with the crane or SFP wall?
3. How many strand locking wedges (collets) can fail before the system no longer has a sufficient factor of safety? How are strand or collet failures detected?
4. What safety devices other than the counterbalance valves are in place to prevent sudden loss of hydraulic pressure in the strand jack and in the swing arms?
5. What is the design vertical hook travel distance?
6. What measures must be taken to mitigate corrosion and potential failure of the strands and locking wedges?
7. Do the locking wedges teeth have any adverse effects on the strand integrity over time? Is there a design life for the strands (e.g. 100 lifts at full capacity)? Is there a design life for the collets related to this? If there is a useful design life, how will usage of the crane be tracked and recorded, so that usage does not exceed the design limits. What measures will be implemented when the crane reaches its intended design life and what evaluations will be undertaken at that time if more lifts need to be performed after its useful design life?
8. How will visual inspection of the strand jack, swing arms, hydraulic system, and other critical components be accomplished?
9. Will that same inspection process be implemented at Indian Point as was used at HBPP and how will the inspection process be accomplished given there is no permanent work platform in the area of the strand basket?
10. What allowance is made in analysis for overturning moments?
11. How was prying action in the fasteners between the strand jack and center beam evaluated?
12. Are there any reductions in factor of safety due to the reduced coefficient of friction of wet strands? Are there any requirements to re-lubricate the assembly due to immersion in the SFP or exposure to the SFP borated water environment?

Hydraulics and Controls

1. Are hydraulic controls designed to safely reset to a zero-motion state after an electric power loss? Are hydraulic controls designed hold the load stationary following a loss of hydraulic pump power or pressure?
2. Please provide a list of the hydraulic system failure modes evaluated and proposed mitigations.
3. What force imbalance between the cylinders was considered in design to represent the imbalance that could develop between the time that a failure is observed, and cylinder pressure is equalized?
4. What allowance for mismatch between cylinder forces was allowed for in design? If no allowance for mismatch was made in design, what safety features of the metering system will prevent a force mismatch from developing?
5. Have the consequences of a hydraulic oil spill into the spent fuel pool been evaluated?
6. How are hydraulic lines routed so as to avoid being beneath, near, or in the way

of the lifted load?
7. Will any of the strand jack components require routine inspection? If so, how frequently and how will this be accomplished without a permanent work platform from which to inspect?
8. How will operators be trained to address these contingency scenarios related to electronic and hydraulic failures? Is any equipment or hardware required to be immediately available perform these emergency actions? How much time is available for any required operator actions?
9. Will crane functional testing include a two-block test to demonstrate the action of the counterbalance system?

Structural Analysis

1. How will this dimensional change in the outrigger arm be accommodated while providing support for all horizontal loads?
2. Was lateral torsional buckling considered? Were local buckling modes of failure considered in the calculation?
3. What allowances were made in the analysis of the HI-LIFT to represent the effects of fabrication tolerances? For example, was there any assumption made about out-of-plumbness of the overall assembly in the vertical condition?
4. What components of the HI-LIFT received an additional 15% design margin?
5. Was low cycle fatigue evaluated during HI-LIFT crane design?
6. Has the 200% MCL design and test requirement from NUREG 0554 been implemented in the HI-LIFT design? If not, why?
7. Were the soils and foundations below the spent fuel pool wall evaluated for the increased loading?
8. What were the limits of the analysis model (i.e. how much of the structure was represented)? Did the model consider the effects of the loaded wall on the other SFP walls during a seismic event? Or just the two walls to which the HI-LIFT is connected? If only the two walls supporting the HI-LIFT, how was this modeling simplification justified?
9. A convergence study is required to determine at what level of discretization a finite element model provides accurate results. Was such a study performed?
10. How was the stiffness of concrete represented in the finite element model? What assumption were made as to the condition of the concrete supporting the HI LIFT?
11. Was the truck bay wall factor of safety evaluated under the action of this uplift and moment acting in concert with all other code required loads?
12. When positioning the HI-LIFT crane what allowances have been made in the SFP wall for eccentric vertical loading from the crane? i.e. how far from the geometric center of the wall can the crane center of support be located before induced moments create an unconservative stress state in the wall?
13. Has the SFP liner and bedrock below it been evaluated for the increased loading with the proposed 98 ton cask?
14. Are there any fuel assemblies in the pool that would be damaged by the larger HI TRAC' cask falling onto its side?
15. Were new planes of internal high stress identified and evaluated against code requirements? Did this include an evaluation of the effects of these stresses on the SFP liner?
16. What is the assumed displacement between the truck bay wall and the SFP wall during a seismic event? How will the frictional forces of the torque arm rollers be validated to confirm that the assumed boundary conditions are

representative?
17. What testing or inspections of the SFP wall and truck bay wall have been performed to determine their current condition?

Anchors and Attachments

1. Please clarify which code was used to design post-installed anchors.
2. Were factors including the space between individual anchor bolts, the distance from the edge of concrete members, and presence of rebar around the anchors incorporated in the design of post-installed anchors?
3. When the HILIFT baseplate is created based on the field-installed anchor locations, by how much will anchor bolt holes be oversized and will this oversize require plate washers for horizontal and vertical load transfer?
4. When the HILIFT attachment plate is installed on the truck bay wall, by how much will bolt holes be oversized in this attachment plate and will this require the use of plate washers?
5. Please clarify which attachment method is assumed in the design. (The LAR describes attachment to the truck bay wall with "studs" in 2.1.4. This does not match the cross-sectional image which appears to show through bolting with threaded rods.)
6. What limits are placed on the allowable grout pad thickness and were the anchors checked structurally for this thickness?
7. What analysis has been performed to demonstrate the shear and bending capacity of the anchor bolts supporting the HI-LIFT under horizontal seismic loads as this will be the only mechanism of horizontal load transfer?
8. Was relative seismic motion between the SFP wall and truck bay wall determined to fall within the available horizontal travel of the roller support system? If so, how much margin exists at the extreme travel distance before the torque arms crash into the truck bay wall or exit the roller guides?
9. Has consideration been made for the forces that would develop should the truck bay roller support become jammed or otherwise fail to function as intended? Is there any indicator that would identify bearing failure at this location?
10. How do the slide mounts secure the cylinders to the torque arms and what is their margin of safety against failure?
11. Will the HI-LIFT factory load test use an anchorage method and pattern identical to the in-service condition?

Field locating SFP wall anchors might show it necessary to omit one or more anchors due to interferences.

12. How will anchor load testing be equated to the anchor's ability to resist lateral loads (required to resist design seismic loading)?
13. What method was used in the design of the HI-LIFT anchorage? (i.e. rigid base plate or flexible base plate)?

Dose

1. Are there radiological/dose benefits for the proposed HI-LIFT crane? Please provide the actual dose received during the most recent wet transfer. What is the estimated dose for a fuel campaign involving the proposed HI-LIFT crane? Please clarify the dose estimates:
a.Please provide the estimated total dose to be received if the remaining spent fuel is moved to dry cask using the wet-transfer option (in person rem).
b.Please provide the estimated total dose to be received if the remaining spent fuel is moved to dry cask using the proposed IP3 HI-LIFT crane option (in person rem).

Alyse Peterson, P.E.
Senior Advisor
State Liaison Officer Designee
Nuclear Coordination and Radioactive Waste Policy
NYSERDA
17 Columbia Circle | Albany, NY 12203-6399
P: 518-862-1090 x3274 | F: 518-862-1091 | E: alyse.peterson@nyserda.ny.gov
nyserda.ny.gov
follow : friend : connect with NYSERDA