

10 CFR 50.59
10 CFR 50.90

April 4, 2013

ZS-2013-0150

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

Zion Nuclear Power Station, Units 1 and 2
Facility Operating License Nos. DPR-39 and DPR-48
NRC Docket Nos. 50-295 and 50-304

Subject: Submittal of an ASME NOG-1 Exception Request and Update to the Amendment to Approve Methods of Analysis, use of the Upgraded Fuel Handling Building Crane System as a Single-Failure Proof Crane and Approval of a NUREG 0612 Compliant Heavy Loads Handling Program

References:

- 1) *ZionSolutions*, LLC Letter ZS-2013-0083, Daly to NRC, "Response to Requests for Additional Information for Questions 1, 2, 4 and 5," dated February 21, 2013
- 2) *ZionSolutions*, LLC Letter ZS -2012-0448, Daly to NRC, "Request for Amendment to Approve Methods of Analysis, use of the Upgraded Fuel Handling Building Crane System as a Single-Failure Proof Crane and Approval of a NUREG 0612 Compliant Heavy Loads Handling Program," dated October 25, 2012

ZionSolutions, LLC (ZS) requested approval for use of the upgraded Fuel Handling Building Crane as a single-failure proof system in Reference 2. Reference 2 includes a matrix identifying compliance to ASME NOG-1, 2004, "Rules for Construction of Overhead and Gantry Cranes" which includes Section 4140 and took no exceptions to the loads to be considered as part of the structural analyses. Reference 1 provided an initial response to Question 5 regarding the basis that ZS used for not including wind loads as part of the FHB crane design analysis. ZS is superseding its response in total for RAI Question 5, as provided in Reference 1, to request an exception to ASME NOG-1, 2004 Section 4140 for loads associated with wind. The attachment includes the basis for the exception of excluding wind loads as part of the crane design analysis and a description of the administrative controls proposed to minimize the likelihood that the FHB crane will be handling a spent fuel cask during a tornado. Also included is a red line strike out replacement of the original pages from Reference 2 to incorporate the information from the attachment.

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If you have any questions, please contact Jack Bailey at (224) 789-4138.

Respectfully,

A handwritten signature in black ink, appearing to read "Patrick Daly", with a long, sweeping horizontal line extending to the right.

Patrick Daly
Senior Vice President & General Manger
ZionSolutions, LLC

Attachment 1: Revised Response to RAI # 5

cc: John Hickman, U.S. NRC Senior Project Manager
Service List

Zion Nuclear Power Station, Unit 1 and 2 License Transfer Service List

cc:

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RAI #5 This response supersedes in total the response provided on February 21, 2013

Question received from NRC on December 18, 2012:

5. The licensee stated that a seismic analysis was performed in accordance with ASME NOG-1, 2004, "Rules for Construction of Overhead and Gantry Cranes." However, on page 23 of the LAR submittal, "Crane operational load cases in Section 4140 of the ASME NOG-1," and "Crane seismic event loads in Section 4140 of the ASME NOG-1," the wind load for operating, design, and tornado were omitted. Please provide a technical justification regarding the absence of the wind load for operating, design, and tornado were not included in the analysis.

Response:

Request for Exception to ASME NOG-1 Section 4140

The licensing and design basis for the Fuel Handling Building in the ZNPS DSAR do not require (nor provide for) combining operating or design wind loads nor tornado wind loads with the earthquake loads or crane live loads. The building design however is analyzed for the dead load, live load, thermal loading, and design wind loads. It is also analyzed for dead load, thermal loading, and tornado wind loads. In no case do the required analysis include the design basis earthquake combined with design or tornado wind loads.

Section 4140 of ASME NOG-1, 2004, "Rules for Construction of Overhead and Gantry Cranes," identifies the loads and load combinations applicable to the analysis performed for Type 1 cranes (which includes the proposed FHB crane modification). The Operating Wind Load (designated as P_{wo} in NOG-1 and which is not included in DSAR Table 3-5), Design Wind Load (designated as P_{wd} in NOG-1 and is stipulated to be W in the DSAR Table 3-5) and Tornado Wind Load (designated as P_{wt} in NOG-1 and is stipulated to be W' in the DSAR Table 3-5) are not combined with earthquake loads or crane live loads in DSAR Table 3-5 or proposed Table 3-5A load cases, which reflects the design basis of the Zion Station.

The calculations performed for the proposed crane modification are consistent with the above stated station load combinations. Therefore, since the calculations provided for acceptance of this crane to NOG-1 standards do not contain the full set of load combinations, ZS requests an exception to ASME NOG-1 Section 4140 consistent with the existing licensing basis to not include the wind loads as part of the analysis of the crane. Note that the original design basis of the building includes design and tornado wind loads as described above and this exception does not affect the analysis of the crane itself since it is an indoor crane. Proposed updates to Page 23 of 44 of the License Amendment Request and NOG Compliance Matrix sections 4134 and 4140 are provided herewith.

ZS has proposed administrative controls to limit the likelihood of having a load suspended from the hook during a tornado. These commitments to administrative controls are identified in the following locations in the License Amendment Request:

In the “List of Regulatory Commitments” a continuing compliance commitment that states: “Heavy load movements using the Fuel Handling Building (FHB) Overhead Bridge Crane (OBC) are not permitted if a tornado watch or warning has been declared for the site by the National Weather Service. If heavy load handling with the OBC is in progress when any of these criteria are met, the load will be placed in a safe location as soon as possible and the crane secured;”

In the proposed update to the Zion Station DSAR Section 3.9.5.4.2, Load Handling Procedures, that states:

“Because the maximum credible tornado and the fully loaded crane have not been analyzed together, heavy load movements using the Fuel Building overhead bridge crane are not permitted if a tornado watch or warning has been declared for the site;” and

In the “Heavy Loads Program, ZAP-510-19, Section 6.3.12 that states:

Procedures for heavy load handling operations shall include the following Precaution/Limitation:

“Heavy load movements using the Fuel Handling Building (FHB) Overhead Bridge Crane (OBC) are not permitted if a tornado watch or warning has been declared for the site by the National Weather Service. If heavy load handling with the OBC is in progress when any of these criteria are met, then the load will be immediately lowered to a safe location and the crane secured.”

Evaluation of Change in Trolley Weight with Regard to Wind Load Design Basis

As additional information associated with the wind load calculations, an evaluation was performed to consider the additional weight of the trolley in the original building calculations. The following provides a summary of that evaluation.

Zion DSAR Table 3-5 lists the seismic Class I load combinations for the Fuel Handling Building (FHB). The design wind load (W) and maximum credible tornado wind load (W') are not combined with earthquake loads in DSAR Table 3-5 or proposed Table 3-5A load cases. Since the wind loads are not included in seismic load cases, calculation ZION001-CALC-002 does not analyze the wind loading. The original FHB calculations continue to be the design basis for the DSAR required building wind load evaluations. Calculation ZION001-CALC-002 Revision 2 evaluated the effect of the additional new trolley weight (approximately 3600 lb.) on the original wind load analyses and determined the extra mass to be negligible compared to the combined mass of the bridge, trolley, and live load. The resulting change to the building members is therefore insignificant. In addition, ZS recognizes this limitation of the evaluation and has committed to control heavy load movements if a tornado watch or warning has been declared for the site by the National Weather Service. These actions are identified as described above.

Superseded page 23 of 44 with red line strike out changes below

dimensional stress state to be represented as a single positive stress value. Equivalent stress is part of the maximum equivalent stress failure theory. The purpose of providing the von Mises stress is to show the combined stresses and critical regions in one plot, instead of 6 different plots for normal and shear stresses.

Crane operational load cases in section 4140 of the ASME NOG-1

P_{C1} : $P_{db} + P_{dt} + P_{lc}$: enveloped by P_{C2} .

P_{C2} : $P_{db} + P_{dt} + P_{lc} + P_v$: analyzed under section 5.1 of this report.

P_{C3} : $P_{db} + P_{dt} + P_{lc} + P_{ht}$: analyzed under section 5.1 of this report.

P_{C4} : $P_{db} + P_{dt} + P_{lc} + P_{hl}$: analyzed under section 5.1 of this report.

P_{C5} : Plant operation induced loads and static test pressure loads. Not applicable

The trolley positions are addressed in Table 4153.7-2 for extreme environment conditions and all the applicable extreme environment conditions are addressed in the report. Impact loads in section 4133 are defined for operating condition loads and they are not required during seismic application as described in section 4140. For this reason, impact loads are applied only on the mid position, which is the most critical case for operational load case.

Load cases P_{C6} , P_{C7} , P_{C8} and P_{C9} are not performed in this analysis, since construction loads ~~and design wind loads~~ are not applicable for this crane. **ZS requests an exception to the Operating Wind P_{wo} , Design Wind Load P_{wd} , and Tornado Wind Load P_{wt} , since this crane is used indoors and these loads are not part of the facility design basis for the crane itself. Since the tornado wind load is not evaluated in combination with the crane live load in the original plant design basis, procedural provisions shall be made to lower the likelihood of fuel transfer operations during a tornado watch or warning.**

Crane seismic event loads in section 4140 of the ASME NOG-1

P_{C10} : $P_{db} + P_{dt} + P_{cs} + P_e$.

P_{C11} : $P_{db} + P_{dt} + P_e$.

P_{cs} : Credible critical load for SSE = 250,000 lbs.

P_e : SSE loads

Per NOG-1 Section 4140, both operating basis earthquake and safe shut down earthquake are defined as extreme environmental conditions; and for this reason, they have the same allowable values. Since operating basis earthquake response spectra are enveloped by safe shut down earthquake response spectra (and both events have the same allowable values), the OBE event is enveloped by the SSE event and no further evaluation is carried out for OBE event.

Compliance to Section 4300 of NOG-1

NOG -1 Section 4311 - Members Not Controlled by Buckling. It is shown that the members are not controlled by buckling. Therefore, the allowable values in Table 4311-1 are used.

Superseded NOG-1 Compliance Matrix Sections 4134 and 4140 with red line strike out changes below

<p>4134 Wind Loads</p> <p>The following wind loads are to be considered to act in any direction.</p> <p>(a) Operating Wind P_{wo}. The maximum wind load under which the crane will be permitted to operate. If none is stipulated by the purchaser, then the nominal wind load specified in CMAA 70 shall be used.</p> <p>(b) Design Wind P_{wd}. The plant design basis wind load resulting from the 100 year recurrence, "fastest mile of wind." Under this loading, the crane will not be operational, but be secured.</p> <p>(c) Tornado Wind P_{wt}. The plant design basis tornado loads. Tornado pressure differentials associated with the plant design basis tornado shall be included in the loading. Tornado-generated missiles shall be considered. The purchaser shall be responsible for the missile parameters and method of evaluation of tornado loads and tornado-generated missiles. Under these loadings, the crane will not be operational, but be secured. Indoor cranes may be subjected to the design basis tornado if the building enclosures have been designed to fail.</p>	<p>(a) N/A ZS requests an exception to Section 4140 for inclusion of Operating Wind P_{wo} in the load combinations since this crane is used indoors and Operating Wind P_{wo} is not part of the facility design basis. This crane is used indoors and no wind loads are specified.</p> <p>(b) N/A ZS requests an exception to Section 4140 for inclusion of Design Wind P_{wd} in the load combinations for the crane analysis since this crane is used indoors. This crane is used indoors and no wind loads are specified.</p> <p>(c) N/A ZS requests an exception to Section 4140 for inclusion of Tornado Wind P_{wt} in the load combinations for the crane analysis since this crane is used indoors. Procedural provisions shall be made to prevent fuel transfer operations during a tornado watch or warning. This crane is used indoors and no wind loads are specified. Procedural Provisions shall be made to prevent fuel transfer operations during a tornado watch or warning</p>
<p>4140 Load Combinations</p> <p>The following tabulated loads and their designations are described in para. 4120. The various load combinations, using the load designations, are listed herein. All load combinations are applicable to Types I and II cranes, whereas the Crane Operational Loads and the Construction Loads combinations are applicable to the Type III cranes. [Text and/or equations omitted]</p>	<p>ZS requests an exception to this section for inclusion of the Operating Wind P_{wo}, Design Wind Load P_{wd} and Tornado Wind Load P_{wt} for the crane analysis, since this crane is used indoors. Note that wind loads are included in the design basis for the building structure.</p> <p>Procedural provisions shall be made to lower the likelihood of fuel transfer operations during a tornado watch or warning.</p> <p>The various load combinations specified are used for applicable calculations. Ref. MMH Document 36675-05 (Bridge Stress Calculations) and MMH Document 36675-09 (Seismic Analysis).</p>