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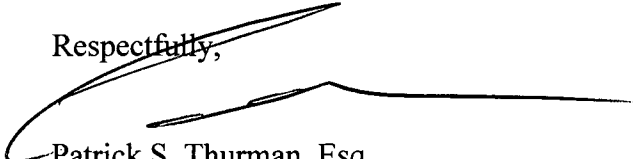
Zion Nuclear Power Station, Units 1 and 2  
Facility Operating License Nos. DPR-39 and DPR-48  
NRC Docket Nos. 50-295 and 50-304

Subject: Submittal of Responses to Requests for Additional Information

Reference: 1. *ZionSolutions*, LLC Letter, Daly to NRC, "Additional Information Supplementing the 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 December 20, 2012

Attachment 1 previously submitted as part of Reference 1 is provided with drawings that we inadvertently left off at the time of initial submittal. The drawings show the crane rail clip design and the placement of the rail clips on the runway girder.

Respectfully,



Patrick S. Thurman, Esq.  
Vice President Regulatory Affairs  
*ZionSolutions*, LLC

cc: John Hickman, USNRC Senior Project Manager  
Service List

Enclosures:  
Reference 1: Attachment 1  
Drawings

FSMEZD

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

cc:

Patrick T. Daly  
Senior VP and General Manager  
*ZionSolutions, LLC*  
101 Shiloh Boulevard  
Zion, IL 60099

Thomas Magette  
Senior VP Nuclear Regulatory Strategy  
*EnergySolutions*  
6350 Stevens Forest Road, Ste. 2000  
Columbia, MD 21046

Patrick Thurman, Esq.  
VP Regulatory Affairs, Licensing &  
Document Control  
*ZionSolutions, LLC*  
101 Shiloh Boulevard  
Zion, IL 60099

Russ Workman  
General Counsel  
*EnergySolutions*  
423 West 300 South, Ste. 200  
Salt Lake City, UT 84101

Gary Bouchard  
VP Engineering, Ops & Nuclear Security and  
Decommissioning Plant Manager  
*ZionSolutions, LLC*  
101 Shiloh Boulevard  
Zion, IL 60099

Illinois Department of Nuclear Safety  
Office of Nuclear Facility Safety  
1035 Outer Park Drive  
Springfield, IL 62704

Alan Parker  
President Projects Group  
*EnergySolutions*  
1009 Commerce Park Drive, Ste. 100  
Oak Ridge, TN 37830

Kent McKenzie  
Emergency Management Coordinator  
Lake County Emergency Management Agency  
1303 N. Milwaukee Avenue  
Libertyville, IL 60048-1308

John Christian  
President of Logistics, Processing and  
Disposal (LP& D) Group  
*EnergySolutions*  
1750 Tysons Boulevard, Suite 1500  
McLean, VA 22102

Regional Administrator  
U.S. NRC, Region III  
2443 Warrenville Road  
Lisle, IL 60532-4352

John E. Matthews  
Morgan, Lewis & Bockius LLP  
1111 Pennsylvania Avenue, NW  
Washington, DC 20004

**Reference 1: Attachment 1**

**Attachment 1:**

Crane Rail Clip Modification Description and Analysis Summary

## Reference 1: Attachment 1

Calculation ZION001-CALC-034 Fuel Handling Building (FHB) 125 Ton Crane Rail Clip Modification and Rail Evaluation

In the Seismic Analysis Summary section of the License Amendment Request a new section “h.” will be added. This section will provide the calculation summary that describes the analysis of the bridge runway rail and rail clips following addition of the modified rail clips. This modification will be completed prior to use of the crane as a single failure proof crane. Drawings associated with the rail clip design and the placement of the rail clips on the runway girder are included as part of this attachment.

The addition to the License Amendment request is provided below:

- h. Calculation ZION001-CALC-034, Fuel Handling Building (FHB) 125 Ton Crane Rail Clip Modification and Rail Evaluation

Summary: Calculations performed in calculation ZION001-002, Appendix B, demonstrated that the original runway rail and rail clip design is not adequate for the new design basis load case for a seismic event with a load on the hook. This new calculation evaluates the proposed rail clip modification and the runway rail with the proposed modification installed.

Model/Methodology Description: Simplified hand calculations are used to design a new crane rail clip assembly using MathCad 15. Governing crane wheel forces at the top of the crane rail for all crane and trolley positions for each of the load combinations from Attachment 56 of Ref. 3.7 are considered in the calculation for the new rail clip design.

As-built survey data of the crane runway rail determined the maximum existing clip center to center spacing to be 2ft.-7in. The majority of the existing clips are 2 ft.-0 in. center to center spacing. The new rail clips will be installed between two existing rail clips providing generally the same center to center spacing (2 ft. -0 in.) as the existing design. Conservatively, the new clips are designed for full wheel forces applied to a single rail clip without relying on the distribution of forces to the adjacent existing clips providing unanalyzed margin.

When a horizontal seismic load from the crane wheel is applied to the head of the crane rail, the force is decoupled into a bearing force on one edge of the crane rail base (bottom flange) along with the corresponding shear force and an uplift force on the opposite edge of the crane rail base (bottom flange). There are rail clips on each edge of the base (bottom flange) of the crane rail. Therefore each clip will either see force from shear with corresponding bearing or force from uplift. No credit is taken for friction between the bottom flange of the rail and the girder. On the bearing side, clips and bolts are designed for the applied shear force. On the uplift side rail clips and bolts are designed for the bending moment due to the rail bearing on the rail clip support.

The crane rail is checked for the applied forces for web shear, web bending and local rail base (bottom flange) bending.

## Reference 1: Attachment 1

The rail clip is connected to the top flange of the bridge runway girder. A local stress check of the crane runway girder flange for the applied rail clip forces is also performed. Crane girder global analysis for the applied new rail clip forces is not within the scope of this calculation. Calculation ZION001-CALC-002 (Ref. 3.7) describes the crane runway girder analysis.

Assumptions: Assume existing 175 lb crane rail is 50ksi material. Per documentation attached to the calculation, minimum yield stress for rail head, rail web and rail base (bottom flange) for controlled cooled crane rail range from 65ksi to 90 ksi. Therefore, this is a conservative assumption and does not need to be verified.

Results: The highest loads and stress values along with allowable values are listed below. Note there are two clip styles; Clip 1 is the standard clip, Clip 2 is located at column tie-backs. The values below are for the limiting clip style for each load type.

Component/Load Description	Load/Stress	Allowable
Bending in clip due to uplift (Clip 2)	34.516 ksi	37.5 ksi
Shear in clip due to uplift at reduced section (Clip 1)	7.055 ksi	20 ksi
Bearing in clip at bolt location (Clip 1)	23.383 ksi	45 ksi
Block shear in clip (Clip 2)	72.34 kip	85.55 kip
Bolt Tension (Clip 1)	17.515 kip	53.7 kip
Bolt Shear (Clip 1)	36.17 kip	39.8 kip
Girder flange local bending due to tension in clip	5.015 ksi	27 ksi
Girder flange local bending due to compression	25.973 ksi	27 ksi
Girder flange local bearing	14.289 ksi	32.4 ksi
Girder flange local block shear	72.34 kip	299.334 kip
Crane rail local web shear	9.114 ksi	20 ksi
Crane rail local web bending	32.427 ksi	37.5 ksi
Crane rail minor axis bending	31.325 ksi	37.5 ksi
Crane rail bottom flange local bending	20.094 ksi	37.5 ksi

**THIS PAGE IS AN  
OVERSIZED DRAWING OR  
FIGURE,  
THAT CAN BE VIEWED AT THE  
RECORD TITLED:**

**ISFSI PROJECT  
FHB CRANE RAIL MODIFICATION**

**DRAWING NOs.:  
ZION001-C-208 SHEET 1  
ZION001-C-208 SHEET 2  
ZION001-C-208 SHEET 3**

**WITHIN THIS PACKAGE... OR,  
BY SEARCHING USING THE  
DOCUMENT/REPORT  
DRAWING NO.**

**D-01 THROUGH D-03**