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SUBJECT: Responds to 921223 GL-87-02 & provides addl info for procedures & criteria to generate licenssing basis in-structure response spectra used for USI A-46 project.

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INDIANA MICHIGAN POWER

AEP:NRC:1040B

Donald C. Cook Nuclear Plant Units 1 and 2
Docket Nos. 50-315 and 50-316
License Nos. DPR-58 and DPR-74
GL-87-02 SUPPLEMENT NO.1; REQUEST FOR ADDITIONAL INFORMATION

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

April 1, 1993

Dear Dr. Murley:

Reference: (1) NRC Safety Evaluation Report (SER) on our Response to Supplement No. 1 to Generic Letter 87-02 dated December 23, 1992

(2) Our letter AEP:NRC:1040A dated September 21, 1992

This letter and its attachment respond to the SER referenced above and provide additional information and clarification for the items noted in the SER regarding a) the procedures and criteria which were used to generate the licensing basis in-structure response spectra to be used for USI A-46 project and b) the criterion to be used for cable tray and conduit evaluation.

In summary, Indiana Michigan Power Company intends to fully implement the Seismic Qualification Utility Group (SQUG) commitments and implementation guidance in accordance with Part I, Section 1.3 of the Generic Implementation Procedure (GIP), Revision 2 (corrected February 14, 1992). This revision was accepted by the NRC staff in its SSER No.2 on the GIP, dated May 22, 1992. This includes complying with the requirements of Section 8 of the GIP for cable tray and conduit evaluation.

Sincerely,

S J Brewer for

E.E. Fitzpatrick
Vice President

EEF/gmd

Attachment

A025

cc: A. A. Blind - Bridgman
J. R. Padgett
G. Charnoff
NFEM Section Chief
A. B. Davis - Region III
NRC Resident Inspector - Bridgman

ATTACHMENT TO AEP:NRC:1040B

ADDITIONAL INFORMATION SUBMITTED

IN RESPONSE TO NRC SER ON

AEP:NRC:1040A, RESPONSE TO

GENERIC LETTER 87-02, SUPPLEMENT NO.1

The following are Indiana Michigan Power Company's responses to the request for additional information noted in NRC's SER dated December 23, 1992, as applicable to the Donald C. Cook Nuclear Plant. The subject NRC SER was issued on Indiana Michigan Power Company's response to three items noted in Supplement No.1 to GL 87-02.

(1) Clarification to the Response to Item No. (1)
Inspection and Evaluation of Cable Tray & Conduit Supports

The NRC SER noted that "the licensee should clearly state whether or not it intends to commit to use the entire SQUG methodology as delineated in GIP-2, Section 8, for inspecting and evaluating cable tray and conduit supports."

(a) We plan to inspect the cable and conduit raceway systems in the plant on an area-by-area basis. As required by Section 8 of GIP, this inspection will include checking the raceway system (i.e., conduits, cable trays, and their support systems) against the Inclusion Rules, and Other Seismic Performance Concerns, as well as selecting representative, worst-case samples of the raceway supports for further Limited Analytical Review.

We intend to inspect all raceways and their supports. However, there are a few isolated areas in the plant (e.g., the Boric Acid Storage Tank Room, the Control Room Cable Vault) where, due to congestion, close inspection of some of the raceway supports may not be possible without physically removing some of the obstructing cable trays, pipes, or other components. In such cases, the Seismic Review Team will document the field condition, and inspect other similar supports in the area or use design/construction drawings to verify the seismic adequacy of the support involved.

We believe that this approach is consistent with the SQUG philosophy in developing a cost-effective means of verifying the seismic adequacy of raceway systems and their supports.

(b) We have committed to use the entire SQUG methodology as delineated in GIP-2, Section 8, for inspecting and evaluating cable tray and conduit supports. We have no plan to deviate from the SQUG methodology. The tests on certain rod hanger details were performed not as a means to establish a new screening criteria different from those established in GIP-2, rather they were performed to ensure that we stay within the guidelines of GIP-2 (i. e., that certain connection details do not fail prematurely).

(2) Clarification to Response to Item No. (2)
Schedule for Implementation

The schedule for implementing the seismic verification of electrical and mechanical equipment was acceptable to the NRC; therefore, additional clarification is not required.

(3) Clarification to Response to Item No. (3)
Additional Information on In-Structure Response Spectra

Upon review of Attachment 1 to AEP:NRC:1040A, the NRC staff concluded that the licensee's response with respect to the in-structure response spectra is acceptable. However, based on the information provided, the NRC staff disagrees with the licensee's conclusion that the licensing basis in-structure response spectra are considered to be "conservative, design" in-structure response spectra. The NRC staff concluded that the spectra should be classified as "median-centered" response spectra for the purpose of USI A-46 issue resolution. The NRC staff believes that if additional information is provided regarding (a) the procedure followed in broadening the peak responses, (b) the structural damping values used in the structural dynamic analyses, and (c) whether only one component of the horizontal earthquake motion or two orthogonal components were used as inputs to the structural analysis, and if this additional information is found to be satisfactory by the staff, then the in-structure response spectra could be classified as "conservative, design".

Additional information regarding the in-structure response spectra (ISRS) generation is given below.

Information on items (a) and (c) was included in the original submittal and is now reformatted for easier readability. Information on item (b) had been covered in a general way in the original submittal and is now specifically detailed.

Containment Building

(a) To allow for soil and structure property variations, the resonance response on the response spectra curve was used for frequencies in the interval of ±10% of the resonant frequency. That is, the peak response acceleration was assumed to be occurring anywhere within ±10% of the apparent resonant frequency or, equivalently, the peak response acceleration of the ISRS was broadened ±10% on the frequency scale.

(b) The structural damping values used in the structural dynamic analyses of the Containment Building were 2% for Operating Basis Earthquake (OBE) and 5% for Design Basis Earthquake (DBE). These damping values were used as

modal damping for all modes. The higher damping effect from the soil was conservatively ignored, though soil-structure interaction was considered in the model.

(c) The Containment Building was modeled as two vertical sticks with lumped masses, one representing the containment shell (the concrete outer shell), and the other, the internal structure. As the model was axisymmetrical about the vertical axis, only one component of the horizontal earthquake motion was used as input in the structural dynamic analysis. However, four different earthquake records, one at a time, were used as input motions. The final ISRS were obtained by enveloping the responses of the structure to the four earthquakes. The resulting ISRS can be used for horizontal excitation in any direction.

Auxiliary Building

(a) The ISRS for the Auxiliary Building were obtained by the following steps: (1) perform time-history dynamic analyses using four real earthquake records (one at a time) as input motions in one horizontal direction; (2) derive the ISRS from the corresponding time history responses at the location where ISRS is desired, for each of the four earthquake input motions; (3) average the four ISRS obtained in step 2; (4) repeat steps 1 through .3 for input motion in the other horizontal direction; (5) envelop the ISRS obtained from steps 3 and 4; (6) repeat steps 1 through 5 using a dynamic analysis model with the stiffness of the soil springs reduced to one third of their calculated values; (7) envelop the ISRS obtained from step 5 and step 6. The resulting ISRS can be used for horizontal excitation in either direction.

As described above, the broadening of the ISRS peaks was a result of the combination of ISRS from multiple time history analyses, from two orthogonal horizontal input motions, and from two dynamic models with different soil spring constants.

(b) Our analysis indicates that all significant response is associated with the first and second modes which consist almost entirely of "swaying" action within the soil. Over 90% of the modal energy is in the soil springs. This indicates that the modal damping should be almost as much as that in the soil alone, and the soil damping in swaying is very high.

A conservative damping value of 20% of critical was used for the first and the second modes as recommended by

Dr. John M. Biggs, professor of Civil Engineering at the Massachusetts Institute of Technology.

(c) As explained in (a) above, the effects of horizontal earthquake motion in both the N-S and E-W directions were reflected in the final ISRS. However, the dynamic analysis was performed with only one horizontal input motion at a time.

Conservatism in the ISRS

The ISRS to be used for USI A-46 for Cook Nuclear Plant are considered to be "conservative, design", based on the following considerations:

(1) the ISRS were developed based on the licensing-basis ground response spectrum,

(2) multiple real earthquake records were used in the analyses for developing the ISRS,

(3) the effect of soil-structure interaction was considered,

(4) a time-history analysis approach was used in the analyses, and

(5) significant amplifications were reflected in the resulting ISRS.

(4) Changes to License Basis

Originally, the seismic qualification of electrical and mechanical equipment at Cook Nuclear Plant was performed in accordance with IEEE-344-1971. Since 1980, the seismic qualification of electrical and mechanical equipment for replacement is being performed under the requirements of IEEE-344-1975 unless otherwise noted. We will evaluate the necessity to change the licensing basis methodology (UFSAR) to reflect a commitment to the USI-A-46 methodology after the receipt of the Staff's plant specific SER on the SQUG project.