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JAFP-14-0102
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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: Response to Request for Additional Information (RAI) Associated with Near-Term Task Force (NTTF) Recommendation 2.1, Seismic Hazard and Screening Report

James A. FitzPatrick Nuclear Power Plant
Docket No. 50-333
License No. DPR-059

Reference:

1. NRC letter to Entergy, Request for Information (RFI) Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3 of the NTTF Review of Insights from the Fukushima Dai-ichi Accident, ML12053A340, dated March 12, 2012
2. Entergy Letter to NRC, Seismic Hazard and Screening Report (CEUS Sites), Response to NRC RFI Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the NTTF Review of Insights from the Fukushima Dai-ichi Accident, JAFP-14-0039, dated March 31, 2014
3. NRC Letter to Entergy, Request for Additional Information Associated with Near-Term Task Force Recommendation 2.1, Seismic Hazard and Screening Report, ML14195A097, dated July 16, 2014
4. Entergy Letter to NRC, Request for Additional Time to Respond to Request for Additional Information (RAI) Associated with Near-Term Task Force (NTTF) Recommendation 2.1, Seismic Hazard and Screening Report, JAFP-14-0097, dated August 15, 2014

Dear Sir or Madam:

On March 12, 2012, the NRC issued Reference 1 to all power reactor licensees. By Reference 2, Entergy Operations, Inc. (Entergy) provided the Seismic Hazard and Screening Reports for James A. FitzPatrick requested by Reference 1. In Reference 3, the NRC issued RAIs related to these reports and in Reference 4 a response was requested by August 21, 2014. The attachment to this submittal provides Entergy's responses to the RAIs.

This letter contains no new regulatory commitments. If you have any questions regarding this report, please contact Chris M. Adner, Regulatory Assurance Manager, at 315-349-6766.

I declare under penalty of perjury that the foregoing is true and correct. Executed on 21st day of August, 2014.

Sincerely,

Lawrence M. Coyle
Site Vice President

LMC/CMA/mh

Attachment: RAI Responses

cc: NRC Regional Administrator
NRC Resident Inspector
Mr. Douglas Pickett, Senior Project Manager
Mr. Michael Balazik, Project Manager
Ms. Bridget Frymire, NYSPSC
Mr. John B. Rhodes., President NYSERDA

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Attachment

RAI Responses

(7 Pages)

RAI Responses

NRC RAI 1:

Appendix B of the seismic hazard screening report states that criteria in Table 2-3 from EPRI NP-6041 which is intended for use with structures designed as Seismic Category I structures was applied to the Seismic Category II turbine building as a basis for screening out the turbine building from the seismic margin analysis. Justifications provided for application of EPRI NP-6041 Table 2-3 in this manner include the use of lower damping values and other constraints used in the Operating Basis Earthquake (OBE) analysis of the turbine building.

a. In the IPEEE, EPRI NP-6041 screening criteria intended for Seismic Category I structures was applied to the Seismic Category II turbine building. The turbine building, as a Seismic Category II structure, could have been designed using local building codes. The seismic performance of buildings designed using local building codes may differ significantly compared to buildings designed in accordance with NRC guidance for Seismic Category I structures. Due to these potential differences, similar design peak ground acceleration is not considered a sufficient justification for screening. Provide additional explanation to justify the application of the EPRI NP-6041 screening criteria intended for Seismic Category I structures as applied to the Seismic Category II turbine building.
b. It is unclear in Appendix B what is meant by "constraints" used in the OBE analysis. Provide additional clarification and explanation on what is meant by constraints used in the OBE analysis and how that affects the design of the turbine building.
c. The damping value used in the OBE analysis was not clearly indicated. Describe what was the damping value used in the OBE analysis and why is it appropriate for your site.

Entergy Response to RAI 1

a. The Turbine Building Complex at the James A Fitzpatrick Nuclear Power Plant (JAF) includes the Turbine Building, Administration Building, Radwaste Building, Screenwell-Pump House and Emergency Diesel Generator building. All of these buildings are structurally connected and, thus, a single structural model was developed as part of the seismic design basis. Parts of this complex are designated as Class I structures; the balance are Class II structures. As stated in Section 12.4.6.3 of the JAF Updated Final Safety Analysis Report (UFSAR):

   > "Due to the interconnection of Class I and Class II structures, namely the Control Room, Turbine Building, Emergency Generator Building, Screenwell-Pumphouse Building and the Radioactive Waste Building, the combined structures were modeled and a dynamic analysis was performed as described in Section 12.5."

   State-of-the-art seismic analysis for that time frame was performed by developing a horizontal and a decoupled vertical mathematical model. The horizontal model is depicted in Attachment 1, and the lumped masses depict all of the structures comprising the turbine building complex (both Class I and Class II).

   The UFSAR specifically notes that for the Class II structures within the Turbine Building Complex, both the OBE and Design Basis Earthquake (DBE) were evaluated using this combined model. However, due to more conservative characterizations of damping and allowable stresses for the OBE case, DBE level earthquake loading did not govern the design over the OBE level:

   > "Class II portions of the structure, whose failure could damage or affect the performance of the Class I portion of the structure or Class I equipment contained therein, are designed to

RAI Responses

withstand the Operating Basis Earthquake, 0.08g. Design Basis Earthquake loadings were also considered, but determined not to govern the design."

Therefore, since:

- Both OBE and DBE levels were considered in the design of the Class II portions of the Turbine Complex
- Allowable stresses and damping levels are the same as the Class I portions of the Turbine Complex (see Attachment 2 designating common structural design level requirements for both Class I and Class II structures at JAF)

The Class II portions of the Turbine Complex can be considered to have a design equivalent to a Class I structure, and the screening criteria for Class I structures from Table 2-3 of EPRI NP-6041 R1 can be applied to the Class II portions of the complex. Specifically note (e) for Category I structures where the 5% damped peak spectral acceleration is less than 0.8g. Note (e) states: "Evaluation not required for Category I structures if design was for a SSE of 0.1 g or greater."

The SSE (DBE) for Fitzpatrick utilized a peak ground acceleration (PGA) of 0.15g (> 0.1g), so all structures designed to the DBE level in the Turbine Complex (Class I and Class II) would demonstrate a 0.3 g High Confidence of Low Probability of Failure (HCLPF) and not require further evaluation. This is consistent with the approach taken for the seismic Individual Plant Examination of External Events (IPEEE) study undertaken for JAF.

b. The word "constraints" refers to the allowable stresses used for the structural design that includes the OBE. JAF FSAR Update Table 12.4-6 (Attachment 2) shows loading conditions (3) and (4) that include OBE and DBE, respectively. From this table it can be seen that the OBE stress allowables are more restrictive than the DBE stress allowables. For loading condition 3 that includes the OBE, the AISC and ACI code allowable stresses are increased by 1/3. However, for loading condition 4 with DBE, the structural and reinforcing steel allowables are increased to 90% of yield strength, and the concrete stresses are allowed to go up to 75% of ultimate strength. Since Class II portions of the Turbine Building Complex were designed to a 0.08g OBE, it has reserve capacity in addition to the OBE to reach the level of stress limits allowed for the DBE.

c. Damping values for the OBE and DBE analyses are given in Table 12.4-2 of the UFSAR (Attachment 3). These damping levels were established during the early design stages of the JAF nuclear plant for the various structure types (e.g. concrete, steel frame, etc.). The levels of damping used in the DBE design are comparable to those recommended in Table 4-1 EPRI NP-6041 R1 for structures at about ½ of yield. To account for the reduced seismic demand at the OBE the damping levels used were lower, and the 2% damping used for both steel and concrete reflects damping at low demand levels with elastic behavior.

NRC RAI 2:

The submitted IPEEE high confidence of a low probability of failure (HCLPF) Spectrum (IHS) is anchored to a peak ground acceleration of 0.22g. The anchor of 0.22g is dependent on block wall HCLPF values. Appendix B of the seismic hazard screening report notes that EPRI NP-6041 guidance was not followed exactly in the assessment of the HCLPF of the block walls in the IPEEE seismic margin assessment. Provide a description and basis of the reassessment of the HCLPF for the modified block walls that resulted in increasing the plant HCLPF to 0.22g. Specifically, did you deviate from the EPRI NP-6041 guidance in the development of the fragilities? And, if so, describe the implications of the deviations from that guidance.

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Entergy Response to RAI 2

Background - The original seismic IPEEE evaluation for the JAF nuclear plant concluded that four block walls had relatively low HCLPF levels (0.17g) and that these walls controlled the plant level HCLPF. These four walls consisted of EGB-272-6, 7, 9 & 10 in the Diesel Generator Building and represented a seismic interaction potential for the emergency diesel generator system which supplies the emergency power. Entergy completed modifications for each of these four walls and updated their HCLPF calculations to reflect the effects of the upgraded configuration. Evaluations of the modified block walls were shown to have a HCLPF of 0.26g PGA. Due to the increase in the HCLPF capacity of these walls, these four block walls were no longer the governing components for JAF and the plant HCLPF value was increased to 0.22g PGA.

Compliance with EPRI NP-6041 - EPRI NP-6041 does not provide direct guidance on the methods/assumptions which are appropriate for the evaluation of unreinforced block walls. As a result, Entergy assumed damping levels associated with reinforced concrete (7% damping) in their seismic analyses and utilized linear elastic analysis methods with associated allowable tensile stresses of 42.5 psi.

Entergy recently conducted a review of the previous block wall calculations for the four upgraded walls and determined that more appropriate methods and assumptions should be applied in determining the seismic response/capacity used to generate a HCLPF. As stated above, EPRI NP-6041 does not provide specific guidance on the evaluation and damping of unreinforced block walls. Department of Energy (DOE) DOE/EH-0545 “Seismic Evaluation Procedure for Equipment in U.S. Department of Energy Facilities” is considered to be a valid technical reference for these block walls (this approach is used for both SMAs and SPRAs) and was used to reevaluate the four subject block walls. Section 10.5.1 of DOE/EH-0545 provides specific recommendations and analysis procedures for unreinforced masonry (URM) walls.

New walkdowns of these four block walls were conducted to verify the block wall perimeter conditions. These walkdowns verified that all of the walls are supported laterally at the top by structural angle “keepers.” Based on this boundary condition DOE/EH-0545 recommends utilizing the reserve energy method along with a 5% damped input spectra to determine the wall capacity. Using these recommendations the reevaluated HCLPF capacity for walls EGB-272-6, 7, 9 & 10 is calculated to be 0.23g PGA. Thus, the recent reassessment of the seismic capacity of these four (4) upgraded block walls verifies that they exceed the reported 0.22 g plant level HCLPF.

<u>NRC RAI 3</u>

Section 3.3 of Appendix B of the seismic hazard screening report states that "the full scope detailed review of relay chatter required in SPID (EPRI, 2013a) Section 3.3.1 has not been completed. The results of the review will be provided in a future submittal." However, Section 4.2, High Frequency Screening (> 10 Hz), states that "above 10 Hz, the IHS exceeds the ground motion response spectra. Therefore, a High Frequency Confirmation will not be performed." Clarify this apparent contradiction as to whether they are the same or different reports and to confirm that a review of relay chatter will be submitted as stated in Section 3.3.

Entergy Response to RAI #3

The James A. FitzPatrick IPEEE (Report No. JAF-RPT-MISC-02211, Revision 0, June 1996) was performed and submitted using Focused Plant criteria.

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The standard approach for relay chatter evaluation for an A-46 plant was generally used. Bad actor relays modeled in the Individual Plant Examination (IPE) were automatically included in the IPEEE. Relays not included in the IPE were modeled if they would cause an impact on the IPEEE evaluation. This was determined by comparing the list of JAF relays to the list of relays in EPRI-NP-7148-SL, Appendix E, for Low Ruggedness Relays and EPRI-NP-7147-SL, Appendix D, for relays covered by generic equipment response spectrum (GERS).

The relays that were on the Low Ruggedness Relay list or were not found in the GERS list were inserted into the PRA model with a failure probability of 0.1 and the model was resolved. The net effect is that confidence was gained that the relays in the Emergency Diesel Generator (EDG) system were not bad actor relays. There was no analysis of relay capacity included and relay performance including “seal in” and “lock out” was not well documented in the IPEEE.

For a focused scope plant the NRC Safety Evaluation Report (SER) on the JAF IPEEE stated, “In conclusion the relay evaluation used a standard approach and seemed to have been comprehensive”. A new Full Scope Relay Chatter Treatment was stated in the Seismic Hazard and Screening Report, Appendix B - IPEEE Adequacy Review, Section 2.1 (Entergy Letter JAFP-14-0039). In addition, in order to provide a complete relay analysis, the ruggedness of the relays will be considered to eliminate complete failure where possible.

The Full Scope Relay analysis will document the relays relevant to the actuation and operation of equipment relied upon to respond to a postulated earthquake of the review level magnitude and will delineate whether they are “seal–in” or “lock-out” functions. This will include relays that are direct acting (actuates a component) or indirect acting (actuation relay actuates a relay that actuates a component). For those relays with either function an assessment of operator ability to reset or over ride will be made and documented.

This re-evaluation to meet full scope IPEEE requirements will be completed per the NEI recommended schedule, Relay Chatter Reviews for Seismic Hazard Screening (ML13281A308).

Section 4.2 of the Seismic Hazard and Screening Report indicated that since the IHS exceeds the ground motion response spectrum (GMRS) a High Frequency Confirmation will not be performed. This did not apply to the Relay Evaluation to meet full scope requirements which was not included in the original IPEEE per focused scope plant requirements. The Seismic Hazard and Screening Report showed that the IPEEE was adequate to support screening and it was concluded that the high frequency confirmation was not required for everything except relays since the IHS is above the GMRS. This statement should have indicated clearly that this did not apply to relays. The IPEEE adequacy was sufficient except for the full scope relay analysis that is required by the Screening, Prioritization, and Implementation Details (SPID) to bring the assessment in line with full scope assessments and this will be performed as indicated above.

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Attachment 1 – JAF Turbine Building Complex Structural Model Developed for Seismic Design

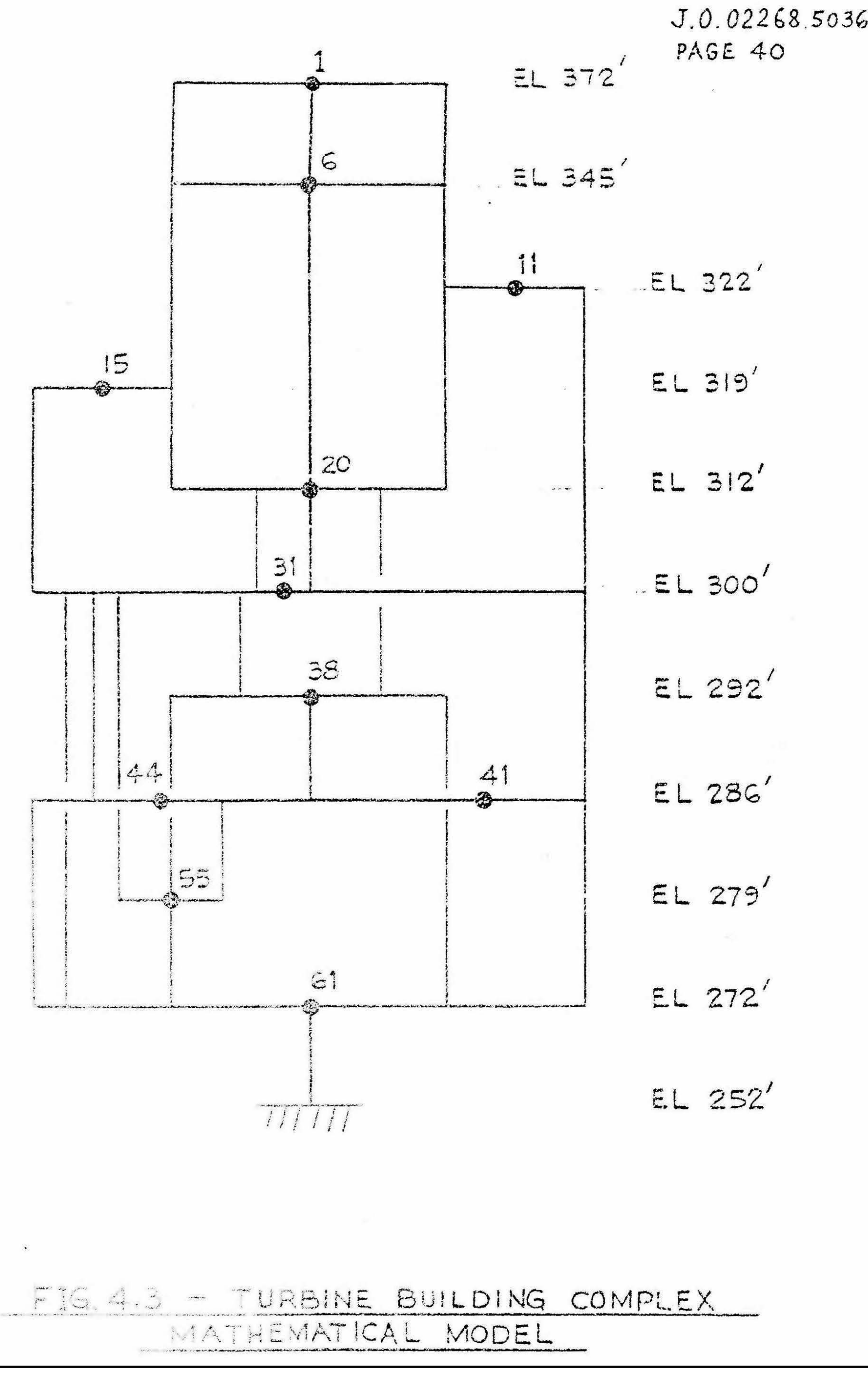

FIG. 4.3 – TURBINE BUILDING COMPLEX MATHEMATICAL MODEL

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Attachment 2 – FSAR Table 12.4-6 from JAF FSAR

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TABLE 12.4-6

STRUCTURAL DESIGN STRESS LEVELS
CLASS I AND CLASS II STRUCTURES

Loading Condition	Material: Structural Steel	Material: Reinforcing Steel	Material: Concrete
1. Normal Dead + Live Load	AISC Code	ACI-318 (Working Stress)	ACI-318 (Working Stress)
2. Item (1) + Wind	1/3 increase per AISC code	1/3 increase per ACI code	1/3 in-crease per ACI code
3. Item (1) + Opera-ting Basis Earthquake	1/3 increase per AISC code	1/3 increase per ACI code	1/3 in-crease per ACI code
4. Item (1) + Design Basis Earthquake	90 percent of yield strength	90 percent of yield strength	75 per-cent of ultimate strength
5. Normal Dead + Tornado Loads	90 percent of yield strength	90 percent of yield strength	75 per-cent of ultimate strength *
6. Normal Dead + Max. Possible Flood	90 percent of yield strength	90 percent of yield strength	75 per-cent of ultimate strength

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Attachment 3 – Table 12.4-2 From JAF FSAR

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TABLE 12.4-2

DAMPING FACTORS FOR STRUCTURE AND EQUIPMENT CALCULATIONS

	Percent of Critical Damping	
	Operating Basis Earthquake	Design Basis Earthquake
Concrete Structures	2.0	5.0
Steel Frame Structures, Bolted and Riveted Assemblies	2.0	3.0
Welded Assemblies	1.0	1.0
Fluid Containers	0.5	0.5
Vital Piping Systems	0.5	1.0
Plant Equipment	0.5	1.0