

NRR-PMDAPEm Resource

From: Jackson, Diane
Sent: Friday, July 24, 2015 7:53 AM
To: Shams, Mohamed
Cc: DiFrancesco, Nicholas; Wyman, Stephen; Spence, Jane; Devlin-Gill, Stephanie; Roche, Kevin; Yee, On; Heeszal, David; 50.54f_Seismic Resource; RidsNroDsea Resource
Subject: FERMI 2 - TECHNICAL REVIEW CHECKLIST RELATED TO INTERIM ESEP SUPPORTING IMPLEMENTATION OF NTTF R2.1, SEISMIC (TAC NO. MF5241)
Attachments: Fermi R2.1 seismic ESEP NRC review.docx

July 24, 2015

MEMORANDUM TO: Mohamed K. Shams, Chief

Hazards Management Branch (JHMB)

Japan Lessons-Learned Division

Office of Nuclear Reactor Regulation

FROM: Diane T. Jackson, Chief

Geosciences and Geotechnical Engineering Branch 2 (RGS2)

Division of Site Safety and Environmental Analysis

Office of New Reactors

SUBJECT: FERMI 2 - TECHNICAL REVIEW CHECKLIST RELATED TO INTERIM EXPEDITED SEISMIC EVALUATION PROCESS SUPPORTING IMPLEMENTATION OF NTTF RECOMMENDATION 2.1, SEISMIC, RELATED TO THE FUKUSHIMA DAI-ICHI NUCLEAR POWER PLANT ACCIDENT (TAC NO. MF5241)

The NRC technical staff working through the Geosciences and Geotechnical Engineering Branches 1 and 2 (RGS1 and RGS2) completed the Technical Review Checklist of the FERMI 2 response to Enclosure 1, Item (6) of the March 12, 2012, request for information letter issued per Title 10 of the Code of Federal Regulations, Subpart 50.54(f), to power reactor licensees and holders of construction permits requesting addressees to provide further information to support the NRC staff's evaluation of regulatory actions to be taken in response to Fukushima Near-Term Task Force (NTTF) Recommendation 2.1: Seismic which implements lessons learned from Japan's March 11, 2011, Great Tōhoku Earthquake and subsequent tsunami. This addresses the staff review of the interim Expedited Seismic Evaluation Process (ESEP) report in response to Requested Item (6) of Enclosure 1, "Recommendation 2.1: Seismic," of the 50.54(f) letter. Attached is a file containing the technical review checklist to prepare a response letter to the licensee.

The NRC staff reviewed the information provided and, as documented in the enclosed staff checklist, determined that sufficient information was provided to be responsive to this portion of the Enclosure 1 of the 50.54(f) letter. The application of this staff review is limited to the interim ESEP as part of NTTF R2.1: Seismic activities.

This electronic memo constitutes the DSEA concurrence provided that only editorial changes are made to the staff assessment that would not affect the technical conclusions or technical context of the assessment.

This concludes the NRC's efforts associated with TAC NO. MF5241 for the review of the interim ESEP report for the FERMI 2.

Docket No: 50-341

CONTACT: Stephanie Devlin-Gill

Office of New Reactors

301-415-5301

Copy: Nicholas DiFrancesco, Stephen Wyman, Jane Spence, Stephanie Devlin-Gill, Kevin Roche, On Yee, David Heeszal; 50.54f_Seismic Resource; RidsNroDsea Resource

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TECHNICAL REVIEW CHECKLIST
BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO EXPEDITED SEISMIC EVALUATION PROCESS INTERIM EVALUATION
IMPLEMENTING NTTF RECOMMENDATION 2.1 SEISMIC
FERMI 2
DOCKET NO. 50-341

By letter dated March 12, 2012 (USNRC, 2012a), the U.S. Nuclear Regulatory Commission (NRC) issued a request for information to all power reactor licensees and holders of construction permits in active or deferred status, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(f) "Conditions of License" (hereafter referred to as the "50.54(f) letter"). Enclosure 1 of the 50.54(f) letter requests addressees to reevaluate the seismic hazard at their site using present-day methods and guidance for licensing new nuclear power plants, and identify actions to address or modify, as necessary, plant components affected with the reevaluated seismic hazards. Requested Information Item (6) in Enclosure 1 to the 50.54(f) letter requests addressees to provide an interim evaluation and actions taken or planned to address a higher seismic hazard relative to the design basis, as appropriate, prior to completion and submission of the seismic risk evaluation.

Additionally, by letter dated April 12, 2013¹, the Electric Power Research Institute (EPRI) staff submitted EPRI TR 3002000704 "Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force (NTTF) Recommendation 2.1: Seismic" (hereafter referred to as the guidance). The Augmented Approach proposed that licensees would use an Expedited Seismic Evaluation Process (ESEP) to address the interim actions as requested by Information Item (6) in the 50.54(f) letter. The ESEP is a simplified seismic capacity evaluation with a focused scope of certain key installed Mitigating Strategies equipment that is used for core cooling and containment functions to cope with scenarios that involve a loss of all AC power and loss of access to the ultimate heat sink to withstand the Review Level Ground Motion, which is up to two times the safe shutdown earthquake (SSE). Due to the expedited and interim nature of the ESEP, the assessment does not include many considerations that are part of a normal risk evaluation. These deferred items, include but are not limited to, structures, piping, non-seismic failures, and operator actions, as well scenarios such as addressing loss of coolant accidents. By letter dated May 7, 2013², the NRC staff endorsed the guidance. Central and eastern United States licensees with a reevaluated seismic hazard exceeding the SSE submitted an ESEP interim evaluation in December 2014

Consistent with the interim nature of this activity, the staff performed the review of the licensee's submittal to assess whether the intent of the guidance was implemented. A multi-disciplined team checked whether the identified methods were consistent with the guidance. A senior expert panel reviewed the team's questions, if any, and checklist for consistency and scope. New or updated parameters (e.g., In-Structure Response Spectra, High Confidence of Low Probability of Failure calculations) presented by the licensees were assessed only based on licensee statements for acceptability for the Item (6) response. The application of this staff review is limited to the ESEP interim evaluation as part of NTTF R2.1: Seismic activities.

¹ ADAMS Accession No. ML13102A142

² ADAMS Accession No. ML13106A331

NTTF Recommendation 2.1 Expedited Seismic Evaluation Process

Technical Review Checklist for Fermi 2

By letter dated December 9, 2014³, DTE Energy Company (the licensee) provided an Expedited Seismic Evaluation Process (ESEP) report in a response to Enclosure 1, Requested Information Item (6) of the 50.54(f) letter, for the Fermi 2.

I. Review Level Ground Motion

The licensee:	
<ul style="list-style-type: none"> described the determination of the review level ground motion (RLGM) using one of the means acceptable by the guidance 	No
<ul style="list-style-type: none"> identified location of the control point and is consistent with March submittal 	Yes
<ul style="list-style-type: none"> compared the site ground motion response spectra used to select the ESEP RLGM to the SSE. 	Yes
Fermi 2 used a new FIRS developed specifically for use in the SPRA.	
Notes from the Reviewer: None	
Deviation(s) or Deficiency(ies), and Resolution: <ul style="list-style-type: none"> For the ESEP, Fermi 2 defined its RLGM using the Foundation Input Response Spectra (FIRS) it developed for use in its upcoming SPRA, which is different from that reported in its Seismic Hazard Screening Report⁴(SHSR). As described in a clarification call with the licensee, the Fermi 2 RLGM is calculated as a FIRS including the effect of soil layers above the foundation depth on the nonlinear soil properties of the soil layers below, in terms of both the confining pressure and the soil column frequency of the soil layers above the truncated depth. Because the SPRA FIRS (the RLGM) bounds the SHSR GMRS, this approach is acceptable for this interim evaluation. 	
The NRC staff concludes:	
<ul style="list-style-type: none"> the licensee's RLGM meets the intent of the guidance 	Yes
<ul style="list-style-type: none"> the RLGM is reasonable for use in the interim evaluation 	Yes

II. Selection of the Success Path

The licensee:	
<ul style="list-style-type: none"> described the success path 	Yes
<ul style="list-style-type: none"> described normal and desired state of the equipment for the success path 	Yes
<ul style="list-style-type: none"> ensured that the success path is consistent with the plant's overall mitigating strategies approach or provided a justification for an alternate path 	Yes
<ul style="list-style-type: none"> stated that the selection process was in accordance with the guidance or meets the intent of the guidance 	Yes
<ul style="list-style-type: none"> used installed FLEX Phase 1 equipment as part of the success path 	Yes
<ul style="list-style-type: none"> included FLEX Phase 2 and/or 3 <u>connections</u> 	Yes
<ul style="list-style-type: none"> considered installed FLEX Phase 2 and/or 3 <u>equipment</u> 	N/A

³ ADAMS Accession No. ML14345A469

⁴ ADAMS Accession No. ML14090A326

NTTF Recommendation 2.1 Expedited Seismic Evaluation Process

Technical Review Checklist for Fermi 2

Notes from the Reviewer: None	
Deviation(s) or Deficiency(ies), and Resolution: <ul style="list-style-type: none"> No deviation or deficiency was identified in this particular section. 	
The NRC staff concludes that: <ul style="list-style-type: none"> the selected success path is reasonable for use in the interim evaluation the licensee considered installed Phase 2 and 3 connections or equipment in the interim evaluation. 	Yes Yes

III. Selection of the Equipment List

The licensee: <ul style="list-style-type: none"> developed and provided the ESEL by applying the ESEP identified equipment considering the following functions: <ul style="list-style-type: none"> Core cooling (with focus on Mode 1) function Available, sustainable water source Containment function and integrity 	Yes Yes Yes Yes
Notes from the Reviewer: None	
Deviation(s) or Deficiency(ies), and Resolution: <ul style="list-style-type: none"> No deviation or deficiency was identified in this particular section. 	
For PWR Plants ONLY	
The licensee included indicators / instrumentation for the following functions: level, pressure, temperature, that would be indicative of (but not explicitly identified to specific instruments): water level of the steam generator (SG), pressure of SG, containment, and reactor coolant system (RCS); and temperature of the RCS.	N/A
For BWR Plants ONLY	
The licensee considered indicators for the following functions: level, pressure, temperature that would be indicative of (but not explicitly identified to specific instruments): Temperature of suppression pool, RCS, containment); Pressure of suppression pool, RCS, and drywell; water level of the suppression pool.	Yes
Notes from the Reviewer: None	
Deviation(s) or Deficiency(ies), and Resolution: <ul style="list-style-type: none"> No deviation or deficiency was identified in this particular section. 	
Through a sampling of the ESEP key components, the NRC staff concludes that: <ul style="list-style-type: none"> the licensee's process to develop the ESEL meets the intent of the guidance for the interim evaluation the desired equipment state for the success path were identified the licensee considered the support equipment for the ESEL both front-line and support systems appeared to be included in the ESEL as evidenced by inclusion of SSCs on the success path and of support systems (e.g., batteries, motor control center, inverters). 	Yes Yes Yes Yes

NTTF Recommendation 2.1 Expedited Seismic Evaluation Process

Technical Review Checklist for Fermi 2

IV. Walkdown Approach

<p>The licensee:</p> <ul style="list-style-type: none"> described the walkdown screening approach, including walkbys and walkdowns performed exclusively for the ESEP, in accordance with the guidance credited previous walkdown results, including a description of current action(s) to verify the present equipment condition and/or configuration (e.g., walk-bys), in accordance with the guidance stated seismic walkdown training of walkdown personnel. 	<p>Yes</p> <p>Yes</p> <p>Yes</p>
<p>Notes from the Reviewer: None</p> <p>Deviation(s) or Deficiency(ies), and Resolution:</p> <ul style="list-style-type: none"> No deviation or deficiency was identified in this particular section. 	
<p>The licensee:</p> <ul style="list-style-type: none"> described the material condition of the equipment (e.g. material degradation credited previous walkdown results, included a description of current action(s) to verify the present equipment condition (e.g., walk-bys), meeting the intent of the guidance 	<p>Yes</p> <p>Yes</p>
<p>The licensee:</p> <ul style="list-style-type: none"> described the conditions of structural items considered for the interim evaluation, including: <ul style="list-style-type: none"> spatial interactions (i.e., interaction between block walls and other items/components) anchorage piping connected to tanks (i.e., differential movement between pipes and tanks at connections) 	<p>Yes</p> <p>Yes</p> <p>Yes</p>
<p>Notes from the Reviewer: None</p> <p>Deviation(s) or Deficiency(ies), and Resolution:</p> <ul style="list-style-type: none"> No deviation or deficiency was identified in this particular section. 	
<p>The licensee reported no deviations for Fermi 2 for this section. Any deviations identified were addressed, and there is a discussion of how the deficiencies will be addressed in the ESEP submittal report.</p>	<p>Yes</p>
<p>The NRC staff concludes that:</p> <ul style="list-style-type: none"> the licensee described the performed walkdown approach, including any credited previous efforts (e.g., IPEEE) consistent with the guidance the licensee addressed identified deviations consistent with the guidance, if any 	<p>Yes</p> <p>Yes</p>

V. Capacity Screening Approach and HCLPF Calculation Results

<p>The licensee:</p> <ul style="list-style-type: none"> described the capacity screening process for the ESEL items, consistent with the guidance (e.g., use of EPRI NP-6041 screening table). 	<p>Yes</p>
<ul style="list-style-type: none"> presented the results of the screened-out ESEL items in the ESEP report described the development of in-structure response spectra (ISRS) 	<p>Yes</p>

NTTF Recommendation 2.1 Expedited Seismic Evaluation Process

Technical Review Checklist for Fermi 2

<ul style="list-style-type: none"> based on scaling described the development of ISRS based on new analysis consistent with the guidance described the method for estimating HCLPF capacity of screened-in ESEL items, including both structural and functional failure modes consistent with the guidance: <ul style="list-style-type: none"> use of Conservative Deterministic Failure Margin (CDFM) use of fragility analysis (FA) use of experience data or generic information credited Individual Plant Evaluation for External Events (IPEEE)spectral shape for HCLPF capacity estimates is similar to or envelopes the RLGM, and anchored at the same control point presented the results of HCLPF capacities including associated failure modes for screened-in ESEL items reviewed the ESEL items with the lowest HCLPF values to ensure that their capacities are equal or greater than the RLGM 	<p>N/A</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>
<p>Notes from the Reviewer:</p> <ul style="list-style-type: none"> Because the submittal did not mention treatment of equipment above 40 feet, the staff requested clarification regarding the method used for screening those items. The licensee's response (ML15148A432) described the screening and treatment of those ESEL components to be consistent with the guidance. The staff finds this sufficient for the interim evaluation. The staff requested clarification regarding how parameter variation is incorporated into the soil-structure interaction (SSI) analyses. The licensee's response (ML15148A432) provided a detailed summary of its assessment of variability in the SSI model that the staff finds sufficient for the interim evaluation. The staff requested clarification regarding the seismic SSI analysis to obtain the ISRS. The licensee's response (ML15148A432) described why embedment effects were not considered. The staff finds this sufficient for the interim evaluation. The staff requested clarification regarding the use of the "rule of the box" approach to develop HCLPF values for components mounted in panels and cabinets. The licensee's responses (ML15148A432 and ML15189A234) explained how it implemented "rule of the box" consistent with the guidance. The staff finds this sufficient for the interim evaluation. The staff requested clarification regarding the method used to determine the HCLPF values. The licensee's response (ML15148A432) clarified how the fragility parameters used were in accordance with the guidance. The staff finds this acceptable for this interim evaluation. <p>Deviation(s) or Deficiency(ies), and Resolution:</p> <ul style="list-style-type: none"> No deviation or deficiency was identified in this particular section. 	

NTTF Recommendation 2.1 Expedited Seismic Evaluation Process

Technical Review Checklist for Fermi 2

The NRC staff concludes that:	
• the licensee described the implementation of the capacity screening process consistent with the intent of the guidance	Yes
• the licensee presented capacity screening and calculation results, as appropriate, in the ESEP report	Yes
• the method used to develop the ISRS is consistent with guidance for use in the ESEP	Yes
• for HCLPF calculations, the licensee used HCLPF calculation methods as endorsed in the guidance	Yes
• no anomalies were noted in the reported HCLPF	Yes

VI. Inaccessible Items

The licensee:	
• provided a list of inaccessible items	No
• provided a schedule of the planned walkdown and evaluation for all inaccessible items	N/A
• provided Regulatory Commitment to complete walkdowns	N/A
Fermi will provide results or complete walkdown by: N/A	
Notes from the Reviewer:	
• There were no inaccessible items for future walkdown or walkby.	
• The staff requested clarification to provide specifics about the assessment of possible inaccessible ESEL items. The licensee's response (ML15148A432) summarized how it developed confidence to address the remaining items consistent with guidance. The staff finds this sufficient for the interim evaluation.	
Deviation(s) or Deficiency(ies), and Resolution:	
• No deviation or deficiency was identified in this particular section.	
The NRC staff concludes that the licensee:	
• listed inaccessible items	N/A
• committed to provide the results (e.g. walkdowns, walkbys, etc) of the remaining inaccessible items consistent with the guidance	N/A
• substitutions, if needed, were appropriately justified	N/A

VII. Modifications

The licensee:	
• identified modifications for ESEL items necessary to achieve HCLPF values that bound the RLGM, as specified in the guidance	N/A
• provided a schedule to implement such modifications (if any), consistent with the intent of the guidance	N/A
• provided Regulatory Commitment to complete modifications	N/A
• provided Regulatory Commitment to report completion of modifications.	N/A
Fermi will:	
• complete modifications by N/A	
• report completion of modifications by N/A	

NTTF Recommendation 2.1 Expedited Seismic Evaluation Process

Technical Review Checklist for Fermi 2

Notes from the Reviewer: <ul style="list-style-type: none">No modifications were identified through the ESEP.	
Deviation(s) or Deficiency(ies), and Resolution: <ul style="list-style-type: none">No deviation or deficiency was identified in this particular section.	
The NRC staff concludes that the licensee: <ul style="list-style-type: none">identified plant modifications necessary to achieve the target seismic capacityprovided a schedule to implement the modifications (if any) consistent with the guidance	N/A N/A

VIII. Conclusions:

The NRC staff assessed the licensee's implementation of the ESEP guidance. Due to the interim applicability of the ESEP evaluations, use of the information for another application would require a separate NRC review and approval. Based on its review, the NRC staff concludes that the licensee's implementation of the interim evaluation meets the intent of the guidance. The staff concludes that, through the implementation of the ESEP guidance, the licensee identified and evaluated the seismic capacity of certain key installed Mitigating Strategies equipment that is used for core cooling and containment functions to cope with scenarios that involve a loss of all AC power and loss of access to the ultimate heat sink to withstand a seismic event up to the Review Level Ground Motion (RLGM). In the case of Fermi 2, the FIRS for the upcoming SPRA was the RLGM, which the staff found acceptable for this interim evaluation. The licensee did not identify any modifications. The application of this staff review is limited to the interim ESEP as part of NTTF R2.1: Seismic activities.

In summary, the licensee, by implementing the interim ESEP, has demonstrated additional assurance which supports continued plant safety while the longer-term seismic evaluation is completed to support regulatory decision making. The NRC staff concludes that the licensee responded appropriately to Enclosure 1, Item (6) of the 50.54(f) letter, dated March 12, 2012, for Fermi 2.

Technical Reviewers: David Heeszal, Tony Nakanishi, Kevin Roche, Stephanie Devlin-Gill, Joseph Braverman (NRC Consultant)