

NRR-PMDAPEm Resource

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Sent: Wednesday, June 10, 2015 1:46 PM
To: Shams, Mohamed
Cc: DiFrancesco, Nicholas; Wyman, Stephen; Spence, Jane; Devlin-Gill, Stephanie; Roche, Kevin; Nakanishi, Tony; Lehman, Bryce; Tsirigotis, Alexander; Jardaneh, Mahmoud; Candelario, LUISSETTE; 50.54f Seismic Resource; RidsNroDsea Resource
Subject: PILGRIM NUCLEAR POWER STATION - TECHNICAL REVIEW CHECKLIST RELATED TO INTERIM EXPEDITED SEISMIC EVALUATION PROCESS SUPPORTING NTTF RECOMMENDATION 2.1, SEISMIC (TAC NO. MF526)
Attachments: Pilgrim R2.1 seismic ESEP NRC review.docx

June 10, 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: PILGRIM NUCLEAR POWER STATION - 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. MF5262)

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 PILGRIM NUCLEAR POWER STATION 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 Expedited Seismic Evaluation Process (ESEP) Interim Evaluation 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 reviewer 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 ESEP interim evaluation 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. MF5262 for the review of the ESEP Interim Evaluation report for the PILGRIM NUCLEAR POWER STATION.

Docket No: 50-293

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Hearing Identifier: NRR_PMDA
Email Number: 2147

Mail Envelope Properties (AF843158D8D87443918BD3AA953ABF780133FEE2051B)

Subject: PILGRIM NUCLEAR POWER STATION - TECHNICAL REVIEW CHECKLIST
RELATED TO INTERIM EXPEDITED SEISMIC EVALUATION PROCESS SUPPORTING NTTF
RECOMMENDATION 2.1, SEISMIC (TAC NO. MF526)

Sent Date: 6/10/2015 1:45:34 PM

Received Date: 6/10/2015 1:45:35 PM

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Files	Size	Date & Time
MESSAGE	3073	6/10/2015 1:45:35 PM
Pilgrim R2.1 seismic ESEP NRC review.docx		59064

Options

Priority: Standard

Return Notification: No

Reply Requested: No

Sensitivity: Normal

Expiration Date:

Recipients Received:

TECHNICAL REVIEW CHECKLIST
BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO EXPEDITED SEISMIC EVALUATION PROCESS INTERIM EVALUATION
IMPLEMENTING NTTF RECOMMENDATION 2.1 SEISMIC
PILGRIM NUCLEAR POWER STATION
DOCKET NO. 50-293

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 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.

¹ADAMS Accession No. ML13102A142

²ADAMS Accession No. ML13106A331

NTTF Recommendation 2.1 Expedited Seismic Evaluation Process

Technical Review Checklist for Pilgrim Nuclear Power Station

By letter dated December 16, 2014³, Entergy Nuclear Operations Inc, 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 Pilgrim Nuclear Power Station (Pilgrim).

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	Yes
<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 safe shutdown earthquake (SSE).	Yes
Pilgrim used a scaled SSE at the maximum ratio of <u>2.0</u> because the GMRS is above two times the SSE.	
Notes from the reviewer: None	
Deviation(s) or Deficiency(ies), and Resolution: No deviation or deficiencies were found in the review of this particular section.	
The NRC staff concludes:	
<ul style="list-style-type: none">the licensee's RLGM meets the intent of the guidancethe RLGM is reasonable for use in the interim evaluation.	Yes 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>	Yes

NTTF Recommendation 2.1 Expedited Seismic Evaluation Process

Technical Review Checklist for Pilgrim Nuclear Power Station

Notes from the reviewer: None	
Deviation(s) or Deficiency(ies), and Resolution: No deviation or deficiencies were found in the review of 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 Expedited Seismic Equipment List (ESEL)

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: No deviation or deficiencies were found in the review of this particular section.	
<p style="text-align: center;"><u>For PWR Plants ONLY</u></p> 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 a steam generator (SG), pressure of SG, containment, and reactor coolant system (RCS); and temperature of the RCS.	N/A
<p style="text-align: center;"><u>For BWR Plants ONLY</u></p> 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: No deviation or deficiencies were found in the review of this particular section.	

NTTF Recommendation 2.1 Expedited Seismic Evaluation Process

Technical Review Checklist for Pilgrim Nuclear Power Station

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 	Yes
<ul style="list-style-type: none"> the desired equipment state for the success path were identified 	Yes
<ul style="list-style-type: none"> the licensee considered the support equipment for the ESEL 	Yes
<ul style="list-style-type: none"> 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, MCC, inverters). 	Yes

IV. Walkdown Approach

The licensee:	
<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 	Yes
<ul style="list-style-type: none"> 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 	Yes
<ul style="list-style-type: none"> stated seismic walkdown training of walkdown personnel. 	Yes
Notes from the reviewer: None	
Deviation(s) or Deficiency(ies), and Resolution: No deviation or deficiencies were found in the review of this particular section.	
The licensee:	
<ul style="list-style-type: none"> described the material condition of the equipment (e.g., material degradation 	Yes
<ul style="list-style-type: none"> 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 	Yes
The licensee:	
<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 ⁽¹⁾ piping connected to tanks (i.e. differential movement between pipes and tanks at connections) 	Yes Yes Yes

NTTF Recommendation 2.1 Expedited Seismic Evaluation Process

Technical Review Checklist for Pilgrim Nuclear Power Station

Notes from the reviewer:

1. The anchorage of motor generator (MG) set, EG-23, had a calculated HCLPF less than the RLGM. The staff finds this acceptable because the licensee's proposed anchorage modification results in a HCLPF greater than the RLGM.

Deviation(s) or Deficiency(ies), and Resolution:

No deviation or deficiencies were found in the review of this particular section.

The licensee reported deviations for Pilgrim .	Yes
If deviations were identified, there is a discussion of how the deficiencies were or will be addressed in the ESEP submittal report.	Yes
The NRC staff concludes that: <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 	Yes Yes

V. Capacity Screening Approach and High Confidence/Low Probability of Failure (HCLPF) Calculation Results

The licensee: <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) ⁽¹⁾ • presented the results of the screened-out ESEL items in the ESEP report • described the development of in-structure response spectra (ISRS) based on scaling ⁽²⁾ • 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 IPEEE spectral shape for HCLPF capacity estimates is similar to or envelopes the RLGM, and anchored at the same control point ⁽²⁾ • 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 	Yes Yes Yes N/A Yes Yes N/A Yes Yes Yes Yes
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NTTF Recommendation 2.1 Expedited Seismic Evaluation Process

Technical Review Checklist for Pilgrim Nuclear Power Station

Notes from the Reviewer:

1. The staff asked questions to the licensee regarding the HCLPF calculations for equipment at elevations beyond 40 ft above grade and the scaling procedure used to obtain the vertical RLGM ISRS. The staff finds that the licensee responses (ML15132A065) adequately addressed the concern and met the intent of the guidance for this interim evaluation.
2. The basis of the staff's conclusion is not the statement in Section 6.2 of the ESEP submittal about the "available margin against SSE," but that the table in Attachment B of the ESEP submittal shows that HCLPF values are >RLGM.
3. The plant seismic design basis assumes no amplification of the vertical ground motion with elevation above the basemat. The staff finds this met the intent of the guidance for this interim evaluation. However, in the seismic risk evaluation, amplification of the vertical ground motion at elevations above the basemat should be considered, including the effect of vertical floor flexibility, in the development of ISRS and for the evaluation of building structural elements.

Deviation(s) or Deficiency(ies), and Resolution:

No deviation or deficiencies were found in the review of this particular section.

The NRC staff concludes that:	
• the licensee described the implementation of the capacity screening process consistent with the intent of the guidance ⁽¹⁾	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 ^{(1) (3)}	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 ⁽¹⁾	Yes
• provided a schedule of the planned walkdown and evaluation for all inaccessible items	No
• provided Regulatory Commitment to complete walkdowns.	No
Pilgrim will provide results or complete walkdown by:	N/A

NTTF Recommendation 2.1 Expedited Seismic Evaluation Process

Technical Review Checklist for Pilgrim Nuclear Power Station

Notes from the Reviewer:

1. There are a total of 13 Torus Water Temperature Elements (TEs) on the ESEL. Six (6) of the TEs were not walked down since they are located in a high radiation area. The evaluation of subject TEs was done by comparison and similarity to seven (7) other TEs that were walked down. The staff finds this is to be an acceptable approach for this interim evaluation.

Deviation(s) or Deficiency(ies), and Resolution:

No deviation or deficiencies were found in the review of this particular section.

The NRC staff concludes that the licensee:

- listed inaccessible items
- committed to provide the results (e.g. walkdowns, walkbys, etc) of the remaining inaccessible items consistent with the guidance
- substitutions, if needed, were appropriately justified

Yes

No

Yes

VII. Modifications

The licensee:

- identified modifications for ESEL items necessary to achieve HCLPF values that bound the RLGM, as specified in the guidance
- provided a schedule to implement such modifications (if any), consistent with the intent of the guidance
- provided Regulatory Commitment to complete modifications
- provided Regulatory Commitment to report completion of modifications.

Yes

Yes

Yes

Yes

Pilgrim will:

- complete modifications by December 2016
- report completion of modifications by: 60 days following completion of ESEP activities (February 2017)

Notes from the Reviewer: None

Deviation(s) or Deficiency(ies), and Resolution:

No deviation or deficiencies were found in the review of this particular section.

The NRC staff concludes that the licensee:

- identified plant modifications necessary to achieve the target seismic capacity
- provided a schedule to implement the modifications (if any) consistent with the guidance

Yes

Yes

NTTF Recommendation 2.1 Expedited Seismic Evaluation Process

Technical Review Checklist for Pilgrim Nuclear Power Station

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 Pilgrim, the RLGM was set at the maximum ratio of two times the SSE in accordance with the guidance because the GMRS is above two times the SSE. The staff did not identify deviations or exceptions taken from the guidance. The application of this staff review is limited to the ESEP interim evaluation as part of NTTF R2.1: Seismic activities. The licensee identified safety enhancing modifications based on the evaluation and committed to complete modifications by within two planned refueling outages after December 31, 2014, and report the completion of modifications within 60 days following completion of ESEP activities. In accordance with the guidance, modifications are expected to be completed no later than December 2016, if the modifications do not require a plant shutdown to access equipment.

In summary, the licensee, by implementing the ESEP interim evaluation, 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 Pilgrim Nuclear Power Station.

Principle Contributors:

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