NRR-PMDAPEm Resource

From: Jackson, Diane
Sent: Tuesday, August 25, 2015 12:10 PM
To: Shams, Mohamed
Cc: DiFrancesco, Nicholas; Wyman, Stephen; Spence, Jane; Devlin-Gill, Stephanie; Roche, Kevin; Yee, On; Candelario, Luissette; Nakanishi, Tony; Lehman, Bryce; Tsirigotis, Alexander; 50.54f_Seismic Resource; RidsNroDsea Resource
Subject: OYSTER CREEK NUCLEAR GENERATING STATION - TECHNICAL REVIEW CHECKLIST RELATED TO INTERIM ESEP SUPPORTING IMPLEMENTATION OF NTTF R2.1, SEISMIC (TAC NO. MF5257)
Attachments: Oyster Creek R.2 1 seismic ESEP NRC review.docx

August 25, 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: OYSTER CREEK NUCLEAR GENERATING 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. MF5257)

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 OYSTER CREEK NUCLEAR GENERATING 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 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. MF5257 for the review of the interim ESEP report for the OYSTER CREEK NUCLEAR GENERATING STATION.

Docket No: 50-219

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TECHNICAL REVIEW CHECKLIST

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO EXPEDITED SEISMIC EVALUATION PROCESSINTERIM EVALUATION

IMPLEMENTING NTTF RECOMMENDATION 2.1 SEISMIC

OYSTER CREEK NUCLEAR GENERATING STATION

DOCKET NO. 50-219

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, 2013[1], 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, 2013[2], 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.

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1 ADAMS Accession No. ML13102A142

2 ADAMS Accession No. ML13106A331

By letter dated December 19, 2014[3], Exelon Generation Company, LLC 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 Oyster Creek Nuclear Generating Station (Oyster Creek).

I. Review Level Ground Motion

The licensee: • described the determination of the review level ground motion (RLGM) using one of the means acceptable by the guidance • identified location of the control point and is consistent with March 2014 Seismic Hazard and Screening Report submittal • compared the site ground motion response spectra used to select the ESEP RLGM to the SSE.	Yes Yes Yes
Oyster Creek Nuclear Generating Station used a scaled licensing basis spectrum at a ratio of 1.60, rounded up from calculated 1.53.[1]	
Notes from the reviewer: 1. The staff requested clarification of the plant's design-basis safe shutdown earthquake (SSE) and whether all 92 components contained in the "Oyster Creek ESEL," Table A-1, have demonstrated capacity at or above the GMRS demand level. In its response on July 24, 2015 (ML15212A242), the licensee provided documentation that all non-high frequency susceptible components on the ESEL have seismic capacities at or above the GMRS level, or are not required to implement the FLEX strategies. The staff finds the information sufficient for the purpose of 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: • the licensee's RLGM meets the intent of the guidance • the RLGM is reasonable for use in the interim evaluation.	 Yes Yes

II. Selection of the Success Path

The licensee: • described the success path • described normal and desired state of the equipment for the success path • ensured that the success path is consistent with the plant's overall mitigating strategies approach or provided a justification for an alternate path • stated that the selection process was in accordance with the guidance or meets the intent of the guidance • used installed FLEX Phase 1 equipment as part of the success path • included FLEX Phase 2 and/or 3 connections • considered installed FLEX Phase 2 and/or 3equipment	 Yes Yes Yes Yes Yes Yes Yes

3ADAMS Accession No.ML14353A332

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 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: • developed and provided the ESEL by applying the ESEP • identified equipment considering the following functions: o Core cooling (with focus on Mode 1) function o Available, sustainable water source o 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.	
<u>For PWR Plants ONLY</u> The licenseeincluded 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
<u>For BWR Plants ONLY</u> The licenseeconsidered 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.	

Through a sampling of the ESEP key components, the NRC staff concludes that: • 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 centers, inverters).	Yes Yes Yes Yes

IV. Walkdown Approach

The licensee: • described the walkdown screening approach, including walk-bys and walkdowns performed exclusively for the ESEP, in accordance with the guidance(1) • 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.	Yes Yes Yes
Notes from the reviewer: 1. The licensee determined that Oyster Creek met the Low Seismic Hazard screening. By following this screening, described in Section 2 of EPRI 3002000704, the licensee limited the ESEL to the diesel generator fuel oil storage tank (T-39-2) only. In conjunction with the Reviewer Note in Section I of this checklist, this is acceptable to the staff 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 licensee: • described, if needed, adverse 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	No Yes
The licensee: • described the conditions of structural items considered for the interim evaluation, including: o spatial interactions (i.e. interaction between block walls and other items/components) o anchorage o piping connected to tanks (i.e. differential movement between pipes and tanks at connections)	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.	

The licensee reported deviationsfor Oyster Creek. If deviationswere identified, there is a discussion of how the deficiencies were or will be addressed in the ESEP submittal report.	No N/A
The NRC staff concludes that: • the licensee described the performed walkdown approach, including any credited previous efforts e.g., Individual Plant Examination of External Events(IPEEE) consistent with the guidance • the licensee addressed identified deviations consistent with the guidance, if any	Yes N/A

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

The licensee: • 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 • 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: o use of Conservative Deterministic Failure Margin (CDFM) o use of fragilityanalysis (FA) o 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 • 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 N/A N/A Yes Yes

Notes from the Reviewer:

1. The licensee used RLGM = 1.60 x SSE, in order to envelope GMRS at all frequencies. The scale factor is driven by the ratio of GMRS/SSE at 1 Hz. As a result, the RLGM peak spectral acceleration (0.70g at 5 Hz) significantly exceeds the GMRS peak spectral acceleration (0.33g at 5 Hz).

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 • the licensee presented capacity screening and calculation results, as appropriate, in the ESEP report • the method used to develop the ISRS is consistent with guidance for use in the ESEP • for HCLPF calculations, the licensee used HCLPF calculation methods as endorsed in the guidance • no anomalies were noted in the reported HCLPF	Yes Yes Yes Yes Yes

VI. Inaccessible Items

The licensee: • provided a list of inaccessible items(1) • provided a schedule of the planned walkdown and evaluation for all inaccessible items • provided Regulatory Commitment to complete walkdowns.	Yes No No
Oyster Creek will provide results or complete walkdown by: N/A	N/A
Notes from the Reviewer: 1. The licensee stated that the confined space around the diesel generator fuel oil storage tank (T-39-2) prevented the access during the time of the walkdowns. The licensee evaluated it using previous walkdown information from NTTF 2.3: Seismic Walkdown Submittal and USI A-46. The licensee performed adetailed analysis calculation and determined it to be acceptable with no further walkdown. The staff finds this is 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 N/A 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.	N/A N/A N/A N/A
Oyster Creek will: • complete modifications by:N/A • report completion of modifications by: N/A	N/A N/A

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	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),and thus, provides additional assurance while plant seismic risk evaluation is being conducted. In the case of Oyster Creek, in accordance with the guidance, the RLGM used a scaled licensing basis spectrum at the ratio of 1.60. The licensee classified the site as a low seismic hazard site and used the special screening consideration, per ESEP guidance, for the low-frequency GMRS exceedances. Oyster Creek GMRS only exceeds the licensing basis spectrum below 1.9 Hz within the 1-10 Hz range, consequently its ESEP evaluation scope is limited to the equipment items with potential susceptibility to damage from spectral accelerations at low frequencies.As noted in the review checklist, the staff did not identify deviations or exceptions were taken from the guidance. The licensee found the equipment evaluated for the ESEP to have adequate capacity for the required demand. Therefore, no modification of equipment were required.

In summary, by implementing the ESEP interim evaluation, the licensee demonstrated that additional assurance exists which supports continued plant safety and confirms that sufficient time exists to allow the completion of longer-term seismic evaluations 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 Oyster Creek Nuclear Generating Station.

Principle Contributors: Stephanie Devlin-Gill, On Yee, Tony Nakanishi, Bryce Lehman, Alexander Tsirigotis, Luissette Candelario, and Richard Morante (NRC consultant)