NRR-PMDAPEm Resource

From: Jackson, Diane
Sent: Wednesday, August 12, 2015 5:07 PM
To: Shams, Mohamed
Cc: DiFrancesco, Nicholas; Wyman, Stephen; Spence, Jane; Devlin-Gill, Stephanie; Roche, Kevin; Yee, On; Stirewalt, Gerry; Lyons, Sara; Basavaraju, Chakrapani; Graizer, Vladimir; Jain, Bhagwat; 50.54f_Seismic Resource; RidsNroDsea Resource
Subject: INDIAN POINT NUCLEAR GENERATING UNITS 2 AND 3 - TECHNICAL REVIEW CHECKLIST RELATED TO INTERIM ESEP SUPPORTING IMPLEMENTATION OF NTTF R2.1, SEISMIC (TAC NO.MF5245 AND MF5246)
Attachments: Indian Pt R2.1 seismic ESEP staff review.docx

August 12, 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: INDIAN POINT NUCLEAR GENERATING UNITS 2 AND 3 - 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. MF5245 AND MF5246)

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 INDIAN POINT NUCLEAR GENERATING UNITS 2 AND 3 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. MF5245 and MF5246 for the review of the interim ESEP report for the INDIAN POINT NUCLEAR GENERATING UNITS 2 AND 3.
Docket No: 50-247 and 50-286
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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

INDIAN POINT NUCLEAR GENERATING, UNITS 2 AND 3

DOCKET NOS. 50-286 AND 50-333

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 22, 2014[3], Entergy Nuclear Operations, Inc. (Entergy, 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 Indian Point Nuclear Generating Units 2 & 3 (Indian Point or IP2, IP3).

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 submittal • compared the site ground motion response spectra used to select the ESEP RLGM to the SSE	 Yes Yes Yes
Indian Point used 2 x SSE	
Notes from reviewer: • The licensee used the maximum ratio of two times the SSE because the GMRS from the March 2014 Seismic Hazard and Screening report (SHSR)[4]was greater than two times the SSE for the Indian Point site. Deviation(s) or Deficiency(ies)s and Resolution: • No deviations or deficiencies were identified in this 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 3 equipment	 Yes Yes Yes Yes Yes Yes N/A
Notes from reviewer: None Deviation(s) or Deficiency(ies)s and Resolution: • No deviations or deficiencies were identified in this section	

3 ADAMS Accession No. ML15008A086

4 ADAMS Accession Nos. ML14099A110 (Unit 2) and ML14099A111 (Unit 3)

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 Equipment List

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 reviewer: 1. From the ESEP report, the FLEX description for IP2 appeared inconsistent with the FLEX description for IP3 and the Overall Integrated Plan (OIP) andtherefore,the flow paths and associated valves evaluated was unclear. The licensee clarified that the FLEX strategy for feeding the steam generators is the same for both Units 2 and 3; that the primary success path includes the turbine driven auxiliary feedback water (TDAFW) pump obtaining water from the condensate storage tank (CST); and that the primary water storage tank (PWST) or fire water storage tank (FWST) will be used to provide make-up to the CST. The staff determined that the licensee's clarification adequately addressed the issue and met the intent of the guidance for this interim evaluation. Deviation(s) or Deficiency(ies)s and Resolution: • No deviations or deficiencies were identified in this section	
PWR Plants ONLY Foundation Input Response Spectra (FIRS) 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.	Yes
BWR Plants ONLY The licenseeconsidered indicators for the following functions: level, pressure, temperature that would be indicative of, but not explicitly identified with, specific instruments: Temperature of suppression pool, RCS, containment; pressure of suppression pool, RCS, and drywell; water level of the suppression pool.	N/A
Notes from reviewer: None Deviation(s) or Deficiency(ies)s and Resolution: • No deviations or deficiencies were identified in this 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 center (MCC), inverters)	Yes Yes Yes Yes

IV. Walkdown Approach

The licensee: • 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 that the walkdown was performed by seismically trained personnel	Yes Yes Yes
Notes from reviewer: None Deviation(s) or Deficiency(ies)s and Resolution: • No deviations or deficiencies were identified in this section	
The licensee: • described, if needed, adverse 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	Yes 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 reviewer: • The licensee provided a status of IP3 modifications in a supplement letter dated June 25, 2015 (ML15182A249). The licensee indicated that the IP3 modifications for FWST 31 and 32 and anchorages so that HCLPF>RLGM were on schedule. Deviation(s) or Deficiency(ies)s and Resolution: • No deviations or deficiencies were identified in this section	

The licensee reported no deviations for Indian Point Units 2 and 3. If deviations were identified, there is a discussion of how the deficiencies were or will be addressed in the ESEP submittal report.	N/A
The NRC staff concludes that: • the licensee described the performed walkdown approach, including any credited previous efforts (e.g., Individual PlantExamination of External Events (IPEEE)) consistent with the guidance • the licensee addressed identified deviations consistent with the guidance, if any	Yes Yes

V. Capacity Screening Approach and 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). • 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 fragility analysis (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 reviewer:

1. The staff noted the ESEP report states that the vertical direction RLGM ISRS is obtained by scaling the vertical amplified ground response spectrum, but does not indicate the scaling factor used. The staff asked the licensee to clarify the scaling factor used. In the response dated April 21, 2015 (ML15118A570), the licensee stated that, in accordance with Section 1.8.2 of IP-RPT-04-00481, both IP2 and IP3 vertical response ISRS are calculated as two-thirds of the horizontal in-structure floor response such that the horizontal scale factor of 2 is also applicable to vertical response for the RLGM. The staff finds that the response adequately addressed the question and met the intent of the guidance for this interim evaluation.

2. The staff asked the licensee to clarify why, for Unit 3, Section 6.6 states that the evaluated ESEL components were determined to have adequate capacity for the design

basis loads based on the high confidence, low probability of failure (HCLPF) calculations (i.e., HCLPF capacities are greater than the RLGM), while Section 8.2 identifies modifications required for the Fire Water Storage Tank anchorage because their HCLPF is below the RLGM. The licensee's April 21, 2015, response (ML15118A570) stated that the conclusion contained in Section 6.6 for Unit 3 incorrectly excludes the two fire water storage tanks, which require modifications in order for HCLPF capacity to exceed RLGM demand; that Section 6.6 refers to Attachment B which does correctly identify the current HCLPF and modification is required; and that the final conclusion in Section 8.2 is also correct and site CR-IP3-2015-00061 exists to track the modifications. The staff finds that the response adequately addressed the question and met the intent of the guidance for this interim evaluation.

3. The staff requested clarification regarding whether any ESEL items are located at an elevation greater than 40 feet above grade and, if so, to discuss the method used for screening the items and provide the criteria and references to the appropriate guidance used to evaluate the items. The licensee's April 21, 2015, response (ML15118A570) described the method to which these ESEL items were evaluated and determined to be rugged by the seismic review team for both IP2 and IP3. The staff finds that the response adequately addressed the question and met the intent of the guidance for this interim evaluation.

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

- No deviations or deficiencies were identified in this section

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	Yes
• provided a schedule of the planned walkdown and evaluation for all inaccessible items	Yes
• provided Regulatory Commitment to complete walkdowns	Yes
Indian Point will complete walkdownsno later than the end of the second planned refueling outage after 31 December 2014.	

Notes from reviewer:

1. For Unit 2, two items were not walked down due to their inaccessibility. Those two components were evaluated based on review of existing calculations, NTTF 2.3 walkdowns and associated photographs, and a recent scan performed in the area and screened out. The staff finds this meets the guidance and is acceptable for this interim evaluation.

2. For Unit 3, four items were not walked down due to their inaccessibility related to contamination and high radiation at the time of the walkdowns. Those components were evaluated based on review of recent photographs. The staff finds this meets the guidance and is acceptable for this interim evaluation.

3. Indian Point Unit 2, contained 41 inaccessible items, which the licensee committed to walkdown or walk-by no later than the end of the second planned refueling outage after December 31, 2014. For Indian Point 3, the licensee provided a supplementon June 25, 2015 (ML15182A249) with the results of the walkdown and evaluations for the inaccessible items.

Deviation(s) or Deficiency(ies)s and Resolution:
- No deviations or deficiencies were identified in this 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 Yes N/A

VII. Modifications to Plant Equipment

The licensee: • identified modifications for ESEL items necessary to achieve HCLPF values that bound the RLGM (excluding mitigative strategies equipment (FLEX)), 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
Indian Point will: • modify IP2 RWST and Fire Water Storage Tank and anchorages, andwill modify IP3 Fire Water Storage Tanks 31 and 32 and anchorages by December 31, 2016, orno later than the end of the second planned refueling outage after December 31, 2014, for associated Unit. • report completion of modifications by submitting a letter to the NRC within 60 days following completion of ESEP activities outlined in the table presented in Section 8.4 of the ESEP Report for both Units 2 and 3.	

Notes from reviewer:
- In the supplement dated June 25, 2015 (ML15182A249), the licensee provided an update to the IP3 walkdowns, evaluations and modifications. The licensee reported that no new modifications were identified from the IP3 walkdown of inaccessible items.

Deviation(s) or Deficiency(ies)s and Resolution:
- No deviations or deficiencies were identified in this 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

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 Indian Point, 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 within two planned refueling outages after December 31, 2014. The licensee committed to submit a letter summarizing the results and report the completion of modifications within 60 days following completion of ESEP activities for each Unit. 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,or modifications are expected to be completed no later than the end of the second planned refueling outage after December 31, 2014, for associated Unit if an outage is required.

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 Indian Point Nuclear Generating, Units 2 and 3.

Principal Contributors: Vladimir Graizer, Kevin Roche, Sara Lyons, Jinsuo Nie, B.P. Jain, Basavaraju Chakrapani, Gerry Stirewalt, Carl Constatino (NRC Consultant)