NRR-PMDAPEm Resource

From: Jackson, Diane
Sent: Monday, August 10, 2015 6:03 PM
To: Shams, Mohamed
Cc: DiFrancesco, Nicholas; Wyman, Stephen; Spence, Jane; Devlin-Gill, Stephanie; Roche, Kevin; Yee, On; Pettis, Robert; Gallucci, Ray; Patel, Pravin; Wang, Weijun; Graizer, Vladimir; 50.54f_Seismic Resource; RidsNroDsea Resource
Subject: BEAVER VALLEY NUCLEAR STATION, UNITS 1 AND 2 - TECHNICAL REVIEW CHECKLIST RELATED TO INTERIM ESEP SUPPORTING IMPLEMENTATION OF NTTF R2.1, SEISMIC (TAC NOS. MF5223 AND MF5224)
Attachments: Beaver Valley R2.1 seismic ESEP NRC review.docx

August 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: BEAVER VALLEY NUCLEAR STATION, UNITS 1 AND 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 NOS. MF5223 AND MF5224)

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 BEAVER VALLEY NUCLEAR STATION, UNITS 1 AND 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 NOS. MF5223 and MF5224 for the review of the interim ESEP report for the BEAVER VALLEY NUCLEAR STATION, UNITS 1 AND 2.
Docket Nos: 50-334 and 50-412
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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

BEAVER VALLEY POWER STATION, UNITS 1 AND 2

DOCKET NOS. 50-334 AND 50-412

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

NTTF Recommendation 2.1 Expedited Seismic Evaluation Process

Technical Review Checklist for Beaver Valley Power Station, Units 1 and 2

By letter dated December 19, 2014,[3] FirstEnergy Nuclear Operating Company (FENOC) 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 Beaver Valley Power Station (Beaver Valley), Units 1 and 2.

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
Beaver Valley Units 1 and 2 used a specific GMRS.	
Notes from the Reviewer: • The licensee used a new GMRS rather than its seismic hazard reevaluation GMRS documented in its March 2014 Seismic Hazard and Screening Report (SHSR)[4], which was found acceptable for use in Recommendation 2.1 seismic activities by the staff. Because the new GMRS is similar to and bounds the SHSR GMRS, the staff judged that this GMRS is acceptable for this interim evaluation. **Deviation(s) or Deficiency(ies), and Resolution:** • No deviations or deficiencies were identified.	
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 Yes
Notes from the Reviewer: None **Deviation(s) or Deficiency(ies), and Resolution:** • No deviations or deficiencies were identified.	

3 ADAMS Accession No ML14353A059

4ADAMS Accession No ML14092A203

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 the Reviewer: 1. The staff verified that major components in direct flow path were identified through the use of system notebooks. 2. Inclusion of power-operated valves not required to change state as part of FLEX mitigation strategy. **Deviation(s) or Deficiency(ies), and Resolution:** • No deviations or deficiencies were identified.	
<u>For PWR Plants ONLY</u> 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
<u>For BWR Plants ONLY</u> 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.	N/A
Notes from the Reviewer: None **Deviation(s) or Deficiency(ies), and Resolution:** • No deviations or deficiencies were identified.	
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 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 the Reviewer: 1. Although the licensee did not state that walkdown personnel had been trained in seismic walkdowns, other activities referenced in the ESEP report involveseismic (i.e., SQUG) training, such as NTTF Recommendation 2.3 seismic walkdowns, seismic probabilistic risk assessments. The staff finds this acceptable evidence for this interim evaluation. **Deviation(s) or Deficiency(ies), and Resolution:** • No deviations or deficiencies were identified.	
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 No No
Notes from the Reviewer: None **Deviation(s) or Deficiency(ies), and Resolution:** • No deviations or deficiencies were identified.	
The licensee reported deviations for Beaver Valley Units 1 and 2. If deviations were identified, there is a discussion of how the deficiencies were or will be addressed in the ESEP submittal report.	Yes Yes
The NRC staff concludes that: • the licensee described the performed walkdown approach, including any credited previous efforts (e.g., IndividualPlant Examination 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).	Yes
• presented the results of the screened-out ESEL items in the ESEP report	Yes
• described the development of in-structure response spectra (ISRS) based on scaling	N/A (see Note 1)
• described the development of ISRS based on new analysis consistent with the guidance	Yes
• described the method for estimating HCLPF capacity of screened-in ESEL items, including both structural and functional failure modes consistent with the guidance:	Yes
o use of Conservative Deterministic Failure Margin (CDFM)	Yes
o use of fragility analysis (FA)	Yes
o use of experience data or generic information	N/A
• credited IPEEE spectral shape for HCLPF capacity estimates is similar to or envelopes the RLGM, and anchored at the same control point	Yes
• presented the results of HCLPF capacities including associated failure modes for screened-in ESEL items	Yes
• reviewed the ESEL items with the lowest HCLPF values to ensure that their capacities are equal or greater than the RLGM	Yes

Notes from the Reviewer:

1. The licensee did not use a scaled ISRS. The licensee calculated a new ISRS based on a new GMRS for its upcoming seismic risk evaluation. The ISRS is judged by the staff to be acceptable for this interim evaluation only based on the staff's review of ESEP submittal and because the new GMRS is similar to and bounds the SHSR GMRS.
2. The staff requested clarification regarding the HCLPF calculation for components mounted in or on "parent" components. The licensee's response (ML15181A085) provided expanded description with examples, of the process used to obtain HCLPF values for components mounted in or on "parent" components (rule-of-the-box). This expanded description adequately addressed the staff's concern and met the intent of the guidance for this interim evaluation.
3. The staff requested clarification regarding how variability was taken into consideration in SSI analyses. The licensee's response (ML15181A085) described the method used to estimate variability for the SSI analyses. The licensee used a peak shifting approach that incorporated variability of +/- 20% in the analyses which is consistent with EPRI 6041. This adequately addressed the staff's concern and met the intent of the guidance for this interim evaluation.

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

- No deviations or deficiencies were identified.

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 • provided a schedule of the planned walkdown and evaluation for all inaccessible items • provided Regulatory Commitment to complete walkdowns	Yes No N/A
Beaver Valley will provide results or complete walkdown by: __N/A_____	N/A
Notes from the Reviewer: 1. The staff requested clarification regarding the assessment of inaccessible items. The licensee's response (ML15181A085) stated that the one or more methods were used to assess the inaccessible items. The methods include similarity to other components; mounting configuration from drawings; and identification of plant modifications or seismic evaluations. Those methods are based on previous walk down for more than 700 components per Unit and other IPEEE supporting documents, and the assessment process is consistent with the recommendation of EPRI 6041. This explanation adequately addressed the staff's concern and met the intent of the guidance for this interim evaluation. **Deviation(s) or Deficiency(ies), and Resolution:** • No deviations or deficiencies were identified.	
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 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.	N/A N/A N/A N/A

Beaver Valley Units 1 and 2 will: • complete modifications by _____N/A_____ • report completion of modifications by ___N/A_____	N/A
Notes from the Reviewer: No modifications were identified. **Deviation(s) or Deficiency(ies), and Resolution:** • No deviations or deficiencies were identified.	
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). In the case of Beaver Valley, the RLGM was a new site GMRS that was developed as part of the upcoming seismic risk evaluation. The licensee did not identify any necessary modification of equipment from this evaluation. The application of this staff review is limited to the ESEP interim evaluation as part of NTTF R2.1: Seismic activities.

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 Beaver Valley, Units 1 and 2.

Princple Contributors: Ray Gallucci, Kevin Roche, On Yee, Pravin Patel, Robert Pettis, Vladimir Graizer, Weijun Wang, Thomas Houston (NRC Consultant)