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Nuclear LLC

10 CFR 50.54(f)

LR-N15-0100

MAY 07 2015

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Hope Creek Generating Station
Renewed Facility Operating License No. NPF-57
NRC Docket No. 50-354

Subject: Hope Creek Generating Station's Response to Request for Additional Information Regarding Flooding Aspects of Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident

References:

1. NRC letter, "Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," dated March 12, 2012

2. PSEG Letter LR-N14-0041, "PSEG Nuclear LLC's Response to Request for Information Regarding Flooding Aspects of Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident – Hope Creek Generating Station Flood Hazard Reevaluation," dated March 12, 2014

3. NRC Letter, "Hope Creek Generating Station, Request for Additional Information Regarding Flooding Hazard Reevaluation (TAC No. MF3924)," dated July 2, 2014

4. PSEG Letter LR-N14-0170, "PSEG Nuclear LLC's 30-day Response to Request for Additional Information Regarding Flooding Aspects of Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," dated July 28, 2014

5. PSEG Letter LR-N14-0207, "PSEG Nuclear LLC's 90-day Response to Request for Additional Information Regarding Flooding Aspects of Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," dated September 23, 2014

6. NRC e-mail to PSEG, "Salem and Hope Creek Request for Additional Information RE: flood hazard reevaluation report submitted in response to NRC 50.54(f) letter," dated April 13, 2015

On March 12, 2012, the Nuclear Regulatory Commission (NRC) sent PSEG Nuclear LLC (PSEG) a request for information (Reference 1) pursuant to 10 CFR 50.54(f), associated with Near-Term Task Force (NTTF) Recommendation 2.1 for flooding. PSEG responded by providing a flooding hazard reevaluation report (FHRR) for the Hope Creek Generating Station (HCGS) (Reference 2). Reference 3 transmitted an NRC Request for Additional Information (RAI) regarding the FHRR, to which PSEG responded in References 4 and 5. In Reference 6, the NRC requested additional information to support its review of the HCGS flooding hazard reevaluation. Attachment 1 provides the additional information requested by Reference 6 for HCGS.

There are no regulatory commitments contained in this letter.

If you have any questions or require additional information, please do not hesitate to contact Mr. Brian Thomas at 856-339-2022.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 5/7/15
(Date)

Sincerely,

Paul J. Davison

Paul J. Davison
Site Vice President
Hope Creek Generating Station

Attachment:

1. Hope Creek Generating Station Response to Request for Additional Information (RAI) Regarding Flooding Hazard Reevaluation

cc:

Mr. William Dean, Director of Office of Nuclear Reactor Regulation
Mr. Daniel Dorman, Administrator, Region I, NRC
Ms. Carleen Sanders-Parker, Project Manager, NRC
NRC Senior Resident Inspector, Hope Creek
Mr. Patrick Mulligan, Manager IV, NJBNE
Mr. Thomas MacEwen, Hope Creek Commitment Tracking Coordinator
Mr. Lee Marabella, PSEG Commitment Coordinator – Corporate

LR-N15-0100

Attachment 1

Hope Creek Generating Station
Response to Request for Additional Information (RAI) Regarding Flooding Hazard Reevaluation

LR-N15-0100
Attachment 1

Hope Creek Generating Station
Response to Request for Additional Information (RAI) Regarding Flooding Hazard Reevaluation

RAI 1: Local Intense Precipitation (LIP) - Event Duration and Distribution

The flood hazard reevaluation report (FHRR) presents a local intense precipitation (LIP) flood reevaluation for a 1-hour, front-loaded probable maximum precipitation (PMP) event using Hydrometeorological Report (HMR) Nos. 51 and 52. Provide justification that the LIP analysis presented in the FHRR is bounding in terms of warning time, flood depth, and flood duration. This justification can include sensitivity analysis of LIP event duration to consider localized (one square mile) PMP events up to 72 hours in duration (e.g., 1-, 6-, 12-, 24-, 48-, 72-hour PMPs) and various rainfall distributions (e.g., center-loaded and others in addition to a front-loaded distribution). The evaluations could identify potentially bounding scenarios with respect to flood height, event duration, and associated effects.

Response to RAI 1: Local Intense Precipitation (LIP) – Event Duration and Distribution

From NUREG/CR-7046 Section 3.2 (Reference 1):

> "Local intense precipitation is a measure of the extreme precipitation at a given location. The duration of the event and the support area are needed to qualify an extreme precipitation event fully. ***Generally, the amount of extreme precipitation decreases with increasing duration and increasing area.*** The PMP values for areas of the United States east of the 105th meridian are presented in HMRs 51 (Schreiner and Riedel 1978) and 52 (Hansen et al. 1982). The 1-hr, 2.56-km^2 (1-mi^2) PMP was derived using single-station observations of extreme precipitation, coupled with theoretical methods for moisture maximization, transposition, and envelopment. ***HMR 52 recommended that no increase in PMP values for areas smaller than 2.56 km^2 (1 mi^2) should be considered over the 1-hr, 2.56-km^2 (1-mi^2) PMP. The local intense precipitation is, therefore, deemed equivalent to the 1-hr, 2.56-km^2 (1-mi^2) PMP at the location of the site.***"

Since the 1-hr, 1-mi^2 LIP event bounds the Hope Creek Generating Station (HCGS) drainage area, the evaluation of a longer duration and larger storm event was not warranted. This approach is consistent with the definition of a LIP event per NUREG/CR-7046 (Reference 1) as described above. The rainfall data for the LIP event was developed using HMR-52 (Reference 2).

The 1-hr PMP event temporal distribution was developed in accordance with HMR-52 and NUREG/CR-7046. In accordance with HMR-52 and NUREG/CR-7046, the sub-1-hr PMP depths were obtained by applying multiplication factors from HMR-52, Figures 36, 37, and 38. The PMP rainfall distribution and hyetograph were developed in accordance NUREG/CR-7046 Appendix B. The front-loaded PMP event was selected

for HCGS because it results in maximum flood depths early in the event and consequently the shortest response time. HCGS is equipped with flood protection features, including watertight doors, which are rated to significantly greater elevations than any possible LIP flood depth. The only response to the LIP event is closing the existing watertight doors. Therefore, the most conservative LIP event for HCGS is one that has the shortest response time for watertight door closure. The duration of the flooding is non-consequential once the watertight doors are closed. In addition, procedural changes have been made to close the doors well in advance of a LIP event so that the warning time significantly bounds the response time for door closure.

RAI 2: Streams and Rivers - PMF

The flood hazard reevaluation report (FHRR) presents a streams and rivers probable maximum flood (PMF) reevaluation for two probable maximum precipitation (PMP) events based on HMR Nos. 51 and 52. Present-day regulatory guidance recommends consideration of snowmelt as a contributor to flooding in evaluating the PMF from precipitation. However, the FHRR does not describe whether snowpack and snowmelt were considered. Provide a description of snowpack and snowmelt characteristics that were considered in the streams and rivers flood reevaluation. Justify why evaluating snowmelt as a contributor to the PMF is not necessary, or provide an evaluation of snowmelt contribution to flooding as described in present-day regulatory guidance.

Response to RAI 2: Streams and Rivers – PMF

NUREG/CR-7046 Section 3.3 (Reference 1) states that "The PMF is defined by ANSI/ANS-2.8-1992 (ANS 1992) as '…the hypothetical flood (peak discharge, volume, and hydrograph shape) that is considered to be the most severe reasonably possible, based on comprehensive hydrometeorological application of PMP and other hydrologic factors favorable for maximum flood runoff such as sequential storms and snowmelt.'"

HCGS is located near the confluence of the Delaware Bay and Delaware River. The potential for site flooding exists from a combined event scenario with storm surge and astronomic tide being the main contributors to flooding. NUREG/CR-7046 and ANS-2.8 (Reference 3) detail the methodology for performing a combined event analysis using a series of alternatives. Specifically, Section 9.2.2.2 of ANS-2.8 describes the four alternatives that include PMF events, Alternatives I, II, III, and IV. These alternatives are appropriate for streamside locations on an open and semi-closed body of water. None of these alternatives include the consideration of snowpack or snowmelt, which is more appropriately considered for sites located on inland streams (Sections 9.2.1 and 9.2.1.1 of ANS-2.8).

PMP events augmented by snowpack or snowmelt would potentially occur in winter or early spring. Major storm surge events in the Delaware Bay would be associated with tropical or post-tropical systems, which could occur in the summer and fall months. Therefore, the effects of snowpack and snowmelt should not be combined with a storm surge event. PMP-based flooding in the upper Delaware River Basin alone does not have a significant effect on the water levels at the site (see Reference 5, Section 2.2).

In addition, Section 3/4.7.3 of the HCGS Technical Requirements Manual (TRM) (Reference 4) specifies the flood levels at which (1) watertight integrity will be established (at which time flood protection procedures will be initiated on a site-wide basis to protect the plant from flood waters) and (2) plant shutdown will be initiated. Closure of the protective doors is required by the TRM when the river water level exceeds Elevation 96 feet PSE&G Datum (PSD), which is well below the nominal site grade of 101.5 feet PSD.

RAI 3: Comparison of Reevaluated Flood Hazard with Current Design Basis

The FHRR for Hope Creek Generating Station Unit No. 1 provides a comparison of the reevaluated flood hazards with the current licensing basis (CLB). For the purposes of the FHRR, the parameter of interest is the current design basis (CDB). Provide clarification for the inconsistencies identified in the FHRR with regard to the comparison of the reevaluated flood hazard to the current design basis and submit a revised hazard comparison consistent with the instructions provided in the 50.54(f) letter.

Response to RAI 3: Comparison of Reevaluated Flood Hazard with Current Design Basis

The HCGS FHRR (Reference 5) uses the terminology "current design basis" and "current licensing basis" interchangeably. The FHRR is in all cases comparing the reevaluated flood hazards with the current design basis as documented in the Hope Creek Generating Station UFSAR (Reference 6).

References

1. NUREG/CR-7046, Design-Basis Flood Estimation for Site Characterization at Nuclear Power Plants in the United States of America, November 2011

2. NOAA Hydrometerological Report No. 52 (HMR-52), Application of Probable Maximum Precipitation Estimates – United States East of the 105th Meridian, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, and U.S. Department of the Army Corps of Engineers

3. ANSI/ANS-2.8-1992, Determining Design Basis Flooding at Power Reactor Sites

4. Hope Creek Technical Requirements Manual, TRM 3/4.7.3, Flood Protection, Revision 10

5. LR-N14-0041, "PSEG Nuclear LLC's Response to Request for Information Regarding Flooding Aspects of Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident – Hope Creek Generating Station Flood Hazard Reevaluation", dated March 12, 2014

6. PSEG Nuclear LLC, "Hope Creek Generating Station Updated Final Safety Analysis Report", Revision 19, 2012