



Kelvin Henderson  
Vice President  
Catawba Nuclear Station

Duke Energy  
CN01VP | 4800 Concord Road  
York, SC 29745  
o: 803.701.4251  
f: 803.701.3221

10 CFR 50.4  
10 CFR 50.54(f)

CNS-16-043

June 23, 2016

Attention: Document Control Desk  
U. S. Nuclear Regulatory Commission  
Washington, D. C. 20555-001

Duke Energy Carolinas, LLC (Duke Energy)  
Catawba Nuclear Station (CNS), Units 1 and 2  
Docket Numbers 50-413 and 50-414  
Renewed License Nos. NPF-35 and NPF-52

**Subject:** Additional Information Regarding Flood Hazard Reevaluation Report, Response to 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

**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 (ADAMS Accession No. ML12053A340)
2. NRC Letter, Prioritization of Response Due Dates for Request For Information Pursuant to Title 10 of the *Code of Federal Regulations* 50.54(f) Regarding Flooding Hazard Reevaluations for Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, dated May 11, 2012 (ADAMS Accession No. ML12097A509)
3. Duke Energy Letter, Flood Hazard Reevaluation Report, Response to NRC 10 CFR 50.54(f) Request for Additional 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, 2014 (ADAMS Accession No. ML14077A054)
4. NRC Letter, Revised Interim Staff Response to Reevaluated Flood Hazards Submitted in Response to 10 CFR 50.54(f) Information Request - Flood-Causing Mechanism Reevaluation, dated December 21, 2015 (ADAMS Accession No. ML15352A192)

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5. NUREG/CR-7046 (PNNL-20091), Design-Basis Flood Estimation for Site Characterization at Nuclear Power Plants in the United States of America, Date Published: November 2011 (ADAMS Accession No. ML11321A195)
6. Nuclear Energy Institute (NEI), "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," NEI 12-06, Revision 2, December 2015 (ADAMS Accession No. ML15348A015)
7. NRC Order EA-12-049, "Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events", dated March 12, 2012 (ADAMS Accession No. ML12054A735)

Ladies and Gentlemen:

On March 12, 2012, the NRC issued Reference 1 to all power reactor licensees and holders of construction permits in active or deferred status. Enclosure 2 of Reference 1 requested that each licensee perform a reevaluation of external flooding sources and report the results in accordance with the NRC's prioritization plan (Reference 2). The Flooding Hazard Reevaluation Report (FHRR) for Catawba was provided by Reference 3. The FHRR shows that some flood levels exceed the Current Design Basis (CDB) levels for Catawba. The increased levels are the result of newer methodologies and guidance which are applicable to new reactor reviews and typically exceed the methodologies and guidance used to establish the CDB for existing plants.

By letter dated December 21, 2015 (Reference 4), the NRC provided a revised summary of the interim staff response to the reevaluated flood-causing mechanisms described in the FHRR for Catawba, as well as supplemental information resulting from requests for additional information and audits. The staff summary of the results from the review were provided in tables as an enclosure to the letter. Table 1 provides the CDB flood hazard mechanisms flood levels. The reevaluated flood hazard mechanisms that exceed CDB results are provided in Table 2. The NRC concluded that the reevaluated flood hazards information is suitable for assessments associated with Near-Term Task Force (NTTF) Recommendation 2.1 "Flooding" for Catawba, as well as the Mitigating Strategies Assessment (MSA) of the impact of the reevaluated flood hazard information on the mitigating strategies developed in response to NRC Order EA-12-049 (Reference 7).

NUREG/CR-7046 (Reference 5) defines a deterministic process for the evaluation of flooding impacts at a nuclear site as the Hierarchical Hazard Assessment (HHA) approach. This approach allows for a progressively refined stepwise estimation of site-specific flood hazards. The HHA process allows licensees the option to refine simplified flooding evaluations, based on varying degrees of conservatism, to assess susceptibility to flooding.

An additional flood-hazard assessment of the combined effects flood-causing mechanism is warranted based on the initial estimated impacts of the simplified conservative analysis. Although the FHRR has been submitted in response to the March 12, 2012, NRC request for information pursuant to the 10 CFR 50.54(f) letter, Duke Energy intends to perform a more representative evaluation of the combined effects flooding mechanism, consistent with the HHA process.

The evaluation of this flooding mechanism is being refined using updated and site specific parameters to achieve a more accurate physics-based, but conservative, analysis of flooding. Applied Weather Associates (AWA) was employed to reevaluate the Site Specific Probable Maximum Precipitation (SSPMP). Data used to determine rainfall values reported in Hydro-meteorological Report (HMR) 51 and 52 is more than 40 years old. The site specific study includes the analyses of storms, considering the unique characteristics of the watershed/site, and updates the storm database that were not included in these HMRs. The initial stage of the HHA process refined the generalized Probable Maximum Precipitation (PMP) found in HMR 51 with a site-specific study directly applicable to the Catawba-Wateree watershed. The SSPMP was used to develop and evaluate the Site Specific Probable Maximum Flood (SSPMF) for the Catawba-Wateree River Basin identified with the Cowans Ford and Wylie Dams. This PMP reanalysis has been completed and provides an updated PMP Catawba-Wateree River Basin specific analysis.

A second refinement involves using a more appropriate method to model precipitation losses to compute runoff in conjunction with Combined Effects, Appendix H, Section H.1 of NUREG 7046. The precipitation losses used in computing the runoff in the Catawba FHRR are based on a common industry, empirical runoff infiltration method (Curve Number) developed by the Soil Conservation Service (SCS) for single precipitation events. The results reported in the 2014 FHRR allows for initial abstraction during the antecedent event but, as applied, did not allow abstraction during the second PMF event. This limitation leads to overly conservative results at Catawba. The SSPMF Constant Loss Rate (CLR) method allows for initial abstractions during back-to-back events leading to conservative but realistic and more accurate results at Catawba. The second refinement will involve re-evaluating the infiltration losses on the Catawba-Wateree River Basin by applying the CLR method in lieu of the SCS method in the existing hydrologic model. This second refinement effort is currently underway. Based upon preliminary results from this refinement, it is expected that Section H.2 of NUREG 7046 Floods Caused by Seismic Dam Failures will now be the controlling Combined Effects scenario. Re-evaluation of this controlling scenario is also underway.

Nuclear Energy Institute (NEI) guidance document NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide", Revision 2 (Reference 6), Appendix G, includes a methodology to perform a MSA with respect to the reevaluated flood hazards. The methodology provided by Appendix G will be employed to assess the impact of the flooding hazard reevaluations with respect to the guidance and strategies required by Order EA-12-049 (Reference 7). For the combined effects flooding mechanism, the updated combined effects flooding analysis will be included in the MSA submittal.

Duke Energy anticipates completing and submitting the MSA for Catawba by the end of the first quarter of 2017. The summary results of the SSPMF CLR method for the combined effects flooding mechanism will be included with the MSA submittal.

There are no regulatory commitments associated with this letter. Please address any comments or questions regarding this matter to Sherry Andrews at 803-701-3424.

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I declare under penalty of perjury that the foregoing is true and correct. Executed on June 23, 2016.

Sincerely,

A handwritten signature in black ink, appearing to read 'K. Henderson', with a long horizontal flourish extending to the right.

Kelvin Henderson,  
Vice President, Catawba Nuclear Station

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xc:

C. Haney, Regional Administrator  
U.S. Nuclear Regulatory Commission, Region II  
Marquis One Tower  
245 Peachtree Center Avenue NE, Suite 1200  
Atlanta, GA 30303-1257

W. M. Dean, Director, Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
One White Flint North, Mailstop 13 HI6M  
11555 Rockville Pike  
Rockville, MD 20852-2738

Michael D. Orenak, Project Manager  
U.S. Nuclear Regulatory Commission  
One White Flint North, Mailstop O-8G9A  
11555 Rockville Pike  
Rockville, MD 20852-2738

P.J. Bamford, Senior Project Manager  
U.S. Nuclear Regulatory Commission  
One White Flint North, Mailstop 13 F15  
11555 Rockville Pike  
Rockville, MD 20852-2738

G.A. Hutto, III  
NRC Senior Resident  
Catawba Nuclear Station

Justin Folkwein  
American Nuclear Insurers  
95 Glastonbury Blvd., Suite 300  
Glastonbury, CT 06033-4453