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June 14, 2012

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

Subject: Duke Energy Carolinas, LLC (Duke Energy)
Oconee Nuclear Station (ONS), Units 1, 2, and 3
Renewed Facility Operating License Numbers DPR-38, DPR-47, and DPR-55;
Docket Numbers 50-269, 50-270, and 50-287;
Response to Requests for Additional Information Regarding Modifications to Address External Flooding Concerns

References:

1. Duke Energy letter from T. Preston Gillespie to Luis Reyes (Nuclear Regulatory Commission), Oconee Response to Confirmatory Action Letter (CAL) 2-10-003, dated November 29, 2010
2. Duke Energy letter from T. Preston Gillespie to Victor McCree (Nuclear Regulatory Commission), Oconee Response to Confirmatory Action Letter (CAL) 2-10-003, dated April 29, 2011
3. Nuclear Regulatory Commission (NRC) letter from John Grobe to Preston Gillespie (Duke Energy), Oconee Nuclear Station, Units 1, 2, and 3, Assessment of Duke Energy Carolinas, LLC's, April 29, 2011, Response to Confirmatory Action Letter Regarding Modifications to Address External Flooding Concerns (TAC Nos. ME6133, ME6134, and ME6135), dated August 18, 2011
4. Duke Energy letter from T. Preston Gillespie to Victor McCree (Nuclear Regulatory Commission), Response to Requests for Additional Information Regarding Necessary Modifications to Enhance the Capability of the ONS Site to Withstand the Postulated Failure of the Jocassee Dam, dated October 17, 2011
5. Safety Evaluation by the Office of Nuclear Reactor Regulation Related to Duke Energy Carolinas, LLC, Confirmatory Action Letter – Commitments to Address External Flooding Concerns, Closure of Inundation Site Results, Oconee Nuclear Station Units 1, 2, and 3 (ONS), dated January 28, 2011

A001
NRR

6. Nuclear Regulatory Commission (NRC) letter from Luis Reyes to Dave Baxter (Duke Energy), Confirmatory Action Letter – Oconee Nuclear Station, Units 1, 2, and 3 Commitments to address external Flooding Concerns, dated June 22, 2010

By letter dated November 29, 2010 (Ref. 1), Duke Energy committed to provide the NRC with a list of necessary modifications to enhance the capability of the ONS site to withstand the postulated failure of the Jocassee Dam. This list of necessary modifications was provided to the NRC in a letter dated April 29, 2011 (Ref. 2). The NRC transmitted a Request for Additional Information (RAI) letter to Duke Energy on August 18, 2011 (Ref. 3), concerning information provided in the April 29, 2011 letter. Duke Energy provided the requested information by letter on October 17, 2011 (Ref 4). The NRC has transmitted a second Request for Additional Information in a letter dated May 15, 2012. Attachments 1 and 2 to this letter provide Duke Energy's responses to the two NRC RAIs contained in the May 15, 2012 letter.

On March 12, 2012, the NRC issued a Request for Information 10 CFR 50.54(f) Regarding Recommendations 2.1, 2.4 and 9.3 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident. The 10 CFR 50.54(f) for "Recommendation 2.1: Flooding", requires a reevaluation of flooding hazards to address all potential flood causing mechanisms pertinent to the site using NUREG CR/7046. NUREG CR/7046 was issued in November 2011 after the current January 28, 2011 Safety Evaluation (Ref 5) which provided bounding parameters and analysis for the inundation of the ONS site resulting from a postulated failure of the Jocassee Dam. The flooding reevaluation required by the 10 CFR 50.54(f) using NUREG CR/7046 may not be consistent with the January 28, 2011, Safety Evaluation due to updated assumptions and a required integrated assessment that includes all potential flooding hazards. Duke Energy has the following questions to enable the Oconee Nuclear Site to complete the proposed list of modifications to mitigate external flooding that was provided to the NRC in a letter dated April 29, 2011 (Ref. 2):

1. Will the January 28, 2011, Safety Evaluation (Ref 5) satisfy the requirements of the 10 CFR 50.54(f) "Recommendation 2.1: Flooding", as the Hazard Reevaluation Report for the site with no further flooding evaluations required?

2. If the January 28, 2011, Safety Evaluation (Ref 5) does not satisfy "Recommendation 2.1: Flooding" as the Hazard Reevaluation Report for the site, will the June 22, 2010, Confirmatory Action Letter (Ref 6) be closed by the NRC to the March 12, 2012, NRC Request for Information 10 CFR 50.54(f) Regarding Recommendation 2.1?

An answer to these questions will enable Duke Energy to determine the appropriate flooding hazard as directed by the NRC and to subsequently design, implement the modifications, and process changes to mitigate the hazard consistent with the required industry response. The NRC has designated Oconee Nuclear Station as a Category 1 Site for the Fukushima 10 CFR 50.54(f) with the flooding Hazard Reevaluation Report due on March 12. 2013, and an Integrated Assessment Report due on March 12, 2015.

This letter contains no regulatory commitments. If there are any questions regarding this submittal, please contact Kent Alter, the ONS Regulatory Compliance Group Manager, at (864) 873-3255.

I declare under penalty of perjury that the foregoing is true and correct. Executed on June 14, 2012.

Sincerely,

TP Gillespie

T. Preston Gillespie, Jr.
Vice President
Oconee Nuclear Station

Attachments:

Attachment 1: Response to May 15, 2012, Requests for Additional Information Regarding ONS External Flooding
Attachment 2: Codes and Standards for Oconee Nuclear Station External Flood Mitigation Solutions

cc w/attachments:

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ATTACHMENT 1

RESPONSE TO MAY 15, 2012, REQUESTS FOR ADDITIONAL INFORMATION REGARDING ONS EXTERNAL FLOODING

Response to May 15, 2012 Requests for Additional Information
Regarding ONS External Flooding

Duke Energy's responses to NRC RAIs documented in the May 15, 2012, letter regarding ONS external flooding are provided in this enclosure. Please note that the 'number' assigned to each RAI corresponds to the numbered sequence of items from the NRC May 15th letter.

NRC RAI 1:
Your letter stated that the mitigative features that Duke plans to implement at the ONS site will be designed, procured, constructed and operated in accordance with the applicable regulatory and industry standards, as appropriate. Provide further information identifying the specific codes and standards that will be used in the design of the new flood walls.

Duke Energy Response:

The codes and standards that will be used in the design of the external flood mitigation structures will be based on FERC accepted codes and standards as shown in Attachment 2. A range of codes and standards are being included to support a final design to mitigate external flooding that can be accomplished with a combination of on-site or off-site modifications which may supplement or alter the design of the flood walls.

NRC RAI 2:
Provide the seismic criteria for the flood walls contained in these codes and standards. If there are no seismic criteria, provide an estimate of the peak ground acceleration that the flood walls could withstand and remain functional.

Duke Energy Response:

The January 28, 2011, Safety Evaluation issued by the Office of Nuclear Reactor Regulation – Commitments to Address External Flooding Concerns, Closure of Inundation Site Results (Cover letter Ref 5), concluded that a potential failure of the Jocassee Dam from a seismic event was not credible. Therefore, seismic standards to be applied in the design and construction of external flood mitigation structures, depending on the structures selected, will be based on the seismic criteria as required by the FERC accepted standard followed (Reference Standards presented in Attachment 2). In all cases where the structure, or the support for the structure (e.g. embankment), is within the jurisdiction of the FERC boundaries, the seismic criteria within the FERC Keowee Supporting Technical Information Document, Rev 1, 1/31/2012 will be followed as it applies. Therefore, the seismic criteria currently committed to for FERC related structures will be consistently maintained. Examples of the seismic criteria for FERC accepted standards are shown below:

1. MSE (Mechanically Stabilized Earth) Wall (e.g.: flood walls, dams, seawalls, retaining walls)
   FHWA NHI-00-043, "Mechanically Stabilized Earth Walls and Reinforced Soil Slopes Design and Construction Guidelines", March 2001
   Seismic Criteria: The peak horizontal ground acceleration criteria is determined by physical location per Section 3 of 'AASHTO Division 1-A, Seismic Design' as referenced in this document in Section 2.7 'Establishment of Project Criteria', Subsection 'c'. The development of the applied seismic loading on the wall (using this peak ground acceleration) for both external and internal stability evaluations are detailed within Section 4.2, subsection 'h' and Section 4.3, subsection 'd', respectively, in Chapter 4 entitled "Design of MSE Walls". Acceptable designs are determined using 'Factors of Safety' comparisons for these evaluations.

2. Cast-in-Place Concrete T-Wall (e.g.: floodwall, seawalls)
   EM 1110-2-2502, "Retaining and Flood Walls", 29 September 1989
   Seismic Criteria: The seismic demand criteria minimums (using Acceleration Coefficients) are determined in Chapter 3, Section IV, subchapter 3-26, subsection 'f – Selection of Acceleration Coefficients ' which references document ER 1110-2-1806, 'Earthquake Design and Evaluation for Civil Works Projects'. The development of the applied seismic loadings (using these Acceleration Coefficients) is detailed within Chapter 3, Section IV subchapter 3-26 Earthquake Forces. Acceptable designs are determined using 'Factors of Safety' comparisons for these evaluations.

3. Sheet Pile Wall (e.g.: retain soil, permeability barrier/flownet inhibitor)
   EM 1110-2-2504, "Design of Sheet Pile Walls", 31 March 1994
   Seismic Criteria: The determination of the applied seismic loadings, or earth pressures, is found in Chapter 4, Section 4-6, Subsection E 'Earthquake Forces', which references back to procedures outlined in EM 1110-2-2502 (listed above). The site seismic demand criteria (or accelerations) used to develop these loads would inherently be included in this cross-reference as well. The referral of seismic demand criteria and load determination to EM 1110-2-2502 demonstrates consistent seismic criteria requirements. The specific processes and conformance for sheet pile wall seismic evaluations are specified in Chapter 1, Section 1-4, where the U. S. Army Corps of Engineers document entitled "A Manual for Seismic Design of Waterfront Retaining Structures" is referenced as the guiding document.

4. Flood Wall Gates (e.g. floodwall access gates)
   EM 1110-2-2705, "Structural Design of Closure Structures for Local Flood Protection Projects", 31 March 1994
   Seismic Criteria: The determination of applied seismic loading is presented in Chapter 4, Section 4-2 of this document which references back to EM 1110-2-2502 (listed above) for load criteria development. The site seismic demand criteria (or accelerations) used to develop these loads would inherently be included in this cross-reference as well. The referral of seismic demand criteria and load determination to EM 1110-2-2502 demonstrates

consistent seismic criteria requirements. The acceptable stress criteria are presented in Chapter 4, Section 4-1 – Stress Criteria.

5. Structural Design
EM 1110-2-2100, "Stability Analysis of Concrete Structures," 1 December 2005
Seismic Criteria: The determination of applied seismic loading is presented in Chapter 4, Section 4-7 "Earthquake Loading Conditions." It is clearly indicated that the design loads shall comply with the requirements of ER 1110-2-1806 (note this is the same Engineering Manual referenced above in EM 1110-2-2502 as the source document for the determination of seismic loadings). This section also discusses the methods presented in source document ER 1110-2-1806 and the development of ground acceleration values used to determine applied seismic loads. The referral of seismic demand criteria and load determination to ER 1110-2-1806 demonstrates consistent seismic criteria requirements. Section 4-9 "Mandatory Requirements", also references ER 1110-02-1806 as the seismic requirement for concrete structures.

As demonstrated above, there is a close link and cross reference between many of these documents. This is seen in the US Army Corps of Engineers Engineering Manuals where the development of the seismic accelerations and the associated applied loads essentially point to the same source document. This demonstrates a deterministic approach to assure a consistent set of seismic criteria regardless of the structural details of the specific structural component.

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ATTACHMENT 2

CODES AND STANDARDS FOR OCONEE NUCLEAR STATION EXTERNAL FLOOD MITIGATION SOLUTIONS

Codes and Standards for Oconee Nuclear Station External Flood Mitigation Solutions

Purpose:

This document establishes the codes and standards to be used for the design, construction, and maintenance of the proposed Flood Protection Structures for the Oconee Nuclear Site.

Scope:

The codes and standards listed here are intended to represent the list of documents for the scope of the proposed External Flood Protection Barriers. The standards include both those applicable for wall selections, as well as standards that may not directly apply to wall selections, but would be used if alternate materials or solutions were utilized. Both groups of standards are listed here for completeness.

Background:

The Oconee Nuclear Station is enhancing its protection against an external flood. Updated flood analyses have been completed to assess the possible flood risks for the Oconee site. One proposed risk mitigation solution is a continuous wall along the eastern and southern portions of the nuclear site protecting the station both during the initial and subsequent flooding from a postulated failure of Jocassee dam.

Basis:

Duke Energy will use FERC accepted standards (e.g. USACE and USBR). These codes and standards are nationally recognized standards associated with federal agencies for flood mitigation structures. The standards and guidelines of these agencies provide a sound basis for enhanced flood protection of the Oconee Nuclear Site. These would be the same standards used for the majority of the large water impoundment and flood protection structures around the country. The application of these standards would provide a consistent set of criteria for the design and implementation of flood protection structures for Oconee as used elsewhere in the nation.

In all cases where the structure, or the support for the structure (e.g. embankment), is within the jurisdiction of the FERC boundaries, the codes and standards committed to in the FERC Keowee Supporting Technical Information Document, Rev 1, 1/31/2012 will be followed as it applies. Therefore, the design criteria currently committed to for Duke Energy FERC related structures will be consistently maintained.

These standards are recognized and proven to be suitable for their intended purpose and role. The extensive use of both impoundment and protective structures built to these standards coupled with their proven functionality and durability supports the basis for application for the Oconee site. Control and management of US waterways and floods solutions has been the mission of the U S Army Corps of Engineers since 1824. The Federal Energy Regulatory Commission has been setting standards since 1930. The Bureau of Reclamation has been setting standards since 1902. All three agencies have had a role in the design, construction and maintenance of the water impoundment structures and flood protection structures within the US. The guidelines from these agencies incorporate lessons learned, technological bases, ongoing research developments, and risk and consequence considerations.

Proposed Standards:

The following FERC accepted codes and standards are representative references and documents for the scope of work under consideration at Oconee. The listing includes some codes and standards beyond the currently intended scope to demonstrate the breadth of applicable documents in determining the final solution. Duke Energy will use FERC accepted standards (e.g. USACE and USBR) to design and construct the primary flood mitigation structures:

1. MSE (Mechanically Stabilized Earth) Wall (e.g.: flood walls, dams, seawalls, retaining walls)
    a. Design
        i. FHWA NHI-00-043, "Mechanically Stabilized Earth Walls and Reinforced Soil Slopes Design and Construction Guidelines", March 2001
        ii. FHWA Geotechnical Engineering Circular No. 11, "Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes", 2010
        iii. FERC, Engineering Guidelines for the Evaluation of Hydropower Projects, Chapter 10, 'Other Dams', October 1997.
    b. Construction
        i. SCDOT 2007 Standard Specifications for Highway Construction, Section 713, "Mechanically Stabilized Earth (MSE) Walls"
2. Cast-in-Place Concrete T-Wall (e.g.: floodwall, seawalls)
    a. Design
        i. EM 1110-2-2502, "Retaining and Flood Walls", 29 September 1989
        ii. FERC, Engineering Guidelines for the Evaluation of Hydropower Projects, Chapter II, 'Gravity Dams', October 2002
    b. Construction
        i. UFGS 03 11 13.00 10, "Structural Cast-in-Place Forming", August 2010
        ii. UFGS 03 15 00.00 10, "Concrete Accessories", August 2010
        iii. UFGS 03 20 00.00 10, "Concrete Reinforcing", August 2010
        iv. UFGS 03 30 00.00 10, "Cast-in-Place Concrete", November 2010

3. Jet Grout (e.g.: ground stabilization, in-situ soil/cement mixing)
    a. Design
        i. ETL 1110-2-565, "Foundation Engineering: In-the-Wet Design and Construction of Civil Works", 30 September 2006
    b. Construction
        i. Geo-Institute of ASCE, Grouting Committee, Jet Grouting Task Force, "Jet Grouting Guideline", June 2009
4. Sheet Pile Wall (e.g.: retain soil, permeability barrier/flownet inhibitor)
    a. Design
        i. EM 1110-2-2504, "Design of Sheet Pile Walls", 31 March 1994
        ii. EM 1110-2-2503, Design of Sheet Pile Cellular Structures Cofferdams & Retaining Structures, September 1989
        iii. FERC, Engineering Guidelines for the Evaluation of Hydropower Projects, Chapter 10, 'Other Dams', October 1997
    b. Construction
        i. UFGS 31 41 16, "Metal Sheet Piling", August 2009
5. Roller Compacted Concrete (e.g.: dams, dam hardening, paving)
    a. Design
        i. EM 1110-2-2006, "Roller-Compacted Concrete", 15 January 2000
        ii. EM 1110-2-1601, "Hydraulic Design of Flood Control Channels", 1 July 1991
        iii. PCA Design Manual for Small RCC Dams, 2003
        iv. PCA Design Manual for RCC Spillways and Overtopping Protection, 2002
        v. PCA, "Facing Systems for Roller-Compacted Concrete Dams & Spillways", 2001
        vi. ACI 207.5R, Roller-Compacted Mass Concrete
        vii. FERC, Engineering Guidelines for the Evaluation of Hydropower Projects, Chapter 10, 'Other Dams', October 1997
    b. Construction
        i. UFGS-03 37 23, "Roller-Compacted Concrete for Mass Concrete Construction", November 2009
        ii. PCA, "Roller-Compacted Concrete Quality Control Manual", 2000
6. Grout Curtain (e.g.: seepage barrier , erosion control)
    a. Design
        i. UFC 3-220-06, "Grouting Methods and Equipment", 16 January 2004
    b. Construction
        i. UFGS 31 32 23, "Foundation Drilling and Grouting", August 2008

7. Flood Wall Gates (e.g.: floodwall access gates)
    a. Design
        i. EM 1110-2-2105, "Design of Hydraulic Steel Structures Change 1", 31 May 1994
        ii. EM 1110-2-2705, "Structural Design of Closure Structures for Local Flood Protection Projects", 31 March 1994
    b. Construction
        i. UFGS 35 20 16.59, "Closure Gates", January 2008
8. Concrete Apron (e.g.: hardened approach or transition zone to control erosion)
    a. Design
        i. EM 1110-2-1601, "Hydraulic Design of Flood Control Channels", 30 June 1994
        ii. EM 1110-2-2007, "Structural Design of Concrete Lined Flood Control Channels", 30 April 1995
    b. Construction
        i. UFGS 32 13 15.20, "Concrete Pavement for Containment Dikes", November 2010
9. Slurry Wall (e.g.: seepage barrier, erosion control)
    a. Design
        i. Deep Foundations Institute Publication TM-SLWL-1, "Industry Practice Standards and DFI Practice Guidelines for Structural Slurry Walls", 2005
    b. Construction
        i. Tamaro, G.J. and Poletto, R.J., "Slurry Walls – Construction Quality Control", Slurry Walls: Design, Construction, and Quality Control, ASTM STP 1129, David B. Paul, Richard R. Davidson, and Nicholas J. Cavalli, Eds., American Society for Testing and Materials, Philadelphia, 1992.
        ii. Millet, R.A., Perez, J.Y., and Davidson, R.R., "USA Practice Slurry Wall Specifications 10 Years Later", Slurry Walls: Design, Construction, and Quality Control, ASTM STP 1129, David B. Paul, Richard R. Davidson, and Nicholas J. Cavalli, Eds., American Society for Testing and Materials, Philadelphia, 1992.
10. Rip Rap (e.g.: erosion control using large rocks/boulders)
    a. Design
        i. EM 1110-2-1601, "Hydraulic Design of Flood Control Channels", 30 June 1994
        ii. EM 1110-2-2302, "Construction with Large Stone", 24 October 1990
    b. Construction
        i. UFGS 35 31 19, "Stone, Channel, Shoreline/Coastal Protection for Structures", January 2008

11. Subsurface Investigation (e.g.: core borings for foundation design)
    i. EM 1110-1-1802, "Geophysical Exploration for Engineering and Environmental Investigations", 31 August 1995
    ii. EM 1110-1-1804, "Geotechnical Investigations", 1 January 2001
    iii. EM 1110-2-1906, "Laboratory Soils Testing", 20 August 1986
    iv. UFGS 02 32 00, "Subsurface Drilling, Sampling, and Testing", May 2010
12. Earthwork (e.g.: soil compaction of embankments)
    a. Design
        i. UFC 3-200-10N, "Civil Engineering", Final Draft, July 2006
        ii. USBR, Design Standard No. 13 – Embankment Dams, and 'Design of Small Dams, Third Edition, 1987
        iii. FERC Engineering Guidelines for Evaluation of Hydropower Projects, Chapter IV-Embankment Dams, and Chapter X- Other Dams
    b. Construction
        i. UFGS-31 00 00, "Earthwork", August 2008
13. Drilled Shafts (e.g.: large concrete foundational supports for wall)
    a. Design
        i. EM 1110-2-2906, "Design of Pile Foundations", 15 January 1991
        ii. FHWA/NHI 10-016, "Drilled Shafts: Construction Procedures and LRFD Design Methods", May 2010
    b. Construction
        i. ACI 336.1-01, "Specification for the Construction of Drilled Piers", 2001
14. Micro piles (e.g.: smaller foundational support for wall)
    a. Design
        i. FHWA-SA-97-070, Micropile Design and Construction Guidelines", June 2000
    b. Construction
        i. Deep Foundations Institute Publication No. TM-MP-1, "Guide to Drafting a Specification for Micropiles", 2002
15. Rock Anchors (e.g.: grouted steel rods anchoring a structure)
    a. Design
        i. FHWA Geotechnical Engineering Circular No. 4, "Ground Anchors and Anchored Systems", 1999
        ii. Post Tensioning Institute (PTI), "Recommendations for Prestressed Rock and Soil Anchors", 2004
    b. Construction
        i. FHWA Geotechnical Engineering Circular No. 4, Appendix E, "Specification for Ground Anchors", 1999
        ii. UFGS 31 68 13, "Soil and Rock Anchors", November 2008

16. Geotechnical Analyses
    i. EM 1110-1-1904, "Settlement Analysis", 30 September 1990
    ii. EM 1110-1-1905, "Bearing Capacity of Soils", 30 October 1992
    iii. EM 1110-2-1901, "Seepage Analysis and Control for Dams", 30 April 1993
    iv. EM 1110-2-1902, "Slope Stability", 31 October 2003
17. Structural Design
    i. EM 1110-2-2000, "Standard Practice for Concrete for Civil Works Structures Change 2", 31 March 2001
    ii. EM 1110-2-2002, "Evaluation and Repair of Concrete Structures", 30 June 1995
    iii. EM 1110-2-2100, "Stability Analysis of Concrete Structures", 1 December 2005
    iv. EM 1110-2-2102, "Waterstops and Other Preformed Joint Materials for Civil Works Structures", 30 September 1995
    v. EM 1110-2-2104, "Strength Design for Reinforced – Concrete Hydraulic Structures Change 1", 20 August 2003
    vi. EM 1110-2-6053, "Earthquake Design and Evaluation of Concrete Hydraulic Structures", 1 May 2007

18. Instrumentation
    i. EM 1110-2-1908, "Instrumentation of Embankment Dams and Levees", 30 June 1995
    ii. EM 1110-2-4300, "Instrumentation for Concrete Structures", 30 November 1987
    iii. FERC, Engineering Guidelines for the Evaluation of Hydropower Projects, Chapter IX, 'Instrumentation and Monitoring

Acronym Listing

ACI – American Concrete Institute
ASCE – American Society of Civil Engineers
DFI – Deep Foundations Institute
EM - Engineering Manual (Army Corps of Engineers)
ETL – Engineer Technical Letters (Army Corps of Engineers)
FERC – Federal Energy Regulatory Commission
FHWA - Federal Highway Administration
NHI – National Highway Institute
PCA – Portland Cement Association
SCDOT - South Carolina Department of Transportation
UFC – Unified Facilities Criteria (Army Corps of Engineers)
UFGS - Unified Facilities Guide Specifications (Army Corps of Engineers)
USACE – U. S. Army Corps of Engineers
USBR – U.S. Bureau of Reclamation
VA – Veterans Affairs