July 12, 2006

Mr. Bruce H. Hamilton
Vice President, Oconee Site
Duke Power Company LLC
7800 Rochester Highway
Seneca, SC 29672

SUBJECT: OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3 (OCONEE 1/2/3) - TORNADO AND HIGH-ENERGY LINE BREAK MITIGATION STRATEGIES (TAC NOS. MC4608, MC4609, AND MC4610)

Dear Mr. Hamilton:

We have completed our review of your letters dated April 12, 2006, and April 28, 2006, regarding the proposed Oconee 1/2/3 mitigation strategies for tornado and high-energy line break (HELB), respectively. We are encouraged by the apparent progress you have made in your plans towards developing these mitigation strategies, which will result in formulating a new licensing basis. In order to ensure that your plans are fully understood, we would like to schedule a meeting to discuss some key issues related to the proposals that you have made in the referenced letters. The issues of particular interest for this meeting are described in Enclosure 1.

It is our understanding that you will be submitting license amendment requests (LARs) for the tornado-mitigation strategy in October 2006 and for the HELB-mitigation strategies in March 2007 for Unit 1, June 2007 for Unit 2, and September 2007 for Unit 3. Following the meeting on key issues, we anticipate that you will provide additional docketed information regarding your plans to address the mitigation strategies.

Enclosure 2 to this letter contains a list of the items that I recommend you address when preparing the LARs for the mitigation strategies. It is important that these LARs be sufficiently complete to enable the Nuclear Regulatory Commission (NRC) staff to perform the technical review that will be conducted prior to the LARs being accepted for further NRC review.

Should you have any questions regarding this letter, please contact me at (301) 415-1453.

Sincerely,

/RA/

Christopher Miller, Deputy Director
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-269, 50-270, 50-287

Enclosures:
1. Key Issues Related to Proposed Tornado and HELB Mitigation Strategies
2. Issues That Should Be Addressed in the License Amendment Requests

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KEY ISSUES RELATED TO TORNADO AND HIGH-ENERGY LINE BREAK MITIGATION STRATEGIES

The following issues were generated based on the Nuclear Regulatory Commission (NRC) staff's review of the tornado and high-energy line break (HELB) mitigation strategy submitted by Duke Power Company LLC on April 12, 2006, and April 28, 2006, respectively. To facilitate review, the issues have been annotated with **[T]** for tornado and/or **[H]** for HELB applicability.

1. Use of TORMIS

   [T] The April 12, 2006, letter states that the TORMIS computer code will be used to evaluate the probability of damage from tornado-generated missiles for certain structures, systems, and components (SSCs). Address the issues discussed in the NRC staff's October 26, 1983, TORMIS Safety Evaluation for those SSCs for which TORMIS is used. All SSCs that are relied upon for tornado mitigation (including Keowee, atmospheric dump valves (ADVs), etc.) and are not adequately protected (irrespective of function) must be collectively assessed. Physical separation of SSCs is not considered a viable option for evaluating the effects of tornados.

2. Cold Shutdown

   [T/H] Discuss how cold shutdown will be achieved, including: a.) a defined time for achieving cold shutdown (e.g., 72 hours); b.) recognition of the strategy/systems to be used (e.g., residual heat removal (RHR), low-pressure service water, high-pressure injection (HPI), pressurizer heaters, ADVs, instruments, etc.; c.) identification of specific vulnerabilities that need to be addressed, equipment to be staged (e.g., cable, etc.); and, d.) a human factors assessment of effort/repair that is consistent with the NRC review standards/guidance.

3. Technical Specifications

   [T/H] To ensure licensing-basis clarity and component operability, Technical Specifications (TSs) need to properly address the tornado/HELB mitigation systems (e.g., protected service water/HPI, standby shutdown facility, etc.) in a manner that is consistent with the Standard TS requirements that have been established for the functions that are being performed by these systems. For example, the minimum required mission time should be 7 days and the Completion Times should be limited to 72 hours in most cases.

4. Reactor Coolant System Letdown Line

   [T/H] The reactor coolant system letdown line exits containment and enters the east penetration room, where it presents an HELB concern and could possibly be damaged by tornado-generated missiles, resulting in a significant loss-of-coolant accident. Discuss how this vulnerability will be addressed, including the possibility of moving the flow-limiting orifice inside containment.

5. Application of Generic Letter 87-11

[H] The April 28, 2006, letter discusses key concepts and assumptions for HELB. Regarding break and crack postulation addressed under the fifth concept/assumption, discuss if all of Generic Letter 87-11, "Relaxation of Arbitrary Intermediate Pipe Rupture Requirements," will be applied, or the specific exceptions that are planned to be requested.

6. Protection of Electrical Penetrations

[H] Affording protection to only those electrical penetrations needed for safe shutdown (as indicated in the April 28, 2006, letter, Mitigation Function 4) may not be all that is needed, assuming that water and foreign material gets in all non-sealed enclosures from water spray or steam. If the enclosures are to be replaced or modified, the new or modified enclosures should be qualified by test, experience, or analysis in accordance with the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.49.

ISSUES THAT SHOULD BE ADDRESSED IN THE LICENSE AMENDMENT REQUESTS

The comments below were generated based on the NRC staff's review of the tornado and high-energy line break (HELB) mitigation strategy submitted by Duke Power Company LLC on April 12, 2006, and April 28, 2006, respectively. To facilitate review, the comments have been annotated with **[T]** for tornado and/or **[H]** for HELB applicability.

1. **[T/H]** Analyses, codes, and/or models being utilized that need to be integrated into the quality assurance manual/commitments should be addressed in the applicable license amendment requests (LARs).

2. **[T/H]** The LARs should discuss any scenarios where the reactor coolant system (RCS) does not stay sub-cooled with a pressurizer steam bubble.

3. **[T/H]** Communications for assuring that the necessary action times are not exceeded for establishing secondary heat removal and reactor coolant pump (RCP) seal injection should be discussed.

4. **[T]** Discussion is needed to justify the conclusion that equipment in the east penetration rooms is largely protected by adjacent structures (i.e., low probability of missile damage).

5. **[T/H]** Additional explanation should be provided regarding the protected switchgear (PSG), such as how the alternate underground cable/supply to the PSG is routed (directly from Keowee or from CT-4), and if there are any tornado or HELB vulnerabilities to the power supplied to or from the PSG other than Keowee (i.e., outside connections in and out of its protected building, interactions with the switch yard, turbine building interfaces, etc.). Describe how the alternate power supply from the PSG to the standby shutdown facility (SSF) will be protected from a tornado and from where it will be controlled. Describe to what extent it will be credited as part of the tornado or HELB-mitigation strategies, and how this capability will be assured, or if it is considered to be defense-in-depth only.

6. **[T/H]** Consideration should be given to alternatives to routing the new protected serice water (PSW) pipe through the penetration rooms (for example, below grade may be an option.)

7. **[T/H]** Any dependencies related to the protected service water system and high-pressure injection (HPI) pumps should be described (e.g., cooling, lubrication) and justified as appropriate.

8. **[T]** The analysis of the control battery room external wall should be discussed for those cases where tornado-related modifications will not be performed.

9. **[T/H]** Provide the basis for PSW/HPI and SSF initiation times and confirmation that a human factors assessment has been completed that is consistent with the Nuclear Regulatory Commission (NRC) review standards and guidance to validate operator actions and times.

10. **[T]** The most limiting tornado-related main steam line ruptures and their impact to the overall tornado mitigation strategy should be described, including any plant modifications deemed necessary to preclude adverse effects.
11. **[T/H]** The borated water storage tank (BWST) critical level and the basis for this level should be discussed (e.g., cool down, RCS leakage, RCP seal leakage, high point vent loss, etc.). Also, how foreign material (e.g., insulation via missile impact, etc..) will be kept from entering the BWST above the critical protected area should be discussed.

12. **[T/H]** Since the reactor head and/or high-point vents will be used for RCS inventory control, describe how using these vents will affect containment pressure and discuss the environmental effects on the SSF makeup pump.

13. **[T/H]** Instrument failures (e.g., pressurizer level, etc.) and how they will be discerned in support of main control room and/or SSF control should be discussed.

14. **[T/H]** The means for assuring a sufficient water supply for the SSF make-up pumps and spent fuel pools should be described. Also describe how criticality concerns associated with the spent fuel pool will be addressed.

15. **[T/H]** Discuss the RCP seal model that will be used, including the conditions and limitations of the applicable topical report as it relates to the Oconee 1/2/3 tornado/HELB-mitigation strategies.

16. **[H]** The April 28, 2006, letter discusses key concepts and assumptions for HELB. Under the first concept/assumption, structures, systems, and components (SSCs) necessary to reach safe shutdown (SSD) will be protected from the possible direct effects of a given HELB event. In that regard, additional discussions should be provided to explain if:

    a. Protection from possible HELB effects on SSCs necessary to reach SSD also includes supporting equipment and the automatic feedwater isolation system, and

    b. SSCs satisfy environmental qualification requirements

    Also, discuss the break locations and effects/strategies that were used in discerning required SSC HELB-related protection.

17. **[H]** Under the third concept/assumption, it was indicated that jet geometry from breaks and cracks will be based on NUREG/CR-2913, “Two Phase Jet Loads,” pending approval from the NRC. In that regard:

    a. Since NUREG/CR-2913 applies to breaks, justification for applying this NUREG to cracks should be provided

    b. The assessment should be site-specific (i.e., the indicated 10-pipe diameters may not provide a large enough zone of influence for potentially affected SSCs)

18. **[H]** Under the fourth concept/assumption, no breaks or cracks will be postulated on systems that operate at high-energy conditions less than 1 percent of the total plant operating time or less than 2 percent of the total system operating time. Additional explanation is needed in the following areas:

    a. How system percentages are justified/confirmed

    b. How far back the associated operating histories are assessed and if this is a periodic assessment

    c. Subject piping should be analyzed in accordance with the Updated Final Safety Analysis Report in order to preclude break and crack postulation based on limited system operation percentages

    d. Aside from the indicated emergency feedwater (EFW) and low-pressure injection systems, any others for which break and crack postulation is being precluded based on limited system-operation percentages should be identified

19. **[H]** The April 28, 2006, letter discusses mitigation functions for HELB. Regarding structure failures addressed under Mitigation Function 1:

    a. The LAR should list pipe inspections being performed (in lieu of implementing modifications for structural components) and provide the reason that modifications were considered not feasible.

    b. GOTHIC Code 4.0, which is to be utilized in calculating pressurization effects in the auxiliary building, should be bench-marked and captured in the quality assurance program

    c. Describe the worst-case break for pressure in the east penetration room and if the block walls fail before the blowout panels. If they do fail before the blowout panels, explain why this is acceptable

20. **[H]** Under Mitigation Function 2, it is indicated that no systems and components located in the turbine building (TB) will be credited for initial HELB-event mitigation or for reaching SSD, except for those systems and components necessary to protect the main steam (MS) pressure boundary. Those systems and components necessary to protect the MS pressure boundary will be protected from the effects of a given HELB event, including, jet impingement, environmental effects, spray, and flooding. In that regard:

    a. Discuss if emergency feedwater (EFW) and/or main feedwater (MFW) will be credited for recovery

    b. Describe what will cool HPI and PSW, and address the function of the atmospheric dump valves in supporting PSW operation

c. Describe the worst-case effect of an MS line break in the TB and the strategy for mitigation. (Include possible effects on SSF-controlled components with associated cables in the TB.)

21. **[H]** Regarding Mitigation Function 3, discuss how long the main control room will remain habitable and how long its equipment will remain functional should control room ventilation be lost following an HELB event.

Oconee Nuclear Station, Units 1, 2, and 3

cc:

Ms. Lisa F. Vaughn
Duke Power Company LLC
526 South Church Street
P. O. Box 1006
Mail Code EC07H
Charlotte, North Carolina 28201-1006

Manager, LIS
NUS Corporation
2650 McCormick Dr., 3rd Floor
Clearwater, FL 34619-1035

Senior Resident Inspector
U.S. Nuclear Regulatory Commission
7812B Rochester Highway
Seneca, SC 29672

Mr. Henry Porter, Director
Division of Radioactive Waste Management
Bureau of Land and Waste Management
Dept. of Health and Env. Control
2600 Bull St.
Columbia, SC 29201-1708

Mr. Michael A. Schoppman
Framatome ANP
1911 North Ft. Myer Dr.
Suite 705
Rosslyn, VA 22209

Mr. B. G. Davenport
Regulatory Compliance Manager
Oconee Nuclear Site
Duke Energy Corporation
ON03RC
7800 Rochester Highway
Seneca, SC 29672

Ms. Karen E. Long
Assistant Attorney General
NC Department of Justice
P.O. Box 629
Raleigh, NC 27602

Mr. R. L. Gill, Jr.
Manager - Nuclear Regulatory
Issues and Industry Affairs
Duke Power Company LLC
526 S. Church St.
Mail Stop EC05P
Charlotte, NC 28202

Division of Radiation Protection
NC Dept of Environment, Health, & Natural
Resources
3825 Barrett Dr.
Raleigh, NC 27609-7721

Mr. Peter R. Harden, IV
VP-Customer Relations and Sales
Westinghouse Electric Company
6000 Fairview Road
12th Floor
Charlotte, NC 28210

Mr. Henry Barron
Group Vice President, Nuclear Generation
and Chief Nuclear Officer
P.O. Box 1006-EC07H
Charlotte, NC 28201-1006

Mr. Charles Brinkman
Director, Washington Operations
Westinghouse Electric Company
12300 Twinbrook Parkway, Suite 330
Rockville, MD 20852