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U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

ATTENTION: Mr. James E. Dyer, Director
Office Nuclear Reactor Regulation

SUBJECT: Duke Energy Corporation
Oconee Nuclear Station Units 1, 2 and 3
Docket Nos: 50-269, 270 and 287
Project Plans for Tornado and High Energy Line Break Events Outside Containment

In a letter dated November 21, 2005, Duke Energy Corporation (Duke) stated it would provide to the NRC staff additional scope and schedule information on planned modifications to address licensing basis issues related to tornado events and High Energy Line Break (HELB) events outside containment at Oconee Nuclear Station (Oconee). The purpose of this letter is to provide this information, as well as proposed license amendment request plans and schedules to clarify or otherwise revise Oconee's current licensing basis (CLB) related to tornado and HELB events outside containment. This letter also provides a response to the NRC staff's request, as set forth in a letter to Duke dated December 23, 2005, that Duke describe how its proposed plans and schedules address the licensing basis positions of the staff regarding HELB events outside containment.

The actions that Duke proposes to address the above issues regarding tornado and HELB events outside containment are described in Attachments 1 and 2. Implementation of these activities will significantly improve the clarity of Oconee's CLB and enhance the associated event mitigation strategies. These actions will require a significant investment of resources by Duke. We will be prepared to discuss any questions you might have regarding this letter in our meeting scheduled for February 7, 2006. Following that meeting, absent verbal or written notification from the Staff that this approach is not sufficient, Duke will proceed with the understanding that implementation of the

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activities described in the Attachments will resolve the NRC staff's concerns regarding Oconee's CLB for tornado and HELB events outside containment. Accordingly, Duke will continue to proceed, consistent with its corporate governance requirements, to obtain necessary internal approvals to fund the implementation of the referenced activities. Duke further requests that NRC delay or suspend inspection and enforcement activities in these areas to ensure the appropriate allocation of Duke and NRC staff resources to accomplish timely resolution of these longstanding CLB issues.

Tornado

Oconee design and construction predates the current regulatory requirements and guidance that exist for tornado events and, in Duke's view, the licensing basis for tornado events incorporated a risk perspective at its inception. The AEC originally accepted Oconee's tornado design; however, in responding to subsequent modifications of regulatory requirements in this area (e.g. post-TMI requirements), the CLB for tornado events evolved over the ensuing years. This has resulted in a CLB for tornado events that Duke continues to view as risk-informed, a position on which the NRC staff differs.

Recognizing these differing positions, over the last few years Oconee has expended significant resources to evaluate the tornado CLB and associated mitigation strategies. This evaluation has led Duke to the development of proposed modifications and license amendment request plans and schedules that will clarify the CLB while maintaining its risk-informed nature, but also provide additional deterministic mitigation strategies such that Duke and the NRC staff can move forward with a common understanding of the CLB. These proposals are set forth in Attachment 1. Once implemented, these changes will result in a significantly improved Oconee licensing basis and tornado risk profile that builds upon the reasonable assurance of plant safety that exists today.

High Energy Line Break Outside Containment

The Atomic Energy Commission (AEC) issued the initial operating license for Oconee Unit 1 with the understanding that Duke would promptly complete and submit analyses to

respond to newly imposed HELB requirements[1]. In April 1973, Duke submitted MDS [HELB] Report No. OS-73.2 and, following a Staff Request for Additional Information, issued Supplement 1 that was found acceptable by the Staff. Duke issued Supplement 2 to the report before initial operation of Units 2 and 3. The MDS report is described in the initial AEC safety evaluation (SE) for Units 2 and 3, but is absent from the Unit 1 SE. These analyses were originally deemed adequate by the AEC and subsequent inspections by the NRC in this area did not identify the present concerns. However, following a 1998 Duke self-assessment, Duke and the NRC staff raised questions regarding Oconee's licensing basis for HELB events outside containment and Duke's compliance with such licensing basis.

As a consequence, Duke has devoted substantial resources to reconstitute the HELB analysis and re-evaluate the associated mitigation strategies. This evaluation has led to the development of proposed modifications and license amendment request plans and schedules that will revise the existing CLB and mitigation strategies for HELB events. These proposals are set forth in Attachment 2.

As communicated in a meeting between Duke and NRC staff on June 30, 2005, the overall HELB Reconstitution project continues. This project will proceed in parallel with the activities described in the Attachments to this letter. Any need for additional modifications identified through the HELB Reconstitution project efforts will be communicated to the Staff.

Response to December 23, 2005, Letter from NRC

In an NRC letter dated December 23, 2005, regarding "High Energy Line Breaks Outside Containment at Oconee Nuclear Station, Units 1, 2, and 3," the Staff made statements and issued requests regarding the following issues: safe end state following a HELB event, characterization of physical effects resulting from jet impingement, and inspections of high energy piping in the East Penetration Rooms (EPRs). The first two issues are discussed in Attachment 2. The requested details relative to piping inspections are set forth in Attachment 3.

[1] December 15, 1972, Giambusso, and January 17, 1973, Schwencer letters, Atomic Energy Commission.

If you have any questions or comments regarding this letter, please contact Graham Davenport of the Oconee Nuclear Site Regulatory Compliance Group at 864-885-3044.

Sincerely,

Henry B. Barron,
Group Vice President Nuclear Generation and
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Attachments (1 through 3)

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Attachment 1

Proposed Tornado Modifications and Licensing Basis Changes
for Oconee Nuclear Station

Modifications[2]

- **Natural Phenomena Barrier System**

1. **Unit 3 Control Room North Wall:** This proposed modification would fortify the Unit 3 north control room wall as necessary to deterministically address the tornado wind loads, differential pressures, and missiles. This proposed modification would install fiber-reinforced polymer (FRP) directly to existing masonry construction, and additional steel barrier plates to address potential missiles. This proposed modification is scheduled for installation by December 31, 2007.

2. **Protection of the Standby Shutdown Facility (SSF) Diesel Fuel Tank Vents:** This proposed modification would relocate the tank vents from their current location to a location against the SSF wall and provide them with a robust structural steel barrier. This proposed modification would improve overall protection of the vents from the effects of tornado wind and missiles. This proposed modification is scheduled for installation by December 31, 2007.

3. **Standby Shutdown Facility Trench Cover:** This proposed modification would install additional protection over a section of an exposed cable/pipe trench cover for the effects of tornado pressure drop, wind load, and missiles. The proposed modification consists of the installation of reinforced concrete covers over the affected area. This proposed modification is scheduled for installation by December 31, 2007.

4. **Units 1, 2, and 3 Borated Water Storage Tank (BWST):** This proposed modification would further protect the critical volume of each unit's BWST from the effects of tornado missile. The modification consists of installation of steel barrier walls supported by structural steel resting on mini-piles. Providing

[2] The schedules set forth herein are best estimates awaiting final detailed modification design, and assume timely approval of supporting LARs by NRC.

this protected source of borated water will eliminate reliance on the spent fuel pool (SFP) to HPI flow path. This proposed modification is scheduled for installation by December 31, 2008.

- **Station Auxiliary Service Water (ASW) Upgrade [Mechanical Portion]**

  This proposed modification would upgrade the current low pressure station ASW system to a fully protected high-head, remotely operated system capable of being promptly and simultaneously aligned to each of the Once-Through Steam Generators (OTSGs), from each unit's control room. This proposed modification consists of replacement of the current ASW Pump with a new booster pump and high-head pump capable of feeding fully pressurized OTSGs. A combination booster pump and high-head pump are required to insure adequate net positive suction head (NPSH) is provided under all conditions. All feed piping will be replaced to meet new high pressure requirements.

  This proposed modification reduces operator burden to place the system into service to remove core decay heat. Operator actions outside the control room are eliminated. The actions eliminated include manually operating the atmospheric dump valves (ADVs) for OTSG depressurization and manually aligning the ASW valves and breakers to supply water to the OTSGs. Since OTSG depressurization would no longer be required, water levels can be maintained to provide long term safe shutdown at hot conditions. Finally, because this new ASW system can be placed into service quickly, this proposed modification will minimize challenging the Pressurizer (PZR) relief valves under saturated water lift and repetitive cycling conditions following a complete loss of main and emergency feedwater. This proposed modification is scheduled to be completed by June 30, 2009.

- **Station ASW Upgrade [Electrical Portion]**

  This proposed modification would consist of new switchgear with alternate, protected power provided from the Keowee Hydro Station via an underground feeder path. This new switchgear and all supporting equipment will be housed in a new tornado protected building to be erected

to the south of the Unit 3 auxiliary building. Normal power to the new switchgear would be provided from the station switchyard. This modification provides alternate, protected power for:

1. The upgraded ASW system,
2. One HPI train for Reactor Coolant Pump (RCP) seal injection that can be promptly aligned,
3. A sufficient number of PZR heaters to maintain a steam bubble in the PZR for Reactor Coolant System (RCS) pressure control,
4. The existing vital I&C battery chargers,
5. The SSF in case of failure of the SSF diesel, and
6. The RCS vents for RCS inventory control.

This proposed modification is scheduled for installation by June 30, 2009.

Licensing Actions to Revise Tornado Licensing Basis

- Duke proposes to submit a License Amendment Request (LAR) to seek Staff approval for the use of Fiber Reinforced Polymer (FRP) technology for application in strengthening selected masonry walls against the effects of tornado wind and differential pressure loads. This LAR will be submitted by June 1, 2006.

- Duke proposes to submit a LAR to establish a new tornado licensing basis (LB). This revision will add detail and clarity to the CLB. The NRC issued a safety evaluation report (SER) to the industry dated October 26, 1983, endorsing the use of TORMIS "when assessing the need for positive tornado missile protection for specific safety-related plant features in accordance with the criteria of SRP Section 3.5.1.4." For Oconee, the use of TORMIS was acknowledged in an NRC SER dated July 28, 1989 titled, "Safety Evaluation Report on Effect of Tornado Missiles on Oconee Emergency Feedwater System." This LAR would incorporate the use of risk-informed mitigation strategies, e.g. TORMIS, as well as the deterministic benefits gained from installation of the modifications addressed in this letter. This LAR will also eliminate taking credit for the spent fuel pool to high pressure injection pump flow path.

On December 21, 2005, Duke submitted a letter to NRC titled, "Request for Staff Feedback in Regards to Oconee Design Basis Tornado Proposal." This letter presented the rationale for an approach to revising the Oconee tornado CLB.

A conference call was held with the NRC on January 17, 2006 to discuss this letter and receive preliminary feedback. During this call, the NRC communicated to Duke that it disagrees with the establishment of the wind speed and atmospheric pressure drop criteria as proposed in the letter. The Staff instead suggested that Duke consider incorporation of the provisions of Draft Regulatory Guide (DG) DG-1143, Proposed Revision 1 to RG 1.76 dated April 1974, entitled "Design Basis Tornado and Tornado Missiles for Nuclear Power Plants." DG-1143 was recently issued for public comment in late January 2006.

During the January 17, 2006 call, Duke agreed to carefully review the revised tornado missile criteria put forth in this DG. Duke pointed out during this call that even with the improved tornado missile characterization expected from this DG, certain aspects of the Oconee design will have to be evaluated using the TORMIS code for the effects of tornado generated missiles.

Duke further agreed during this call to reach a decision regarding possible use of DG-1143. Duke intends to reach a final decision by March 1, 2006. For these reasons, a proposed date of submission of this LAR has not yet been established.

Attachment 2

Proposed HELB Modifications and Licensing Basis Changes for Oconee Nuclear Station

Modifications

- **Station Auxiliary Service Water (ASW) Upgrade [Mechanical Portion]**

  This proposed modification is described in detail in Attachment 1. Relative to HELB, installation of this system resolves existing HELB vulnerabilities for loss of secondary side decay heat removal events where emergency feedwater (EFW) could be lost.

- **Station ASW Upgrade [Electrical Portion]**

  This portion of the ASW upgrade is also described in detail in Attachment 1. Relative to HELB, installation of this system resolves existing HELB vulnerabilities for loss of secondary side decay heat removal events where emergency feedwater (EFW) could be lost and results in an assured power supply for the upgraded ASW and HPI loads.

- **Modifications previously committed to in the November 21, 2005, Duke letter titled, "High Energy Line Break and Tornado Mitigation Strategy."**

  1. Install flood outlet devices for each Oconee East Penetration Room (EPR) by May 31, 2007. This modification will address NRC concerns associated with potential flooding of portions of the auxiliary building (AB) following a HELB event in the EPR.

  2. Install flood impoundment features in each Oconee unit EPR by December 31, 2007. This modification compliments the flood outlet device modification and also addresses potential flooding of the AB following a HELB event in the EPR.

Licensing Actions to Revise HELB Licensing Basis

- **Incorporate NUREG/CR-2913 and BTP MEB 3-1 into Licensing Basis:**

  In an NRC letter dated December 23, 2005, regarding "High Energy Line Breaks Outside Containment at Oconee Nuclear Station, Units 1, 2, and 3," it was noted that dynamic effects from jet impingement are considered to be part of

the Oconee CLB. Given the lack of specific supporting analysis in the April 25, 1973, Duke letter that transmitted MDS Report OS-73.2, Duke does not take exception to this position.

Duke proposes to submit a LAR to credit use of NUREG/CR-2913, "Two-Phase Jet Loads," for characterization of jets resulting from critical cracks. This proposed LAR would also request use of certain portions of BTP MEB 3-1 for postulation of critical cracks based on stress. Approval to use the NUREG and BTP MEB 3-1 would allow Duke to complete the jet impingement analysis, specifically for critical crack locations in the East Penetration Rooms, as well as in other critical areas of the plant. The jet impingement analysis would facilitate the determination of interactions with equipment, including electrical penetrations that may be located near the postulated critical crack location. Protection from jet impingement from critical cracks would be determined on a case-by-case basis as these analyses are completed. These analyses would support the revision of the HELB licensing basis via Unit-specific LARs, as described below. The NUREG/CR-2913 and BTP MEB 3-1 LAR will be submitted by August 31, 2006.

- **Future Planned HELB Licensing Actions:**

Based on activities needed to support design and implementation of the modifications described above, the schedule for submission of the Unit specific LARs has been extended from the schedule communicated during a June 30, 2005, HELB Project update to NRC Management. The revised submission dates are March 31, 2007 for Unit 1, June 30, 2007 for Unit 2, and September 30, 2007 for Unit 3. These LARs will introduce a new HELB analysis document that will replace OS 73.2. Revised sections of the UFSAR, as appropriate, will also be included in the LAR.

- **Other Licensing Actions Addressed**

Also stated in the December 23, 2005 letter, the Staff concluded that the Oconee CLB requires achievement of cold shutdown (CSD) following all HELB events. Duke maintains its position that the level of safe shutdown is

event dependent. In an effort to move beyond this difference of position, Duke will confirm by analyses, that CSD can be achieved for HELB events. However, in order to support an orderly cooldown to cold shutdown, equipment repairs may be required as a result of some postulated HELB events. For those events, Mode 3 will be maintained as long as necessary to facilitate repairs. Once repairs are complete, the plant will be placed in the cold shutdown condition in an orderly manner. This clarification of Duke's position will be documented in the appropriate HELB LAR as described in the previous section.

Attachment 3

Piping Inspection Program Discussion

- **Main Feedwater Piping Welds:**

The Main Feedwater (MFDW) piping located in the East Penetration Room (EPR) has 13 to 17 girth welds depending on the unit. Each unit has 4 piping components that are inspected as part of the flow accelerated corrosion (FAC) inspection program. Each unit has 3 to 5 attachment welds that are included as elective inspections in the ISI program. A break down of the actual number of welds and components per unit is given below. The attachment welds include those for the rupture restraints located at each MFDW reactor building penetration. Although each rupture restraint has eight individual attachment welds, for ISI purposes, each set of eight welds is counted as 1 location.

Unit 1

- 15 Girth Welds (8 on 'A' header, 7 on 'B' header)
- 7 of the Girth welds were made in the fabrication shop, 8 of the total were made in the field.
- 3 Attachment Weld Locations (1 on 'A' header, 2 on 'B' header)

Unit 2

- 17 Girth Welds (9 on 'A' header, 8 on 'B' header)
- 5 of the Girth welds were made in the fabrication shop, 12 of the total were made in the field
- 5 Attachment Weld Locations (2 on 'A' header, 3 on 'B' header)

Unit 3

- 13 Girth (7 on 'A' header, 6 on 'B' header)
- 5 of the Girth welds were made in the fabrication shop, 8 of the total were made in the field
- 4 Attachment Welds (2 each header)

The girth welds will be inspected for weld flaws and thickness using ultrasonic test (UT) equipment. The FAC inspections involve placing a grid on the piping and performing thickness measurement using UT equipment. Inspection of attachment welds involve performing a visual inspection for general weld quality as well as a

surface examination using either a magnetic particle test (MT) or a liquid penetrant test (PT).

Pursuant to the inspection commitment made in the Duke Letter to the NRC dated November 21, 2005; all MFDW girth and attachment welds located in each unit's EPR will be inspected by spring 2008. Afterwards, these welds will be inspected once during each subsequent 10 year inspection interval. Listed below is a table that provides the inspection dates for the welds to be inspected prior to the spring of 2008.

Unit	Weld Type	Inspection Outage	Outage Date	Number of locations of this type inspected or scheduled to be inspected during outage
1	Girth	1EOC21	10/2003	1
		1EOC22	05/2005	2
		1EOC23	10/2006	6
		1EOC24	04/2008	6
	Attachment	1EOC22	05/2005	1
		1EOC23	10/2006	1
		1EOC24	04/2008	1
2	Girth	2EOC21	10/2005	12
		2EOC22	04/2007	5
	Attachment	2EOC21	10/2005	3
		2EOC22	04/2007	2
3	Girth	3EOC20	05/2003	5
		3EOC21	11/2004	2
		3EOC22	04/2006	6
	Attachment	3EOC22	04/2006	4

Those inspections completed to date have not discovered any code deficiencies. Additional MFDW welds located outside of the EPR but still in the AB will be inspected by the end of the spring 2008 outage and afterwards each subsequent 10 year inspection interval.

- **Main Feedwater Base Metal Inspections:**

As noted in the commitment letter of November 21, 2005, selected base metal locations downstream of the main feedwater isolation valves will be inspected for thickness using UT once every 10-year ISI interval. These locations include the piping between the MFDW rupture restraint and the containment liner weld.

Initial inspection of these locations will occur during the spring 2006, Unit 3 end-of-cycle (EOC) 22 refueling outage (RFO), the fall 2006, Unit 1 EOC23 RFO, and the spring 2007, Unit 2 EOC22 RFO. Additional locations may be chosen based on their proximity to important electrical equipment and based on the jet impingement analysis described above.

- **Main Steam Piping Welds:**

The number of girth and attachments welds for the Main Steam line located in the EPR is as follows:

Unit 1

- 5 girth welds (3 shop, 2 field welds)
- 1 attachment weld

Unit 2

- 4 girth welds (2 shop, 2 field welds)
- 1 attachment weld

Unit 3

- 4 girth welds (2 shop, 2 field welds)
- 1 attachment weld

These welds will be inspected initially by spring 2008 and then during subsequent ISI 10-year intervals.