Duke Energy®

BRUCE H HAMILTON
Vice President
Oconee Nuclear Station

Duke Energy Corporation
ON01VP / 7800 Rochester Highway
Seneca, SC 29672

864 885 3487
864 885 4208 fax
bhhamilton@duke-energy.com

May 25, 2006

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Subject: Oconee Nuclear Station
Docket Nos. 50-269,-270, -287
Licensee Event Report 269/2006-02, Revision 0
Problem Investigation Process No.: O-06-1075

Gentlemen:

Pursuant to 10 CFR 50.73 Sections (a)(1) and (d), Duke Power Company LLC d/b/a Duke Energy Carolinas, LLC submits Licensee Event Report 269/2006-02, Revision 0, regarding postulated High Energy Line Break scenarios which could result in the loss of the High Pressure Injection pumps due to flooding.

These event scenarios are not part of the current Oconee Nuclear Station licensing Basis and do not meet any 10 CFR 50.73 criterion. However, this report is being submitted to clarify the current licensing basis relative to these issues and to answer questions raised by the NRC staff in this regard.

This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

Bruce Hamilton

Bruce H. Hamilton, Vice President
Oconee Nuclear Site

Attachment

IE22

cc: Mr. William D. Travers
Administrator, Region II
U.S. Nuclear Regulatory Commission
61 Forsyth Street, S. W., Suite 23T85
Atlanta, GA 30303

Mr. L. N. Olshan
Project Manager
U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, D.C. 20555

Mr. M. C. Shannon
NRC Senior Resident Inspector
Oconee Nuclear Station

Mr. D. W. Rich
NRC Senior Resident Inspector
Oconee Nuclear Station

INPO (via E-mail)

NRC FORM 366 (6-2004) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

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4. TITLE

High Energy Line Breaks Outside Licensing Basis May Result in Loss of Safety Function

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									Unit 2	05000 270
03	29	06	06	- 02	- 00	05	25	06	FACILITY NAME Unit 3	DOCKET NUMBER 05000 287

9. OPERATING MODE: 1

10. POWER LEVEL: 100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*

20.2201(b)	20.2203(a)(3)(i)	50.73(a)(2)(i)(C)	50.73(a)(2)(vii)
20.2201(d)	20.2203(a)(3)(ii)	50.73(a)(2)(ii)(A)	50.73(a)(2)(viii)(A)
20.2203(a)(1)	20.2203(a)(4)	50.73(a)(2)(ii)(B)	50.73(a)(2)(viii)(B)
20.2203(a)(2)(i)	50.36(c)(1)(i)(A)	50.73(a)(2)(iii)	50.73(a)(2)(ix)(A)
20.2203(a)(2)(ii)	50.36(c)(1)(ii)(A)	50.73(a)(2)(iv)(A)	50.73(a)(2)(x)
20.2203(a)(2)(iii)	50.36(c)(2)	50.73(a)(2)(v)(A)	73.71(a)(4)
20.2203(a)(2)(iv)	50.46(a)(3)(ii)	50.73(a)(2)(v)(B)	73.71(a)(5)
20.2203(a)(2)(v)	50.73(a)(2)(i)(A)	50.73(a)(2)(v)(C)	X OTHER Voluntary
20.2203(a)(2)(vi)	50.73(a)(2)(i)(B)	50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
B.G. Davenport, Regulatory Compliance Manager	(864) 885-3044

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED				15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE)	X	NO				

16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

This is a voluntary LER to address certain postulated High Energy Line Break (HELB) event scenarios for Oconee Nuclear Site (ONS). These scenarios are outside the Current Licensing Basis (CLB) but potentially could result in loss of the High Pressure Injection System, which is credited for mitigation of HELB events, due to flooding caused by the event.

This issue was discovered due to discussion with NRC inspectors about errors in crediting certain drain flow paths in existing analyses. The errors resulted from an inaccurate drawing, an inadequate field walkdown, and misinterpretation of drawings of inaccessible areas.

Corrective actions include correction of the drawings and analyses. Additional actions are expected as a result of a long term project to enhance the plant and CLB to address risk significant HELB issues at ONS.

This event is considered to have no significance with respect to the health and safety of the public.

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17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

EVALUATION:

BACKGROUND

This event is being reported as a voluntary report. The report addresses postulated events which are beyond the Current Licensing Basis (CLB) for Oconee Nuclear Site (ONS).

After ONS design was complete and construction was nearing completion, the Atomic Energy Commission (AEC) issued a letter from A. Giambusso (AEC), Deputy Director for Reactor Projects Directorate of Licensing, to Duke Power Company (now Duke Power Company LLC d/b/a Duke Energy Carolinas, LLC (Duke)), dated December 15, 1972. The "Giambusso Letter" required licensees to address the consequences of pipe ruptures outside containment and submit their analyses to the AEC for review. Due to the specific guidance in the letter, the applicable events were identified as "High Energy Line Break" (HELB) events. The "Giambusso Letter" was amended by an errata sheet provided in a letter from A. Schwencer (AEC), Chief Pressurized Water Reactors Branch No. 4 Directorate of Licensing, to Duke Power Company, dated January 17, 1973 (the "Schwencer letter").

Duke's evaluations of postulated pipe ruptures outside containment were documented in MDS Report No. OS-73.2 dated April 25, 1973, with Supplement 1 to the report dated June 22, 1973 and Supplement 2 to the report dated March 12, 1974. The final report is referred to herein as "HELB report," "MDS Report" and/or "OS-73.2."

The MDS report was incorporated into the ONS license application by reference. It was subsequently approved and accepted by the AEC. "Safety Evaluation prepared by the Directorate of Licensing related to the Oconee Nuclear Station, Units 2 and 3," (referred to herein as "the SER") dated July 6, 1973, was issued as part of the initial licensing of Units 2 and 3. SER Section 7.1.11 "High-energy Line Rupture External to the Reactor Building" addressed the MDS report, and Attachment E-1 of the SER repeated the NRC HELB criteria, as amended by the Schwencer letter. The following is extracted from Section 7.1.11:

"The basic criteria require that:

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"(2) Protection be provided for equipment necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming a concurrent and unrelated single active failure of protected equipment, from the environmental and structural effects (including the effects of jet impingement) resulting from a single open crack at the most adverse location in pipes carrying high-energy fluid routed in the vicinity of this equipment, where the temperature and pressure conditions of the fluid exceed 200F and 275 psig. The size of the cracks should be assumed to be 1/2 the pipe diameter in length and 1/2 the wall thickness in width.

"Staff Evaluation and Conclusion
The staff has evaluated the assessment performed by the applicant and has concluded that the applicant has analyzed the facilities in a manner consistent with the intent of the criteria and guidelines provided by the staff. The staff agrees with the applicant's selection of pipe failure locations and concludes that all required accident situations have been addressed appropriately by the applicant.

"Furthermore the staff has evaluated the analytical methods and assumptions used in the applicant's analyses and find them acceptable and concurs with the proposed plant modifications and the criteria to be used in their designs."

The MDS report Section 2.1.3 stated that "All piping larger than 1" NPS (note: Nominal Pipe Size) is reviewed for the consequences of critical cracks." Section 2.2.1 included criteria for allowed stress and stated that if those stress allowables were not exceeded, "then the break is not considered credible." Section 2.3 "Consequences of Postulated Line Breaks" and Tables 2.3-1 and 2.3-2 only address line breaks and only at specified locations. Based on this wording and internal documentation, it appears that ONS used the stress criterion to eliminate many of the potential break locations and all of the critical cracks specified in the "Giambusso Letter." For Main Feedwater (FDW) [EIIS:SJ] piping within the Auxiliary Building (AB), only the terminal end break remained as a required break. All other FDW break locations or crack scenarios within the AB were eliminated.

Further, it appears that these positions were reached after considerable discussion with the AEC personnel. The wording of the

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SER shows that the staff clearly recognized that the report met the "intent" of the "Giambusso Letter" and that the staff concurred with the selection of pipe failure locations and accident situations.

Several years after approval of the MDS report and initial licensing of ONS, a Standby Shutdown Facility (SSF) [EIIS:NB] was built. The SSF provides additional "defense in-depth" protection to achieve and maintain mode 3 with an average Reactor Coolant temperature at or above 525F following postulated fire, sabotage, or flooding events. The SSF was not specifically credited for HELB events, but ONS notes that fire, flood, and sabotage events can result in similar transients and system demands.

The SSF Reactor Coolant Make-up System is the SSF sub-system designed and credited to supply RC pump seal injection flow in the event that the High Pressure Injection (HPI) [EIIS:CB and BG], the normal make up system, becomes inoperable while a Unit's RCS temperature is above 250F. It can recover RCS volume shrinkage caused by cooling the RCS to Mode 3 with an average Reactor Coolant temperature at or above 525F. However, the SSF Reactor Coolant Make-up System is not credited for events, such as LOCA, which result in significant loss of RCS inventory. The SSF Auxiliary Service Water System (ASW) is the SSF sub-system credited as the backup to FDW and Emergency Feedwater (EFW) [EIIS:BA].

A 1998 Duke HELB self-assessment revealed issues with the original OS-73.2 report, and as a result, Duke decided to fully revalidate and reconstitute the HELB CLB. In late 1999, Duke initiated a project to determine scope of these CLB reconstitution efforts. These HELB CLB reconstitution efforts are ongoing with additional enhancements planned.

In 2000 Duke proposed an Automatic Feedwater Isolation System (AFIS) modification to reduce some of the operator actions required for HELBs on the Main Steam [EIIS:SB] and FDW Systems. This modification was installed on the three ONS units in 2002 and 2003. AFIS is designed to actuate to terminate flow from the FDW and EFW systems to a depressurized steam generator. The FDW terminal end break location is downstream of the final FDW check valve (located in the Penetration Room, which is part of the Auxiliary Building (AB) fourth and fifth floors). So the FDW HELB postulated in the CLB will result in depressurization of the affected steam generator

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and actuation of AFIS, which will result in isolation of FDW and EFW to the affected line.

EVENT DESCRIPTION

By letter dated October 28, 2005, the NRC issued Integrated Inspection Report 2005004. In this report the NRC included several Unresolved Items (URIs). URIs 2005004-08 and 2005004-10 related to postulated HELB events in the Penetration Room. The URIs specifically address breaks or cracks in the FDW System piping as it passes through the Penetration Room. As part of the URIs, the inspector described a flow path for a potential flood scenario which would preferentially distribute flow from the break into the HPI pump room for the affected unit, located in the AB first floor basement. Flood water in the HPI pump room would increase the probability of affecting the operability of the HPI pumps in the room.

On February 15, 2006, Duke submitted a response to Integrated Inspection Report 2005004 which provided supporting information for consideration by the NRC in the disposition of URIs 2005004-08 and 2005004-10. Part of the response included the conclusions of Duke Engineering personnel that the flow path described by the inspector did not exist.

Following submittal of Duke's letter, Engineering determined that the flow path did exist. Duke notified the NRC verbally of the error and submitted a letter on March 29, 2006 withdrawing the February 15, 2006 letter in its entirety.

As a result of the new knowledge relative to that flow path, the calculations related to potential flooding for several HELB scenarios were reexamined and revised.

Duke confirmed previous evaluations which had concluded that FDW HELBs within the ONS CLB do not result in loss of HPI due to flooding unless a single failure occurs to prevent isolation of the broken FDW line. NUREG 1022 Section 3.2.7 contains guidance for determining reportability under the loss of safety function criterion which states: "In determining the reportability of an event or condition that affects a system, it is not necessary to assume an additional random single failure in that system..."

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Therefore Duke did not consider the terminal end HELB with single failure scenario to be a reportable loss of safety function because the NRC guidance specifically states that it is not reportable.

Sufficient Structures, Systems and Components are available to mitigate this HELB with single failure event. Specifically the SSF Reactor Coolant Makeup Pump is credited in the ONS CLB to supply RC pump seal injection flow in the event that the normal make up system (HPI) becomes inoperable for a number of similar scenarios including fire, turbine building flood, and sabotage. Therefore Duke does not consider this HELB with single failure to be reportable as an unanalyzed condition.

In the URI the inspector also postulated a scenario involving a crack in one of the Main FDW Lines. "The inspectors noted that the licensee did not assume breaks sized between a crack and a full break, which would also not be isolated by an AFIS signal. The inspectors noted in the licensing basis (Giambusso letter) that the licensee is required to mitigate the effects from the worst case break, which in this case would be a..." break/crack between the size of a "critical crack" as defined by the Schwencer letter and the full pipe break.

Duke's position is that the Giambusso letter did not require mitigation of the worst case break/crack. The Giambusso letter established specific criteria for determining the break locations to be analyzed, such as terminal ends, intermediate locations based on stresses, and at least 2 arbitrary intermediate locations for each piping run or branch run. The Schwencer letter revised these criteria, and does reference "a single open crack at the most adverse location." However, as quoted in the Background section above, the criteria specifically stated the size of the crack to be evaluated. No other crack sizes were required to be analyzed.

In addition, the MDS report dispositioned the critical crack as not credible because no location met the stress criterion established in the MDS report. The AEC SER specifically states that "The staff agrees with the applicant's selection of pipe failure locations and concludes that all required accident situations have been addressed appropriately..." Therefore, neither the Schwencer letter critical crack nor the inspector's postulated intermediate size crack is in the CLB for ONS.

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Despite the fact that the inspector's postulated cracks were outside the ONS CLB, ONS Engineering had performed calculations and analysis to address the inspector's concerns prior to the Inspection Report being issued. Those calculations had credited flow paths which would distribute flow from one Unit throughout a common hallway to the entire AB basement. These calculations had concluded that there were at least ten minutes available following a postulated critical crack for Operator response before sufficient water was lost to result in loss of HPI pumps due to flooding.

Following Duke recognition of the preferential paths identified by the inspector, Engineering reevaluated those calculations and concluded that critical crack scenarios could result in loss of HPI pumps due to flooding without postulating an additional single failure. However, as stated above, the CLB for ONS does not require those scenarios to be postulated.

ONS has an on-going project to reconstruct and enhance the HELB licensing basis. This includes activities to identify areas where Duke and the NRC agree that the CLB is either weak or poorly defined. Duke has also communicated its intent to correct these areas where appropriate on a risk-informed basis, including implementation of plant enhancement modifications.

With respect to the issue of the Penetration Room walls, Duke is implementing modifications to address flooding following HELB events in the east Penetration Room:

- Installation of Flood Outlet Devices (FOD) began in April 2006 on Unit 3,
- FOD installation will be complete on all units by May 31, 2007,
- Flood impoundment modifications are scheduled to be completed on all units by December 31, 2007,
- Completion of these modifications restores full compliance with the CLB relative to Penetration Room HELB events.

CAUSAL FACTORS

With respect to the inaccurate conclusions relative to preferential flow to one unit's HPI pump rooms via the pipe chase, Duke has concluded that:

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- Drawings did not adequately reflect the as-built configuration of the trench (with respect to a barrier discovered to be installed between the Unit 2 and Unit 3 sections of the pipe trench, which would restrict distribution of flood water between those units).

- Duke personnel did not adequately interpret the applicable drawings when they initially researched the configuration.

- The field walkdowns performed were inadequate to accurately identify the existing plant configuration.

As a result, the calculations and evaluations prepared to support the operability and reportability recommendations and the inspection letter response were based upon incorrect information.

CORRECTIVE ACTIONS

Immediate:

1. Duke verbally notified the NRC of the incorrect statements contained in the February 15, 2006 letter.

Subsequent:

1. Duke withdrew the February 15, 2006 letter by a letter dated March 29, 2006.

2. Engineering revised the analyses for the Penetration Room HELB and concluded that there were insufficient design features to assure adequate distribution of the flood water reaching the AB basement. Therefore existing Operator response time is not adequate to prevent loss of the HPI pumps during these beyond design basis scenarios.

Planned:

1. Revise construction drawings as needed to clarify routing of the trenches that connect to the AB pipe chase.

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2. Install flood outlet devices in the east Penetration Room for each unit.

3. Install flood impoundment features in the east Penetration Room for each unit.

4. Continue the project to reconstruct and enhance the HELB licensing basis.

Corrective actions 2, 3, and 4 are considered NRC Commitment items. There are no other NRC Commitment items contained in this LER.

SAFETY ANALYSIS

This event did not include a Safety System Functional Failure.

A HELB break or crack scenario is not likely to occur. As stated in the original HELB report, all high energy systems including the Main Steam and Main FDW Systems were conservatively designed to preclude pipe ruptures. The main FDW piping is seismically designed, has low stress levels, and is included in the erosion-corrosion monitoring program.

If a HELB break scenario were to occur, no operator actions are required to mitigate flooding consequences for the CLB FDW line break in the east Penetration Room. The Reactor Protection System [EIIS:JC] trips the reactor on high reactor coolant pressure. The AFIS isolates main FDW to the affected main FDW line. These systems will perform their associated actions regardless of the Integrated Control System [EIIS:JA]. The analysis shows that this scenario would not result in a loss of HPI, unless a single failure prevents main FDW isolation.

A "critical crack" in the main FDW piping will result in much lower peak pressures inside the east Penetration Room. The lower blowout panels provided for flood protection may not open due to the lower calculated peak pressure for "critical cracks". However, the upper panels will open to relieve the steam released from the 'critical crack". Therefore, it was assumed that the water released from the critical crack would flow to other areas of the AB and no water would be directed to outside.

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The plant response following the postulated "critical crack" is different from the FDW line break in that Operator action may be required to trip the reactor and isolate FDW to the faulted main FDW line.

Depending on location and size of the break, there is some possibility of impingement damage to cabling for the affected unit's "A" EFW flow control valve, requiring either alignment of EFW through the 'A' Startup FDW Control Valve or use of the SSF ASW.

A Probabilistic Risk Assessment evaluation was performed for a group of scenarios involving a FDW HELB in the Penetration Room. This evaluation was generated to address the URI and includes scenarios with a range of break sizes (including sizes too small to generate an AFIS signal to isolate the leak, as postulated by the NRC inspector), locations relative to the FDW check valve (cracks downstream allow blowdown of the steam generator inventory into the Penetration Room), and recovery options (HPI when available or Reactor Coolant Makeup Pump if HPI is flooded, EFW or use of the SSF ASW). The incremental Core Damage Frequency (dCDF) and Large Early Release Frequency (dLERF) varied based on which unit was affected and whether EFW or the SSF ASW system is credited for mitigation.

The worst case unit was Unit 3, with credit for SSF ASW only:

8.20 E-08 dCDF 3.62 E-09 dLERF

The incremental changes in CDF and LERF remain well below the risk thresholds of 1E-06 /yr and 1E-7 /yr respectively.

Therefore, there was no actual impact on the health and safety of the public due to this event.

ADDITIONAL INFORMATION

There were no releases of radioactive materials, radiation exposures or personnel injuries associated with this event.

This event is not considered reportable under the Equipment Performance and Information Exchange (EPIX) program.