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

Subject: Duke Power Company LLC d/b/a Duke Energy Carolinas, LLC
McGuire Nuclear Station, Unit 2
Docket No. 50-370

NRC Generic Letter (GL) 2004-02, Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors, Revised Request for Relief from the GSI-191 Completion Date, and Response to an NRC Request for Additional Information

References: Refer to Attachment 3

In a letter to the NRC dated June 28, 2006 (Reference 1), Duke Power Company LLC d/b/a Duke Energy Carolinas, LLC (Duke), requested relief from a commitment to resolve GSI-191 for McGuire Unit 2 by December 31, 2007. Subsequently, Duke identified an error in that letter (refer to Attachment 1, Page 7), received a Request For Additional Information (Reference 2) and obtained additional information during and following sump strainer modifications implemented during the Fall 2006 Unit 2 refueling outage (2EOC17). In consequence, this letter replaces the June 28, 2006 letter in its entirety.

The purpose of this letter is to request relief from the December 31, 2007 date for the resolution of GSI-191 for McGuire Unit 2, provide an updated discussion in support of that extension request, and respond to the Request for Additional Information.

Prior to 2EOC17, Duke identified weaknesses in the engineering vendor's conceptual layout of the Unit 2 replacement sump. The

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two main issues identified during the review were the physical restrictions to containment pipe chase traffic that would be created by the completed installation and questionable margin to address chemical effects. Addressing these issues necessitated that a majority of the sump strainer surface be redesigned and relocated, resulting in a delayed implementation of the sump modification. Thus, Duke developed plans to implement the Unit 2 sump strainer modifications in two phases. Phase 1, which was implemented during 2EOC17, increased the available sump strainer surface area from approximately 135 square feet to approximately 1045 square feet. Phase 2, which will be implemented during 2EOC18, plans to install approximately 595 additional square feet. To accomplish Phase 2 and comply with GSI-191, Duke requests an extension of the December 31, 2007 date for resolution of GSI-191 until the start of the Unit 2 Spring 2008 refueling outage. This is an extension of approximately 3 months.

Previous schedule commitments regarding completion of the McGuire Unit 1 sump strainer modification remain unchanged, with full installation scheduled for the Spring 2007 refueling outage.

Attachment 1 of this letter provides more detail regarding the above delay, as well as descriptions of the Phase 1 and Phase 2 sump strainer modifications and other mitigative measures that have or will be taken for McGuire Unit 2 prior to the final resolution of GSI-191.

Attachment 2 provides Duke's response to the RAI identified in Reference 2.

If any questions arise or additional information is needed, please contact C. J. Thomas at (704) 875-4535.

Very truly yours,

Gary R. Peterson

Gary R. Peterson affirms that he is the person who subscribed his name to the foregoing statement, and that all the matters and facts set forth herein are true and correct to the best of his knowledge.

Gary R. Peterson
Vice President
Duke Energy Corporation

Subscribed and sworn to me: Date 2/9/2007

Notary Public JANICE MORRISON

My commission expires: Date 3/6/2008

SEAL

OFFICIAL SEAL
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Attachment 1
Justification for Extension of the Resolution of GSI-191 for McGuire Unit 2

SECY-06-0078, "Status of Resolution of GSI-191, "Assessment of [Effect of] Debris Accumulation on PWR Sump Performance" dated March 31, 2006 provides criteria for evaluating delay of hardware changes related to resolution of GSI-191. SECY-06-0078 states:

> "Proposed extensions to permit changes at the next outage of opportunity after December 2007 may be acceptable if, based on the licensee's request, the staff determines that:
>
> - The licensee has a plant-specific technical/experimental plan with milestones and schedule to address outstanding technical issues with enough margin to account for uncertainties and
>
> - The licensee identifies mitigative measures to be put in place prior to December 31, 2007, and adequately describes how these mitigative measures will minimize the risk of degraded ECCS and CSS functions during the extension period."

Background

In the Duke September 1, 2005, "Response to GL 2004-02, Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," (Reference 3) McGuire stated the intent to modify the existing containment sump to increase the effective strainer area to approximately 2000 square feet. The available layout space for this expanded sump was identified as a combination of pipe chase (existing sump footprint plus significant walkway area) and containment floor space inside the crane wall. Note that substantial removal/relocation of interference items is a prerequisite to strainer installation in these areas.

The engineering vendor evaluated the available space provided by moving all interferences deemed practical, and accounting for strainer submergence requirements, determined the maximum strainer surface area that could be accommodated was approximately 1700 square feet. This surface area was considered adequate by the engineering vendor.

However, during the final design reviews and confirmation tests conducted prior to the Fall 2006 refueling outage, McGuire raised concerns with the engineering vendor's conceptual layout of the replacement sump. The two main issues were:

1. Impacts on pipe chase accessibility:

   The proposed layout had significant adverse impacts on access and transport of materials in the pipe chase area, with several passageway restrictions reduced to a vertical clearance of less than 20 inches. This additional congestion would increase maintenance durations and personnel dose, as well as pose added safety risks due to tight confines and possible complications in the event that evacuation of injured personnel is required.

2. Questionable design margin:

   Although analysis supported approximately 1700 square feet of strainer surface area, Duke requested additional margin to compensate for unknowns associated with ongoing chemical effects analyses.

As a result, the Unit 2 sump modification was redesigned to accomplish the installation of an increased final sump strainer area in two phases. The strainer modules located in the pipe chase walkway area were deleted and additional strainer area was added inside the crane wall. This change in design resulted in a substantial increase in the scope of the interference removal; namely, removal of one train of the containment purge recirculation filter package and fan. The containment purge recirculation filter package is non-safety and its purpose is to reduce the radioactivity level in lower containment by circulating the air through cleanup filters. Additionally, significant increases in the scope of fabrication of plenums, strainer modules, and the strainer enclosure were associated with the redesign effort for this modification.

Unit 2 Phase 1, which was implemented during 2EOC17, increased the available sump strainer surface area from approximately 135 square feet to approximately 1045

square feet. Approximately 900 additional square footage of strainer surface area had been planned for installation during Phase 2 (which will be implemented during 2EOC18).

In January 2007, Duke concluded that the lack of available space in McGuire Unit 2's lower containment, as well as interference items, which could not be prudently relocated or modified, prevented installation of an additional 900 square feet to the strainer. Therefore, current plans call for the installation of approximately 595 additional square feet of strainer surface area. Following completion of Phase 2, the total available sump strainer surface area will be approximately 1640 square feet.

The completion of chemical effects studies and other evaluations is required to confirm that McGuire's ECCS recirculation functions under debris loading conditions will be in full compliance with the Applicable Regulatory Requirements section of NRC Generic Letter 2004-02.

Mitigative Measures

The following mitigative measures have been put in place to minimize the risk of degraded ECCS and CSS functions during the requested extension period:

A. Interim Modification/Measures Completed During the Fall 2006 Refueling Outage for Unit 2 (Phase 1)

1. Phase 1 of ECCS Sump Strainer Modification

The original ECCS sump screens have been removed. Approximately 1045 square feet of strainer surface area was installed.

On page 3 of Attachment 1 to Duke's June 28, 2006 letter providing justification for the time extension for McGuire Unit 2, Duke stated that the strainer area would be interconnected such that either ECCS train can take suction from the combined total strainer structure. During preparation for the installation of the Phase 1 ECCS sump strainer modification, Duke discovered

original licensing correspondence that questioned the acceptability of an interconnected sump. In consequence, Duke installed a divider plate as an interim solution until its removal could be justified.

Activities continue to occur so as to ensure that the ECCS recirculation functions under debris loading conditions at McGuire will be in full compliance with the Applicable Regulatory Requirements section of NRC Generic Letter 2004-02.

2. Microtherm® Insulation Replacement

The twelve panels of Microtherm® insulation previously installed on the Unit 2 reactor vessel head have been removed and replaced with reflective metal insulation (RMI). Test data have demonstrated that Micro-porous insulation debris, combined with other fiber debris, creates a debris bed that can cause relatively high head losses.

By significantly increasing the available strainer surface (approximately 1045 square feet compared to the previous total sump screen area of approximately 135 square feet), and by eliminating the worst type of debris (micro-porous fiber), it is qualitatively judged that the likelihood of strainer blockage has been substantially decreased.

B. Programmatic Controls to Reduce Debris in Containment

McGuire has several programmatic controls in place to ensure that potential sources of debris that may be introduced into containment will be assessed for adverse effects on the ECCS and Containment Spray System recirculation functions. These programmatic controls include requirements related to coatings, containment housekeeping, materiel condition, and modifications. Typical programmatic controls are described below:

Attachment 1
Justification for Extension of the Resolution of GSI-191 for McGuire Unit 2

1. Coating Program

   As described in Duke's November 11, 1998 response to Generic Letter 98-04, "Potential for Degradation of the Emergency Core Cooling System and the Containment Spray System after a Loss-of-Coolant Accident Because of Construction and Protective Coating Deficiencies and Foreign Material in Containment," (Reference 5), Duke has established controls for the procurement, application, and maintenance of Duke applied Service Level 1 protective coatings used inside containment. The requirements of 10 CFR 50, Appendix B are implemented through the specification of appropriate technical and quality requirements for the Service Level 1 coating program. For Service Level 1 coatings, Duke is committed to comply with Regulatory Guide 1.54 at McGuire. As described in Attachment 1 to the November 11, 1998 letter, vendor-coated mechanical and electrical equipment coatings are considered unqualified.

2. Containment Housekeeping/Materiel Condition

   Duke's August 7, 2003 response to Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized Water Reactors," (Reference 6), described planned actions regarding containment cleanliness. These actions have been implemented and provide for containment cleaning and visual inspections.

   Extensive containment cleaning is performed during each refueling outage using water spray, vacuuming, and hand wiping. In general, this is limited to the space in lower containment that would be submerged under large break LOCA conditions. Additionally, localized wash downs are performed as needed. Visual inspections are performed on the remaining areas of containment. Foreign material is removed as

necessary. Material accountability logs are maintained in Modes 1 through 4 for items carried into and out of containment. These controls are implemented using administrative procedures.

3. Modification Process

Duke's modification process currently includes an administrative procedure that directs the design and implementation of engineering changes in the plant. This procedure directs that engineering changes be evaluated for system interactions. As part of this evaluation, there is direction to include consideration of any potential adverse effect with regard to debris sources and/or debris transport paths associated with the containment sump.

C. Operator Actions and Training

Duke's May 27, 2004, "Response to NRC Bulletin 2003-01; Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors," (Reference 7), committed to the following actions that were recommended by WCAP-16204 to reduce the risk associated with potential containment emergency sump blockage during ECCS and Containment Spray recirculation functions:

- Initiate refueling water storage tank makeup following the successful transfer of ECCS and containment spray suction to the containment emergency sump.

- Describe the symptoms of sump clogging problems.

- Originate a response procedure to provide guidance for the potential of both trains of ECCS and containment spray being affected by containment sump blockage.

Additionally, Duke implemented a procedure change which:

- Relocated the step to shut down a containment spray pump when it is no longer required to mitigate the event. This step now occurs earlier in the procedure.

These actions have been completed and appropriate operator training conducted. The actions taken to address each of the above listed items are documented in the Duke corrective action program.

On page 5 of Attachment 1 to the June 28, 2006 letter, Duke erroneously stated that procedural changes had been implemented to manually start a containment air return fan to enhance air flow through the ice condenser. Although procedure changes had been proposed, they had not been implemented because the proposed June 29, 2005 License Amendment Request to allow the manual start of a containment air return fan in response to NRC Bulletin 2003-01 (Reference 4) had not been approved.

The subject License Amendment Request was approved by the NRC on September 25, 2006. The required training and implementation of revised procedures were completed on November 15, 2006.

Implementation Schedule

Prior to the Unit 2 Fall 2006 outage, a redesign of the originally proposed strainer was performed to accommodate installation of the replacement strainer in two phases. Phase 1 includes those portions of the strainer to be installed in the Unit 2 Fall 2006 outage. The Phase 1 redesign provided for the installation of the pipe chase portion of the proposed strainer design, redesign of the portion located inside the polar crane wall to accept future expansion, and redesigned the plenums in the pipe chase. Also during installation of Phase 1, interferences were removed and other work performed in preparation for the installation of Phase 2.

The Phase 2 portion of the redesign will address the expansion of the lower containment strainer during the Unit 2 Spring 2008 outage. The Phase 2 design is currently scheduled to be completed by mid-2007. Installation of Phase 2 will occur during the Unit 2 Spring 2008 outage.

Risk Assessment

A probabilistic risk assessment (PRA) was performed by Duke to specifically assess the impact of extending the time for implementing the final Phase 2 sump strainer modification at McGuire Unit 2 until the Spring 2008 refueling outage (a 70-day delay was assumed).

The risk assessment is conservative because it:

- takes no credit for actual available net positive suction head (NPSH) margin that exists at the plant,
- gives only modest credit for operator mitigation regarding the failure of actions to recover from loss of the Emergency Core Cooling System (ECCS) during recirculation and restoring injection from the Refueling Water Storage Tank (RWST),
- gives only modest credit for previous compensatory actions taken by the plant in response to NRC Bulletin 2003-01 and GL 2004-02, such as development of a specific Emergency Procedure and associated operator training to address containment sump blockage, and
- includes conservative assumptions regarding the potential for sump blockage.

The following documents were reviewed to ensure the approach taken in the analysis was reasonable and consistent with industry documents listed below:

- WCAP-16362, *PRA Modeling Template for Sump Blockage* (April 2005),

- NUREG/CR-6771, *GSI-191: The Impact of Debris-Induced Loss of Emergency Core Cooling System (ECCS) Recirculation on Pressurized Water Reactor (PWR) Core Damage Frequency,*

- NEI 04-07, *Pressurized Water Reactor Sump Performance Evaluation Methodology, and the associated NRC Safety Evaluation Report(SER) [note: reference to the NRC SER was not included in Duke's June 28, 2006 letter. Inclusion into the text of this letter has been made for clarification and completeness. Please reference Duke's response to the NRC's Request for Additional Information, Question 1, included as Attachment 2 to this letter].*

- LA-UR-02-7562, *The Impact of Debris-Induced Loss of ECCS Recirculation on PWR Core Damage Frequency, and*

- WCAP-16204, *Evaluation of Potential ERG and EPG Changes to Address NRC Bulletin 2003-01 Recommendations.*

The results of the PRA demonstrated that the risk associated with extending the modification schedule by 70 days is <1E-6.

Attachment 2
Response to Request for Additional Information

Background Information:

On July 19, 2006, following NRC review of the reference 1 letter, a list of RAI questions (Reference 2) was provided by the NRC project manager via electronic mail. The RAI was discussed via a teleconference with the NRC Project Manager on August 16, 2006.

RAI Questions and Responses

Question 1:

In performing the requested extension impact PRA, Duke Energy said that they had referred to NEI 04-07 for guidance. Did Duke Energy also refer to the NRC Safety Evaluation (SE) on NEI 04-07 (located on the NRC external web site at: http://www.nrc.gov/reactors/operating/ops-experience/pwr-sump-performance/regs-guidance.html#five)?

Response 1:

Duke did review both NEI 04-07 and the companion SE.

The methodology described in NEI 04-07 and evaluated in the NRC SE provides guidance for use in evaluating the susceptibility of PWR containment sumps to blockage resulting from the effects of a postulated LOCA.

Question 2:

Duke Energy stated that they will remove Microtherm® (micro-porous fiber) from the vessel head in the Fall 2006 outage, and that they had qualitatively judged that the likelihood of strainer blockage is therefore substantially decreased. What is the relative significance of the removed Microtherm® clogging potential from the clogging potential of other material to be left in containment after the Fall 2006 outage (i.e. describe the basis for the Duke Energy qualitative judgment).

Response 2:

The risk of strainer blockage based upon the insulation on the vessel head is only present for the fraction of breaks that would be postulated to generate debris from

this area. The reduction in risk for sump clogging (based upon reflective metal insulation debris as opposed to micro-porous fiber) is judged to be significant, but again, this comparison only applies to those breaks that generate debris from the vessel head region.

The baseline analysis conducted by the engineering vendor, Enercon, states that the largest debris-generating break (a double-ended guillotine break of the cross-over leg) would require a minimum sump screen area of 1000 square feet. An additional 359 square feet is required for identified latent debris. The largest particulate-generating break (with micro-porous fiber being classed as a particulate) was modeled as a break at a control rod drive mechanism. To ensure that thin-bed effects from the micro-porous debris were avoided, a minimum strainer area of 1300 square feet was required (plus 359 square feet for latent debris). Thus, the initial analysis showed that the limiting case break for determining strainer size was located at the vessel head. Note that chemical effects and limitations in interstitial volumes given by complex strainer geometries are not reflected in these baseline evaluation conclusions.

The twelve panels of Microtherm® insulation previously installed on the Unit 2 reactor vessel head have been removed and replaced with reflective metal insulation (RMI).

The "other material to be left in containment" (i.e., primarily Nukon and Thermal-Wrap insulation that is used on Steam Generators, Reactor Coolant Pumps, and Reactor Coolant System piping) will pose the majority of the fibrous debris loads in the remaining limiting-case LOCAs, and this source is not affected by the vessel head insulation exchange.

Question 3a:

Duke Energy stated that it had established controls for the procurement, application and maintenance of Service Level 1 protective coatings used inside containment. What is the coating status inside containment?

Response 3a:

The Service Level 1 Coatings inside containment are in good condition. Minimal degradation has been noted from outage to outage.

Question 3b:

Are the majority of coatings considered qualified?

Response 3b:

The majority of coatings inside containment are qualified. McGuire's UFSAR limits the amount of unqualified coatings to 20,000 square feet, which conservatively equates to approximately 10 percent of the total surface area inside containment.

Question 3c:

Has there been a program to remove unqualified or degraded coatings?

Response 3c:

Degraded coatings are identified during the coatings assessments performed during each refueling outage. These degraded coatings are evaluated, removed, and repaired as necessary to maintain the inventory of unqualified coatings within the licensing basis and minimize the amount of coatings that may be susceptible to detachment during a Design Basis Accident (DBA). McGuire has not undertaken a specific program to remove unqualified coatings from inventory and replace them with qualified Service Level 1 coatings.

Question 3d:

What have been the improvements resulting from the new coatings controls since their initiation?

Response 3d:

The coatings assessment program provides a method to monitor the condition of Service Level 1 coatings every outage and take necessary steps to evaluate and repair

degraded coatings as discussed above. Coatings controls for the other attributes of the coatings program are described in Reference 5.

Question 4:

Duke Energy stated that during the Fall 2006 Phase 1 ECCS Sump Strainer Modification an 1100 square foot strainer would be installed (from which both ECCS trains may draw suction). However, Duke Energy did not state the size (surface area) of the strainer to be installed in the Spring 2008 Phase 2 ECCS Sump Strainer Modification. What is the size of the planned Phase 2 strainer?

Response 4:

Phase 1, which was implemented during 2EOC17, increased the available sump strainer surface area from approximately 135 square feet to approximately 1045 square feet. Phase 2, which will be implemented during 2EOC18, plans to install approximately 595 additional square feet. Following completion of Phase 2, the total available sump strainer surface area will be approximately 1640 square feet.

As previously stated, Attachment 1 to Duke's June 28, 2006 letter stated that the strainer area would be interconnected such that either ECCS train can take suction from the combined total strainer structure. During preparation for the installation of the Phase 1 ECCS sump strainer modification, Duke discovered original licensing correspondence that questioned the acceptability of an interconnected sump. In consequence, Duke installed a divider plate as an interim solution until its removal could be justified.

The completion of chemical effects studies and other evaluations is required to confirm that McGuire's ECCS recirculation functions under debris loading conditions will be in full compliance with the Applicable Regulatory Requirements section of NRC Generic Letter 2004-02.

Attachment 3
References

1. Letter, H. B. Barron, Duke Power Company to U.S. Nuclear Regulatory Commission, Dated June 28, 2006, SUBJECT: McGuire Nuclear Station, Unit 2, Docket No. 50-370, NRC Generic Letter 2004-02, Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized Water Reactors, Request for Relief from December 31, 2007 Implementation (ML061990412).

2. Email, John F. Stang, NRC Project Manager to Charles J. Thomas RGC Manager, Duke Power Company, Dated July 19, 2006, SUBJECT: FWD: McGuire Unit 2 GSI Extension Request Conference Call

3. Letter, J. R. Morris, Duke Power Company to U.S. Nuclear Regulatory Commission, Dated September 1, 2005, SUBJECT: Duke Energy Corporation, Oconee Nuclear Stations, Units 1, 2, & 3, Docket Nos. 50-269,50-270, 50-287, : McGuire Nuclear Station, Units 1 and 2 Docket Nos. 50-369, 50-370, Catawba Nuclear Station, Units 1 and 2, Docket Nos. 50-413 and 50-414, Response to NRC Generic Letter 2004-02, Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors (ML052500399).

4. Letter, J. R. Morris, Duke Power Company to U.S. Nuclear Regulatory Commission, Dated June 29, 2005, SUBJECT: Duke Energy Corporation, McGuire and Catawba Nuclear Stations, Units 1, 2, & 3, Docket Nos. 50-369,50-370; and 50-413 and 50-414, respectively, Amendment to Allow and Additional Operator Action to Manually Start One Containment Air Return Fan in Response to NRC Bulletin 2003-01(ML051890090).

5. Letter, M. S. Tuckman, Duke Power Company to U.S. Nuclear Regulatory Commission, Dated November 11, 1998, SUBJECT: Catawba Nuclear Station, Units 1 & 2, Docket Nos. 50-413, 414, McGuire Nuclear Station, Units 1 & 2 Docket Nos. 50-369, 370, Oconee Nuclear Stations, Units 1, 2, & 3, Docket Nos. 50-269, 270, 287, Response to Generic Letter 98-04: Potential for Degradation of the Emergency Core Cooling System and the Containment Spray System After a Loss-of-Coolant Accident Because of Construction and Protective Coating Deficiencies and Foreign Material in Containment.

Attachment 3
References

6. Letter, W. R. McCollum, Duke Energy Corporation to U.S. Nuclear Regulatory Commission, Dated August 7, 2003 SUBJECT: McGuire Nuclear Station, Units 1 & 2 Docket Nos. 50-369, 370, Catawba Nuclear Station, Units 1 & 2, Docket Nos. 50-413 & 414, Oconee Nuclear Stations, Units 1, 2, & 3, Docket Nos. 50-269, 270, 287, Response to NRC Bulletin 2003-01: Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized Water Reactors (ML032260651).

7. Letter, W. R. McCollum, Duke Energy Corporation to U.S. Nuclear Regulatory Commission, Dated May 27, 2004, SUBJECT: Catawba Nuclear Station, Units 1 & 2, Docket Nos. 50-413 , 414, McGuire Nuclear Station, Units 1 & 2 Docket Nos. 50-369, 370, Response to NRC Bulletin 2003-01: Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized Water Reactors (ML041540365).