



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

REGION II  
SAM NUNN ATLANTA FEDERAL CENTER  
61 FORSYTH STREET, SW, SUITE 23T85  
ATLANTA, GEORGIA 30303-8931

December 7, 2007

EA-07-219

Duke Power Company LLC  
d/b/a Duke Energy Carolinas, LLC  
ATTN: Mr. G. R. Peterson  
Vice President  
McGuire Nuclear Station  
12700 Hagers Ferry Road  
Huntersville, NC 28078-8985

SUBJECT: MCGUIRE NUCLEAR STATION - NRC INSPECTION REPORT  
05000369/2007010 AND 05000370/2007010

Dear Mr. Peterson:

The purpose of this letter is to provide you with the Nuclear Regulatory Commission's (NRC's) final significance determination for a finding at Duke Power Company's (Duke) McGuire Nuclear Station (MNS) involving the failure to take adequate corrective actions for an identified nonconformance. This nonconformance involved the discovery that the emergency core cooling system (ECCS) cold leg injection throttle valves had the potential for clogging during high pressure recirculation because their narrow plug-to-seat clearances were smaller than the ECCS sump screen openings. More specifically, Duke's corrective action failed to adequately implement credited inspections of the inside of the ECCS sump. This was evidenced by the 2006 discovery, during an unrelated inspection, of a significant amount of aged yellow duct tape inside the Unit 2 ECCS sump around the suction and guard pipe of both ECCS trains. As documented in our Choice Letter dated September 10, 2007, this finding was assessed under the significance determination process as a preliminary greater than Green issue (i.e., an issue of at least low to moderate safety significance), as well as identified as an apparent violation (AV 05000370/ 2007008-01) of 10 CFR Part 50, Appendix B, Criterion XVI, Corrective Action. The Choice Letter offered you the opportunity to give us your assessment of the risk significance and the associated apparent violation so that we would have a complete understanding of this issue prior to determining the final significance.

At your request, an open regulatory conference was conducted with members of your staff on October 25, 2007, to discuss Duke's position on this issue. The enclosures to this letter include the list of attendees at the regulatory conference, and copies of the material presented by your staff and the NRC at the regulatory conference. During the conference, you provided the results of the testing (i.e., duct tape adhesion testing, heat exchanger/duct tape flow testing, and throttle valve/duct tape flow testing) and the risk analysis performed by Duke, and your conclusion that the finding was of very low safety significance. In addition, you agreed with NRC's characterization of the finding as a violation of regulatory requirements, and advised of the sump strainer design modifications that have addressed the throttle valve clearance non-conformance, as well as the improvements made or planned with foreign material exclusion control processes and procedures.

As presented, Duke's "very low" risk determination was reflective of the following two primary differences from the NRC's phase 3 analysis: (1) Duke credited automatic closure of the main steam isolation valves (MSIVs) for steam line break (SLB) initiators; and (2) Duke evaluated the probability of losing high pressure recirculation ECCS flow based on test results, as well as the potential for tape release and transport. The NRC's disposition of some of the key points raised by these two primary differences is as follows:

- With respect to modeling SLB initiators, the NRC changed the Standardized Plant Analysis Risk (SPAR) model to better reflect MNS design and operation, by crediting the automatic closure of MSIVs. Also incorporated into the model was appropriate credit for operators inducing a very rapid primary system depressurization and utilizing low pressure recirculation in the event that high pressure recirculation fails for stuck open relief valve sequences and smaller medium loss of coolant accident sequences.
- By virtue of the fact the lower 1/3 of the tape around the ECCS suction piping was no longer there (attributed by Duke to soaking in borated water leakage past the sump suction valves and subsequently being pumped out), and the likelihood the pipe surface was not prepped/cleaned before applying the tape (as it was for Duke's new tape adherence test), the NRC did not find Duke's argument for tape non-release to be very persuasive. Consequently, with the tape already being in the sump and approximately the same density as the expected sump water, there is no compelling reason to expect it not to make its way to the ECCS suction piping. Based on the above, the NRC concluded there was a lack of reasonable assurance that the tape wouldn't be transported into the ECCS flow stream.
- NRC acknowledged an ECCS flow split between the containment spray (NS) and residual heat removal (ND) systems; but one that is based on local area effects such as flow velocities and turbulence. With NS and ice condenser systems expected to provide effective containment pressure control for the events in question (i.e., spurious pressurizer safety valve operation, feed and bleed sequences, and primary pipe breaks in the one-inch to three-inch range), an additional ECCS flow diversion via the ND auxiliary containment spray system as suggested by Duke was not considered likely. As such, the assignment of a 50-50 flow split was considered reasonable.
- Duke's testing efforts were not considered to be fully representative of system operating conditions, as they reflected a number of variabilities/uncertainties inherent to being a simulation and not a duplication of actual system conditions. Consequently, we were unable to draw precise conclusions as to the impact the duct tape would have on flow through the ECCS intermediate head injection (IHI) system and high head injection (HHI) system cold leg throttle valves. Rather, Duke's testing tended to support the general conclusions of NUREG/CR-6902 that: smaller clearances are more likely to clog; a continuous debris stream seems to have an adverse effect; and mixed debris fields seem to have an adverse effect. With this in mind, it is not unreasonable to conclude that the throttle valves in the plant which are approximately one turn open (four of four IHI and two of four HHI) are vulnerable to clogging and those valves approximately 2.75 turns open (two of four HHI) would likely be less vulnerable to clogging.

Subsequent SPAR runs were made using the modified model to determine the change in risk for different values of failure (due to clogging) of the HHI and IHI valves, and for different values of the human actions associated with the operators failing to successfully depressurize the primary system. The results span several orders of magnitude, from Green (with full credit for the HHI throttle valves to pass sufficient flow to remove decay heat) to Yellow (with failure of the IHI and HHI throttle valves to pass sufficient flow to remove decay heat). After considering these results, as well as the information developed during the inspection and the points addressed above, the NRC has determined that it is not likely that the two HHI throttle valves which are 2.75 turns open would clog to the point of precluding sufficient decay heat removal. As such, it has been concluded that the inspection finding is appropriately characterized in the mitigating systems cornerstone as having very low safety significance (Green). This final significance determination should not be construed as minimizing the importance of maintaining ECCS sump foreign material exclusion. Rather, it reflects how fortuitous it was that the foreign material consisted entirely of soft debris and that MNS has robust ECCS pump and ND heat exchanger designs, as well as the redundancy of both an IHI and HHI system (the latter of which has two of its four throttle valves approximately 2.75 turns open).

Additionally, the finding was also determined to be a violation of NRC requirements, as delineated in the Choice Letter and presented during the regulatory conference (see Enclosure 2). As previously addressed in the Choice Letter, this finding has a cross-cutting aspect of appropriate corrective actions in the area of problem identification and resolution (Inspection Manual Chapter 0305, Section 06.07, P.1.(d)), and is reflective of the importance in properly implementing established engineering processes to ensure plant licensing and design bases are maintained when dispositioning conditions adverse to quality. Because of its very low safety significance and because the issue was entered into your corrective action program, the NRC is treating the finding as a non-cited violation (NCV) consistent with Section VI.A.1 of the NRC Enforcement Policy. If you contest this NCV, you should provide a response within 30 days of the date of this Final Significance letter, with the basis for your denial, to the United States Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555-0001, with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, D.C. 20555-0001; and the NRC Resident Inspector at the McGuire facility.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and any response will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

For administrative purposes, this letter is issued as NRC Inspection Report No. 05000369,370/2007010, and the above violation is identified as NCV 05000370/2007010-01: Failure to Take Adequate Corrective Action For A Nonconformance Associated With ECCS Throttle Valves. Accordingly, the associated apparent violation AV 05000370/2007008-01 is closed.

DEC

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Should you have any questions regarding this letter, please contact James H. Moorman, III, Chief, Reactor Projects Branch 1, at (404)-562-4647.

Sincerely,

*/RA/*

Charles A. Casto  
Acting Deputy Regional Administrator

Docket Nos.: 50-369, 50-370  
License Nos.: NPF-17, NPF-9

Enclosures: 1. List of Attendees  
2. Material presented by NRC  
3. Material presented by Duke

cc w/encls: (see page 5)

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X PUBLICLY AVAILABLE       NON-PUBLICLY AVAILABLE       SENSITIVE      X NON-SENSITIVE

ADAMS: X Yes      ACCESSION NUMBER: \_\_\_\_\_

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NAME	CEvans	JMoorman	JShea	SMcGruder	BBoger	JBrady	RBernhard	MCunningham
DATE	12/06/2007	12/04/2007	12/06/2007	12/7/2007	12/06/2007	12/4/2007	12/5/2007	12/6/2007
E-MAIL COPY?	YES      NO	YESNO	YES NO	YES      NO	YES      NO	YES      NO	YES      NO	YES      NO

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cc w/encl:

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DEC

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Letter to G. R. Peterson from Joseph W. Shea dated December 7, 2007

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05000369/2007010 AND 05000370/2007010

Distribution w/encl:

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**McGuire Regulatory Conference  
Meeting Attendee List**

NRC

Victor McCree, Deputy Regional Administrator, Region II (RII)  
Harold Christensen, Deputy Division Director, Division of Reactor Projects (DRP), RII  
James Moorman, Chief, Projects Branch 1, DRP, RII  
Michael Franovich, Acting Deputy Director, Division of Risk Assessment (DRA), Nuclear  
Reactor Regulation (NRR)  
John Kramer, Acting Branch Chief, DRA, NRR  
Charles Payne, Chief, Engineering Branch 2, Division of Reactor Safety (DRS), RII  
Rudolph Bernhard, Senior Reactor Analyst, DRS, RII  
Carolyn Evans, Regional Counsel, Enforcement and Investigation Coordination Staff (EICS), RII  
Scott Sparks, Senior Enforcement Specialist, EICS, RII  
George MacDonald, Senior Reactor Analyst, DRS, RII  
Walter Rogers, Senior Reactor Analyst, DRS, RII  
Terrence Reis, Branch Chief, Reactor Inspection Branch, Division of Inspections and Regional  
Support, NRR  
Stewart Magruder, Jr., Deputy Director, Office of Enforcement  
Kent Wood, Technical Assistant, Division of Safety Systems, NRR  
Joseph Brady, Senior Resident Inspector, McGuire Nuclear Station  
Robert Carroll, Senior Project Engineer, DRP, RII  
\*John Stang, McGuire Project Manager, NRR  
\*Evangelos Marino, Chief, Plant Licensing Branch, Division of Operating Reactor Licensing, NRR  
\*Donna Wright, Plant Licensing Branch, NRR  
\*Ryan Eul, Resident Inspector, McGuire Nuclear Station

Licensee

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Regis Repko, Station Manager, MNS  
Jim Kammer, Safety Assurance Manager, MNS  
Duncan Brewer, Safety Assessment Manager, MNS  
Jeff Nolin, Mechanical Civil Engineering (MCE) Manager, MNS  
Ken Ashe, Regulatory Compliance Manager, MNS  
Mike Barrett, Principal Engineer, Probabilistic Risk Assessment  
Bryan Meyer, MCE Senior Engineer, MNS

\*Participated in meeting via telephone