



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION II
SAM NUNN ATLANTA FEDERAL CENTER
61 FORSYTH STREET, SW, SUITE 23T85
ATLANTA, GEORGIA 30303-8931

March 31, 2010

Mr. Regis T. Repko
Vice President
Duke Power Company, LLC
d/b/a Duke Energy Carolinas, LLC
McGuire Nuclear Station
MG01VP/12700 Hagers Ferry Road
Huntersville, NC 28078

**SUBJECT: MCGUIRE NUCLEAR STATION - NRC SUPPLEMENTAL INSPECTION
REPORT 05000369/2010007 AND 05000370/2010007**

Dear Mr. Repko:

On March 9, 2010, the U.S. Nuclear Regulatory Commission (NRC) completed a supplemental inspection pursuant to Inspection Procedure 95001, "Inspection for One or Two White Inputs in a Strategic Performance Area," at your McGuire Nuclear Station, Units 1 and 2. The enclosed inspection report documents the inspection results, which were discussed at the exit meeting on March 9, 2010, with Mr. Steven D. Capps and other members of your staff.

As required by the NRC Reactor Oversight Process Action Matrix, this supplemental inspection was performed because a finding of low to moderate safety significance (White) was identified in the third quarter of 2008 for failure to correct a significant condition adverse to quality related to macro-fouling of the nuclear service water (RN) system strainers. This finding was documented previously in NRC Inspection Report 05000369,370/2008009 and resulted in Violation (VIO) 05000369,370/2008009-01, Failure to Take Adequate Corrective Action for Implementation of Safety-Related RN Strainer Backwash. The NRC was informed of your readiness for the inspection on January 11, 2010.

The objectives of this supplemental inspection were to provide assurance that: (1) the root causes and the contributing causes for the risk-significant issues were understood; (2) the extent of condition and extent of cause of the issues were identified; and (3) corrective actions were or will be sufficient to address and preclude repetition of the root and contributing causes.

This inspection examined activities conducted under your license as they related to safety and compliance with the Commission's rules and regulations, and with the conditions of your license. The inspector reviewed the root cause determination report, selected procedures and records, and interviewed personnel.

The inspector determined that your staff, in general, performed an adequate evaluation of the White finding. Your staff's evaluation determined that the root cause of the issue was changing the configuration of the plant without a total understanding of the design and licensing bases for the RN system strainers during accident conditions, which resulted in the inability to conduct manual strainer backwashes during certain plant conditions.

Your staff also identified that this lack of understanding of design and licensing bases was not limited to the RN strainers, but to the RN system in general and has taken corrective actions to ensure the system design basis documents accurately reflect current licensing bases. The inspector determined that the corrective actions taken and planned will restore the RN strainer to full compliance with the licensing basis. In addition, the inspector found that corrective actions taken or planned appear reasonable and will correct the causes that led to the non-compliance and prevent recurrence. However, the inspector had several observations regarding specific aspects of the root cause evaluation and corrective actions that warranted additional consideration by your staff. These observations were discussed with your staff at the exit meeting and are included in the report.

Based on the results of this supplemental inspection, no findings of significance were identified.

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

Sincerely,

/RA/

Jonathan H. Bartley, Chief
Reactor Projects Branch 1
Division of Reactor Projects

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

Enclosure: NRC Integrated Inspection Report 05000369/2010007 and 05000370/2010007
w/Attachment - Supplemental Information

cc w/encl: (See page 3)

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cc w/encl: (See page 3)

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SIGNATURE	KJK /RA/	JBB /RA/	JHB /RA/				
NAME	KKorth	JBrady	JBartley				
DATE	03/31/2010	03/31/2010	03/31/2010				
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO

DEC

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Letter to Regis T. Repko from Jonathan H. Bartley dated March 31, 2010

SUBJECT: MCGUIRE NUCLEAR STATION - NRC SUPPLEMENTAL INSPECTION REPORT
05000369/2010007 AND 05000370/2010007

Distribution w/encl:

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**U.S. NUCLEAR REGULATORY COMMISSION
REGION II**

Docket Nos.: 50-369, 50-370

License Nos.: NPF-9, NPF-17

Report Nos.: 05000369/2010007, 05000370/2010007

Licensee: Duke Energy Carolinas, LLC

Facility: McGuire Nuclear Station, Units 1 and 2

Location: Huntersville, NC 28078

Dates: March 1, 2010, through March 9, 2010

Inspectors: K. Korth, Resident Inspector Browns Ferry Nuclear Plant

Approved by: Jonathan H. Bartley, Chief
Reactor Projects Branch 1
Division of Reactor Projects

Enclosure

SUMMARY OF FINDINGS

IR 05000369/2010007, 05000370/2010007; 03/01/2010 – 03/09/2010; McGuire Nuclear Station, Units 1 and 2; Supplemental Inspection IP 95001 in response to a White inspection finding for failure to correct a significant condition adverse to quality related to macro-fouling of the nuclear service water (RN) system strainers.

This inspection was conducted by a resident inspector. No findings of significance were identified. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

Cornerstone: Mitigating Systems

This supplemental inspection was performed in accordance with Inspection Procedure (IP) 95001, "Inspection for One or Two White Inputs in a Strategic Performance Area," to assess the licensee's evaluation associated with a White inspection finding involving with the inability to perform manual backwash on the Nuclear Service Water (RN) strainers identified in August of 2007. The NRC staff previously characterized this issue as having low to moderate safety significance (White) as documented in NRC IR 05000369,370/2008009.

During this supplemental inspection, the inspector determined that, in general, the licensee performed an adequate evaluation of the White finding. The licensee's evaluation determined that the root cause of the issue was changing the configuration of the plant without a total understanding of the design. The RN strainer backwash system had been modified to replace RN strainer backwash outlet manual valves with air-operated valves that could not be manually over-ridden. This root cause, along with four other contributing causes, led to operation of the system from 2000/2001 to 2007 without having the capability to manually backwash the strainers following a loss of instrument air (VI). The licensee also identified that this lack of understanding of design and licensing bases was not limited to the RN strainers, but to the RN system in general and has taken corrective actions to ensure the system design basis documents accurately reflect current licensing bases. The inspector determined that the corrective actions taken and planned will restore the RN strainer to full compliance with the licensing basis. In addition, the inspector found that corrective actions taken or planned appear reasonable and will correct the causes that led to the non-compliance and prevent recurrence.

However, the inspector had the following observations regarding specific aspects of the root cause evaluation (RCE) and corrective actions that warranted additional consideration by the licensee. The RCE did not fully document the organizational and programmatic weaknesses that led to the condition, or the reasons that multiple opportunities were missed for earlier discovery (section 02.02.b). The licensee did not revise the RCE when new information was discovered or when additional reviews of the RCE were conducted (section 02.02.b). Weakness of the original extent of condition and extent of cause evaluations resulted in delays in conducting a thorough review, some aspects of which were still in progress at the time of the inspection (section 02.02.d). The RCE did not specifically consider the safety culture components of Inspection Manual Chapter 0305 (section 02.02.e). The root cause and contributing causes were not well linked to the associated corrective actions (section 02.03.a). The quantitative and qualitative measures of success for determining the effectiveness of the

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corrective actions to preclude repetition were not well established (section 02.03.d). Based on the results of the inspection, the licensee initiated PIP M-10-1516 to evaluate the quality of root cause evaluations.

Given the licensee's acceptable performance in addressing the non-compliance of the RN strainer with its licensing bases, the White finding associated with this issue is being closed and will only be considered in assessing plant performance until the end of this quarter in accordance with the guidance in IMC 0305, "Operating Reactor Assessment Program." Since many of the corrective actions have not been completed, the implementation and effectiveness of the licensee's corrective actions will be reviewed during future inspections.

REPORT DETAILS

4. OTHER ACTIVITIES

4OA4 Supplemental Inspection

.01 Inspection Scope

The NRC staff performed this supplemental inspection in accordance with IP 95001 to assess the licensee's evaluation of a White finding which affected the Mitigating Systems cornerstone in the Reactor Safety strategic performance area. The inspection objectives were to:

- provide assurance that the root and contributing causes of risk-significant issues were understood;
- provide assurance that the extent of condition and extent of cause of risk-significant issues were identified; and
- provide assurance that the licensee's corrective actions for risk-significant issues were or will be sufficient to address the root and contributing causes and to preclude repetition.

The licensee entered the Regulatory Response Column of the NRC's Action Matrix in the third quarter of 2008 as a result of one inspection finding of low to moderate safety significance (White). The finding was associated with the failure to take adequate corrective actions related to implementation of a safety-related RN strainer backwash system. On August 6, 2007, the "A" Train of the RN system was declared inoperable when the licensee discovered that manually backwashing RN strainers was not always possible during design basis accidents. In 2000 on Unit 2 and in 2001 on Unit 1, a modification had been implemented to replace strainer backwash outlet manual valves with air-operated valves that could not be manually over-ridden. The Station Instrument Air (VI) system was non-safety-related and could not be relied upon to manually backwash the RN strainers during or following design basis accidents. The finding was characterized as having low to moderate safety significance (White) based on the results of a Phase 3 risk analysis performed by a region-based senior reactor analyst (SRA), as discussed in NRC Inspection Report (IR) 05000369,370/2008009.

As a result of identifying this non-conformance, the licensee made some plant modifications, including a modification to allow operation of the RN strainer backwash outlet valves without reliance on VI, and took other measures to compensate for this condition until full compliance with the design and licensing bases can be restored through additional planned modifications. The licensee conducted a root cause evaluation (RCE), as documented in Problem Investigation Process report (PIP) M-07-4313, to identify weaknesses that existed in various organizations which allowed for a risk-significant finding and to determine the organizational attributes that resulted in the White finding. Subsequently, a number of events and additional reviews impacted the corrective actions associated with the original RCE. During the February 13, 2008,

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meeting of the Nuclear Safety Review Board (NSRB), the board challenged the depth of the original extent of condition and extent of cause evaluations (PIP M-08-1574). Testing of the backwash system on May 27, 2008, to evaluate a potential piping modification revealed the system had inadequate pressure to provide RN strainer backwash flow to the normal discharge path to the Condenser Circulating Water (RC) system and that at high RN flow rates, a negative pressure was created in the strainers making backwash discharge flow to the ground water (WZ) sump unavailable (PIP M-08-3371). On April 27, 2009, during testing of the RN system at high flow rates, the strainers became clogged with corrosion products from the suction piping which was a new macro-fouling source not previously identified (PIP M-09-2216). All of these events and reviews resulted in changes to or additions of corrective actions to the original RCE.

The licensee staff informed the NRC staff on January 11, 2010, that they were ready for the supplemental inspection. From January 25, 2010, to February 4, 2010, in preparation for this inspection, the licensee conducted an in-depth readiness review of the original RCE report using the inspection attributes of IP 95001. As a result of that self-critical readiness assessment, the licensee issued several additional PIPs and added additional corrective actions to the original PIP M-07-4313.

The inspector reviewed the RCE associated with PIP M-07-4313, along with several other evaluations that were conducted in support of or that impacted the corrective actions for the root cause determination. The inspector reviewed the licensee's extent of condition and extent of cause evaluations to ensure they were sufficient in breadth. The inspector reviewed the corrective actions that were taken or planned to address the identified causes. The inspector also held discussions with licensee personnel to ensure that the root and contributing causes, as well as the contribution of safety culture components, were understood and that corrective actions taken or planned were appropriate to address the causes and preclude repetition.

.02 Evaluation of the Inspection Requirements

02.01 Problem Identification

- a. IP 95001 requires that the inspection staff determine that the licensee's evaluation of the issue documents who identified the issue (i.e., licensee-identified, self-revealing, or NRC-identified) and the conditions under which the issue was identified.

The inspector determined that the event evaluations were sufficiently detailed to identify who and under what conditions the issue was identified. The issue was identified on August 6, 2007, by the licensee during the investigation of an abnormally high number of RN strainer automatic backwashes (PIP M-07-4177).

- b. IP 95001 requires that the inspection staff determine that the licensee's evaluation of the issue documents how long the issue existed and prior opportunities for identification.

The licensee's root cause documented that the condition had existed since the implementation of a modification that replaced the RN strainer backwash outlet manual valves with air-operated valves on Unit 2 in 2000 (MM-8444) and on Unit 1 in 2001 (MM-

11224). However, subsequent testing in May 2008 revealed that there was no strainer backwash discharge flow when aligned to the RC system and that strainer discharge flow to the WZ sump was not possible at high RN flow rates (PIP M-08-3371). Based on this information, the operability determination was revised, as were the interim and long term actions to correct the condition. This additional time where backwash was unavailable did not impact the NRC's significance determination of the condition since no credit for strainer backwash was given and the duration used in the evaluation was over a one year period.

The licensee's root cause documented multiple missed opportunities to identify the issue. Opportunities to recognize that manual backwash relied on non-safety related VI, which could be unavailable following an accident, included the evaluation of the need to upgrade the system to meet safety related requirements (PIP M-02-2427), design and implementation of the modification that upgraded the system to meet safety related requirements (MGMM-14403), evaluation of a variance to the modification to add the ability to manually operate the strainer backwash outlet valves using an air supply bypass valve, and revisions to the procedures to manually backwash the strainers.

The inspector determined that the licensee's evaluation was adequate with respect to identifying how long the issue existed and prior opportunities for identification.

- c. IP 95001 requires that the inspection staff determine that the licensee's evaluation of the issue documents the plant-specific risk consequence, as applicable, and compliance concerns associated with the issue.

The NRC determined this issue was a White finding, as documented in NRC IR 05000369,370/2008009. The root cause evaluation did not qualitatively assess the increased risk associated with this condition, but the LER submitted by the licensee (LER 05000369/2007-004) stated that based on a preliminary PRA evaluation, the conditional core damage probability (CCDP) associated with this condition was greater than $1E-6$. At the Regulatory Conference held at the Region II offices on September 18, 2008, the licensee presented the results of their revised evaluation of CCDP as approximately $4.7 E-7$. However, the licensee did not contest the violation or its categorization as having low to moderate safety significance.

The root cause evaluation appropriately documented the condition as a non-compliance with their licensing bases and took appropriate compensatory actions, including plant and procedural modifications to allow manual backwash without instrument air. Full compliance will be restored when all corrective actions associated with this issue are completed.

The inspector concluded that the licensee appropriately documented the risk consequences and compliance concerns associated with the issue.

- d. Findings

No findings of significance were identified.

02.02 Root Cause, Extent-of-Condition, and Extent-of-Cause Evaluation

- a. IP 95001 requires that the inspection staff determine that the licensee evaluated the issue using a systematic methodology to identify the root and contributing causes.

The licensee used the following systematic methods to complete PIP M-07-4313 problem evaluation:

- data gathering through interviews and document review;
- timeline construction;
- events and causal factor charting; and
- barrier analysis.

The inspector determined that the licensee evaluated the issue using a systematic methodology to identify root and contributing causes.

- b. IP 95001 requires that the inspection staff determine that the licensee's RCE was conducted to a level of detail commensurate with the significance of the issue.

The licensee's RCE included an extensive timeline of events, as well as an event and causal factors (E&CF) chart as discussed in the previous section. Using a multidisciplinary team, the licensee identified a single root cause as changing the plant configuration (i.e., manual valves on the RN strainer backwash outlet were replaced with air-operated valves) without a total understanding of the design and licensing bases. In addition, the RCE identified four contributing causes (CC) stemming from inappropriate actions identified on the E&CF chart.

CC1: Design study conducted in 1990 to evaluate the RN strainer design bases (MGDS-224) missed the UFSAR requirement for manual backwash following a LOCA.

CC2: Modifications made in 1993-1994 that downgraded the strainer backwash function to non-safety related (MGMM-3794) were completed without a 10 CFR 50.59 evaluation as an editorial minor modification.

CC3: An assessment completed in 1993 (SITA-93-01) on the operational readiness and functionality of the RN system found issues with the system design including the need for safety related instrumentation for strainer backwash initiation, but the PIP that was generated had no evaluation and no corrective actions.

CC4: The corrective actions from PIP M-02-2427 generated in 2002 for engineering to evaluate the safety classification of the RN strainers based on past strainer fouling events, did not correct the condition. The resulting modification that upgraded the strainer to safety related requirements (MMGM-14403) did not consider the ability to manually backwash the strainers following a loss of VI.

The RCE did not fully document the organizational and programmatic weaknesses that led to the condition, nor the reasons that multiple opportunities were missed for earlier discovery. For example, the reason(s) why there was not a clear understanding of the design bases of the system or why the design change/50.59 process failed to identify the USFAR requirement for manual backwash were not fully explored. This was identified by the licensee during their 95001 readiness review (M-SAG-SA-10-11) and PIP M-10-1208 was initiated to evaluate the reasons why the design bases were not fully understood. It concluded that the licensee did not know the UFSAR was the Current Licensing Basis (CLB) source at the time of the modification and that the Design and Licensing ownership had moved from the General Office to the site in the 1992 to 1996 timeframe.

Contributing to the apparent lack of detailed documentation of the causes of the event was that the licensee did not revise the RCE when new information was discovered (M-08-3371 and M-09-2261) or when additional review of the RCE was conducted. The inspector identified that Nuclear System Directive (NSD) 212, Cause Analysis, indicated that in the event further information becomes available that potentially affects the results of a root cause evaluation, the root cause should be reevaluated to determine if a revision was required. The operability determination was revised and numerous corrective actions were added or revised, however the evaluation portion of the PIP was not changed. This resulted in cases where the critical thinking on why a corrective action was added was not documented and made the linkage between the root and contributing causes and the associated CAs to address the causes difficult. Additionally, the original RCE did not identify that the failure to conduct testing to ensure that the backwash system functioned as designed was a contributor to this event. This was identified in the corrective actions for PIP M-08-3371, but the original RCE was never updated.

However, the inspector determined that the organizational and programmatic weaknesses that caused this event, even if not specifically documented in the RCE, were ultimately addressed in the corrective actions for this PIP and in other related PIPs. For example, the corrective actions addressed weaknesses in the design bases documentation (e.g., DBD and UFSAR), in the design change process, in the 50.59 process and in the knowledge and skills of engineering personnel and 10 CFR 50.59 qualified evaluators and screeners. Based on the results of the inspection, the licensee initiated PIP M-10-1516 to evaluate the quality of root cause evaluations, including determining the reasons PIP M-07-4313 did not apply the "why" staircase sufficiently to determine what process weaknesses needed to be corrected and the reasons the RCE was not revised when additional information was uncovered.

- c. IP 95001 requires that the inspection staff determine that the licensee's RCE include a consideration of prior occurrences of the problem and knowledge of prior operating experience.

The licensee's RCE included a review of both internal and external operating experience (OE). A search of the McGuire PIP database was conducted for previous events assigned cause codes of F1b (Unplanned entry into TS LCO) and J1e (Risks and Consequences associated with change not adequately reviewed). No previous events

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were identified. However, these specific cause codes were not assigned to the root or contributing causes for this evaluation. This was identified by the licensee in their IP 95001 readiness review (M-SAG-SA-10-11) and a subsequent search using the appropriate codes did not identify any prior occurrences. Based on the licensee's evaluation and conclusions, the inspector determined that the licensee's RCE included a consideration of prior occurrences of the problem and knowledge of prior OE.

- d. IP 95001 requires that the inspection staff determine that the licensee's RCE addresses the extent of condition and the extent of cause of the issue.

To address the extent of condition issue, the licensee's RCE contained a review of air-operated valves (AOVs) that receive safety signals that may need to be repositioned from their safety position following an accident. Based on recommendations from the McGuire NSRB meeting on February 13, 2008, additional corrective actions were added to expand the scope of the AOVs that were reviewed and to include instrumentation that is required post-accident that relied on instrument air (VI). No additional valves were found that required VI post-accident and some procedure changes were made to identify alternate indications that could be used for instrumentation that would be unavailable following a loss of VI. During the IP 95001 readiness review a deficiency was identified with the extent of condition. The team found that the extent of condition corrective actions (CAs) should address motive forces other than air (e.g., power-operated components) and other systems containing safety related/non-safety related interfaces should be sampled and evaluated to ensure no similar issues with other safety related systems exist (PIP M-10-1210). At the time of the inspection, the extent of condition review of safety/non-safety system interactions was still in progress.

To address the extent of cause the RCE reviewed other areas where engineering may not have a clear understanding of design bases prior to changing plant configuration. Specifically, a corrective action was created to review the design basis document (DBD) for the entire RN system and the Design Basis Accident DBD to ensure they adequately reflect the current licensing basis. In addition, engineering personnel and 10 CFR 50.59 qualified personnel were trained on this event and on the use of licensing basis documents during the design change process. During the IP 95001 readiness review a deficiency was identified with the extent of cause. The team found that the extent of cause CAs should be expanded to include the 10 CFR 50.59 process (program changes, effectiveness reviews and examples) and the Engineering Change/Engineering Change Approval process (program changes, effectiveness reviews and examples) to ensure current processes would prevent similar events (PIP M-10-1211). This PIP determined that recent 10 CFR 50.59 process changes provide confidence in the current processes such that a similar failure of the program, as documented under PIP M-07-4313, would not occur. Likewise, the current modification process related toward editorial changes process provides sufficient barriers to prevent design and implementation of a non-editorial modification under the editorial process. In addition, PIP M-10-1240 was initiated to perform detailed design bases impact reviews for historical modifications, which were deemed to have potentially similar attributes to the historical modification which improperly downgraded RN strainer safety classification. At the time of the inspection, this review was still in progress.

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As stated earlier, the original RCE did not identify that the failure to conduct testing to ensure that the backwash system functioned as designed was a contributor to this event. However, this was identified following the discovery that backwash to the RC system was not possible and that backwash to the WZ sump could not be performed at high RN flow rates (PIP M-08-3371). Subsequently an extent of cause was conducted that sampled several other safety systems to ensure that all safety functions have been adequately functionally tested and/or monitored (PIP M-08-4602).

The inspector concluded that the licensee has ultimately addressed the extent of condition and the extent of cause of the issue. However, weakness of the original extent of condition and extent of cause evaluations resulted in delays in conducting a thorough review, some aspects of which were still in progress at the time of the inspection.

- e. IP 95001 requires that the inspection staff determine that the licensee's root cause evaluation, extent of condition, and extent of cause appropriately considered the safety culture components as described in IMC 0305.

As part of the RCE, the licensee did not specifically consider the safety culture components of IMC 0305, but did reference some safety culture components in their cause determination. Specifically, CC3 was assigned a cause code of "previous industry or in-house operating experience was not effectively used to prevent problems" (safety culture component of operating experience) and CC4 was assigned a cause code of "corrective actions from previously identified problems or previous event causes were not adequate to prevent recurrence" (safety culture component of problem identification and resolution). The failure to consider safety culture components in the RCE was recognized by the IP 95001 readiness review team (M-SAG-SA-10-11). A corrective action was created in PIP M-07-4313 to conduct an assessment of the safety culture components and a corrective action to PIP M-10-1205 was created for the Safety Assurance/Performance Improvement (SA/PI) Manager to review the current processes and McGuire site understanding of requirements for considering safety culture components. The safety culture component evaluation that was conducted as a result of the readiness review team recommendation concluded that there were no aspects of the RCE that would indicate that the organizations or individuals involved exhibited behavior indicative of a weakness in safety culture, even though the cause codes assigned to two of the contributing causes directly relate to safety culture components. This further demonstrated the lack of specific guidance on considering safety culture components during root cause evaluations.

Based on the results of the inspection, the licensee initiated PIP M-10-1516 to evaluate the quality of root cause evaluations, including addressing the lack of guidance on considering safety culture components during root cause evaluations.

- f. Findings

No findings of significance were identified.

02.03 Corrective Actions

- a. IP 95001 requires that the inspection staff determine that: (1) the licensee specified appropriate corrective actions for each root and/or contributing cause; or (2) an evaluation that states no actions are necessary is adequate.

The root cause and contributing causes 1 and 2 were linked to corrective actions. However contributing causes 3 and 4 were not linked to specific corrective actions. This was identified in the IP 95001 readiness review and PIP M-10-1214 was initiated to correct this oversight.

The inspector reviewed the corrective actions taken for PIP M-07-4313 and determined that, although not well linked, adequate corrective actions have been or will be taken to address the causes of this condition.

- b. IP 95001 requires that the inspection staff determine that the licensee prioritized corrective actions with consideration of risk significance and regulatory compliance.

The licensee took immediate corrective actions to compensate for the inability to manually backwash the RN strainers following a loss of instrument air by modifying the strainer backwash outlet valves to provide a manual means to open the valves without relying on VI. These compensatory actions and associated operability determination were later modified following the discovery that backwash flow path to the RC system was unavailable and that a negative pressure was created in the strainer during high RN flow rates (PIP M-08-3717). This led to procedure changes that provided guidance on aligning strainer backwash flow, if needed, to the WZ sump only and to throttle RN flow to the Component Cooling Water (KC) heat exchangers if strainer pressure was inadequate for sump discharge. These compensatory actions and the associated operability determination were modified again following the discovery of additional macro-fouling sources (PIP M-09-2216). On November 6, 2009, the NRC requested the licensee provide an explanation addressing what compensatory or other measures were in place to assure the operability of the RN system in case strainer macro-fouling does occur until full compliance is restored. In their response dated December 7, 2009, the licensee stated that a dedicated operator was stationed to perform time-critical actions to initiate backwash supply flow to the strainers on a loss of instrument air and listed several modifications and procedural changes that have been made. The response only addressed macro-fouling from soft debris that could be crushed in the strainer and passed through the system and did not reference the procedure to align backwash outlet flow to the WZ sump or the potential need to throttle RN flow to the KC heat exchangers to achieve adequate strainer pressure for backwash operation. The licensee committed to supplement their December 7, 2009 response by April 12, 2010, to more completely describe their interim compensatory measures, including those that would mitigate all design basis type macro-fouling mechanisms that could impact the RN system during design basis events.

These events also impacted the corrective actions needed to restore the system to full compliance. The licensee determined that the preferred approach to restore compliance would be to implement a series of modifications including installation of safety related

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strainer backwash discharge pumps to provide the motive force to direct backwash flow to the RN return header. In a letter dated October 1, 2009, the licensee changed their original commitment of submitting a license amendment to resolve the NOV, to completing these modifications by December 2012. On November 6, 2009, the NRC requested the licensee provide a discussion on why the proposed completion date represented the first available opportunity to restore compliance. In their response dated December 7, 2009, the licensee provided the justification for the proposed durations for modification implementation. The inspector reviewed the reasons provided for the projected completion dates for the modifications and found them to be reasonable given the magnitude of the modifications.

The corrective action to prevent recurrence for the root cause was to revise the DBD for the RN system. This action was appropriately prioritized and has been completed. Based upon the appropriate prioritization of the DBD revision and the review of the implementation schedule for the modifications needed to restore full compliance of the system, the inspector determined that the corrective actions were prioritized with consideration of the risk significance and regulatory compliance.

- c. IP 95001 requires that the inspection staff determine that the licensee established a schedule for implementing and completing the corrective actions.

The inspector determined that all of the corrective actions listed in the RCE have been either scheduled or completed and that the schedule was consistent with the licensee's commitments made to resolve the violation as clarified in their December 7, 2009 response for additional information.

- d. IP 95001 requires that the inspection staff determine that the licensee developed quantitative and qualitative measures of success for determining the effectiveness of the corrective actions to preclude repetition.

As documented in PIP M-07-4313, the licensee established measures for determining the effectiveness of the corrective actions. These measures included the following:

- Conduct an independent review of the RN DBD to ensure that it clearly provides design and licensing bases of the RN Strainer and meets the actual design; and
- Perform an effective review six to nine months following completion of the modifications to RN strainer backwash system using the effectiveness review template.

The licensee's corrective action program only requires effectiveness reviews to be conducted on corrective actions to prevent recurrence (CAPR) and does not provide explicit guidance on how to conduct the reviews. The licensee uses a template posted on their performance improvement website as guidance for these reviews. It consists of a series of five questions: 1) Have the CAPR(s) been properly implemented; 2) Were CAPR(s) implemented per the latest approved schedule; 3) Have the CAPR(s) been challenged adequately; 4) Were the CAPR(s) successful in preventing recurrence; and 5) Have the CAPR(s) prevented the same or similar events?

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The independent review of the revised DBD merely verifies that the action was completed adequately and does not evaluate whether the revision prevented recurrence of improper design changes. The effectiveness of the modifications to restore compliance will be demonstrated during the post-modification testing. The action was initiated to correct the condition, not to prevent recurrence for the causes of the event. Since no other actions were designated as CAPRs, no additional reviews of effectiveness to prevent recurrence are required by the CAP process. This was recognized by the IP 95001 readiness review team (M-SAG-SA-10-11). A corrective action on PIP M-10-1205 was created for the SA/PI Manager to review the current processes and McGuire site understanding of requirements for evaluating CAPR effectiveness.

- e. IP 95001 requires that the inspection staff determine that the licensee's planned or taken corrective actions adequately address a Notice of Violation (NOV) that was the basis for the supplemental inspection, if applicable.

The NRC issued the NOV to the licensee on October 27, 2008. The licensee provided the NRC a written response to the NOV on November 25, 2008. The licensee's response described: 1) the reasons for the violation; 2) corrective steps which have been taken and the results achieved; 3) corrective steps which will be taken to avoid further violations; and 4) the date when full compliance will be achieved. However, the licensee revised their commitments contained in the response to the NOV in a letter dated October 1, 2009. The licensee had originally planned to submit a license amendment to request that the NRC accept the non-conforming condition as is, however following a detailed review the licensee determined a preferred approach would be to implement plant changes to bring the system into full compliance. These changes will be implemented in three phases. Phase 1 will add an assured air supply to the strainer backwash inlet valves. Phase 2 will improve the piping layout from the strainer backwash outlets to the WZ sump to reduce head loss when conducting backwash operation to the sump. Phase 3 will install safety related strainer backwash discharge pumps to provide the motive force to discharge backwash effluent to the RN return header and will remove the air-operated strainer backwash outlet valves.

During this inspection, the inspector reviewed the preliminary designs for these modifications and associated calculations. The inspector determined that when Phase 1 and 3 are completed the system will be restored to full compliance and that the licensee's planned and taken corrective actions addressed the NOV. However, the inspector was unable to determine if the Phase 2 modification would be acceptable due to incomplete design and associated calculations; and the potential reliance on throttling RN flow to achieve the necessary strainer pressure for backwash operations to the WZ sump. Since these corrective actions have not been completed, the implementation and effectiveness of the licensee's corrective actions will be reviewed during future inspections.

- f. Findings

No findings of significance were identified.

4OA6 Exit Meeting

On March 9, 2010, the inspector presented the results of the supplemental inspection to Mr. Steven D. Capps and other members of licensee management and staff. The inspector confirmed that no proprietary information was provided or examined during the inspection.

ATTACHMENT: SUPPLEMENTAL INFORMATION

Enclosure

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

R. Abbott, Regulatory Compliance Engineer
K. Ashe, Regulatory Compliance Manager
D. Brewer, Safety Assurance Manager
M. Broome, Electrical and I&C Engineer
S. Capps, Station Manager
K. Crane, Regulatory Compliance Engineer
C. Curry, Engineering Manager
R. Harris, Modifications Engineer
G. Holbrooks, Project Management
S. Heuertz, Performance Improvement Team
S. Karriker, Balance of Plant Engineering Supervisor
G. Kent, Duke Energy Regulatory Compliance Engineer
M. Leisure, Regulatory Compliance Engineer
W. Leggette, Nuclear Operations Support
J. Nolin, Mechanical and Civil Engineering Manager
R. Pacetti, Performance Improvement Team Manager
T. Pederson, RN System Engineer
R. Repko, Site Vice President
F. Twogood, Engineering Consultant
R. Weathers, RN System Engineer
M. Weiner, Nuclear Operations Support

NRC Personnel

J. Brady, Senior Resident Inspector - McGuire
J. Bartley, Chief, Reactor Projects Branch 1

ITEMS OPENED, CLOSED AND DISCUSSED

Closed

05000369,370/2008009-01	VIO	Failure to Take Adequate Corrective Action for Implementation of Safety-Related RN Strainer Backwash (Section 4OA4)
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LIST OF DOCUMENTS REVIEWED

Procedures

AP/1/A/5500/22, Loss of VI Abnormal Procedure, Rev. 28
AP/2/A/5500/22, Loss of VI Abnormal Procedure, Rev. 25
OP/1/A/6400/006, Nuclear Service Water System, Rev. 180
OP/2/A/6400/006, Nuclear Service Water System, Rev. 136
OP/1/A/6100/010 M, Annunciator Response for Panel 1 AD-12, Rev. 47

Attachment

OP/2/A/6100/010 M, Annunciator Response for Panel 2 AD-12, Rev. 31
 RP/0/A/5700/006, Natural Disaster, Rev. 22

EDM-601, Engineering Change, Rev. 10
 NSD 201, Reporting Requirements, Rev. 21
 NSD 202, Reportability, Rev. 21
 NSD 203, Operability/Functionality, Rev. 21
 NSD 208, Problem Investigation Process (PIP), Rev. 31
 NSD 209, 10CFR 50.59 Process, Rev. 14
 NSD-212, Cause Analysis, Rev. 16
 NSD-228, Applicability Determination, Rev. 5
 NSD-301, Engineering Change Process, Rev. 34

PIPs

M-89-0290, Design Engineering Evaluate Safety Classification of RN Strainers
 M-93-0297, Viability of RN Strainers
 M-00-3122, RN strainer backwash valve modification MGMM8444 does not incorporate adequate provisions for Operations to perform manual strainer backwash
 M-02-2427, Re-evaluation of RN Strainer Filtration Function (Safety or Non-Safety Related)
 M-07-4177, 1B and 2B RN strainer experienced numerous Hi D/P backwashes
 M-07-4313, Inability to manually backwash RN strainers during post-accident conditions
 M-07-5978, Evaluate Compliance with Design Basis for RN Strainer Backwash System Utilizing Non-Safety Related Equipment
 M-08-1574, McGuire NSRB Meeting Minutes from February 13, 2008
 M-08-3371, RN Strainer Backwash Return Flow Direction is from RC (Lake) to the Strainer Instead of from the Strainer to RC (Lake)
 M-08-3668, Assess Functionality of Groundwater Level Monitoring System Based on RN Strainer Backwash Flow to WZ Sump
 M-08-4602, Engineering Management Discussion on Extent of Condition M-08-3371 Problem Evaluation
 M-08-4911, NRC Issuance of a Preliminary Greater than Green Finding
 M-08-7507, NRC Issuance of Violation (VIO) 08-09-01
 M-09-2216, 2A RN Strainer Fouled During High RN Flow Testing per TT Procedure
 M-09-2341, During Loss of Instrument Air (VI) Events, RN A Train Pump Flow May Self-Limit Based on Suction Pressure Limits When Aligned to the SNSWP
 M-10-1145, engineering Review of SITA 93-01 Audit
 M-10-1205, Assessment M-SAG-SA-10-11: NRC IP 95001 Supplemental Inspection Readiness Review - RN System White Finding.
 M-10-1208, Assessment M-SAG-SA-10-11 Deficiency #1 (M-07-4313 Root Cause Evaluation lacks development)
 M-10-1209, Assessment M-SAG-SA-10-11 Deficiency #2 (No evaluation was performed to reconcile the difference between the M-07-4313 Root Cause and the NRC NOV EA-08-220)
 M-10-1210, Assessment M-SAG-SA-10-11 Deficiency #3 (M-07-4313 Root Cause Extent of Condition evaluation and corrective actions are fragmented and inadequate)
 M-10-1211, Assessment M-SAG-SA-10-11 Deficiency #4 (M-07-4313 Extent of Cause evaluation corrective actions are inadequate and not all-encompassing)

- M-10-1212, Assessment M-SAG-SA-10-11 Deficiency #5 (M-07-4313 Root Cause is not adequately addressed by the CAPRs)
- M-10-1214, Assessment M-SAG-SA-10-11 Deficiency #6 (There are no CAs for M-07-4313 Root Cause Evaluation Contributing Cause 3 (CC-3) or Contributing Cause 4 (CC-4))
- M-10-1217, Assessment M-SAG-SA-10-11 Deficiency #7 (several situations noted in PIP M-07-4313 wherein the individual performing the corrective action and the approver were the same person)
- M-10-1240, Perform Detailed Design Bases Impact Review for Historical Modifications Similar to Modification to Downgrade RN Strainer Safety Classification

Miscellaneous

- MCS-1465.00-00-0004, Design Basis Specification for Loss of VI, Rev. 1
- MCS-1465.00-00-0005, Design Basis Specification for Design Events, Rev. 4
- MCS-1574.RN-00-0001, Design Basis Specification for Nuclear Service Water (RN) System, Rev. 28
- MCS-1581.WZ-00-0001, Design Basis Specification for the WZ System, Rev. 9
- MGDS-224, McGuire Design Study to Document the Design Basis for the RN Pump Strainer, 7/11/1990
- M-SAG-SA-10-11, NRC IP 95001 Supplemental Inspection Readiness Review-RN System White Finding
- SITA-93-01, operational readiness and functionality of McGuire's Nuclear Service Water (RN) System
- Licensee Event Report (LER) 05000369/2007-004-00, Procedure Deficiency identified for Performing a Manual Backwash of Nuclear Service Water (RN) Strainers due to Reliance on Non-Safety Instrument Air
- UFSAR Section 9.2.2, Nuclear Service Water System and Ultimate Heat Sink
- TS 3.7.7, Nuclear Service Water System (NSWS), Amendment Nos. 184/166, & Bases B3.7.7, Rev. 0
- A/R 00302781, 10CFR50.59 Screen for Modifications to Add Safety Related Air Supply to the RN Strainer Backwash Inlet valves
- A/R 00302920, 10CFR50.59 Screen for Modifications to Reroute the Backwash Effluent Line to the Auxiliary Building Groundwater Sump (WZ)
- A/R 00302925, 10CFR50.59 Screen for Modifications to Incorporate New Pressure Transmitters and New Backwash Discharge Pumps
- A/R 00302927, 10CFR50.59 Evaluation for Modifications to Incorporate New Pressure Transmitters and New Backwash Discharge Pumps
- A/R 00303967, 10CFR50.59 Screen for Modifications to Incorporate New Pressure Transmitters and New Backwash Discharge Pumps
- A/R 00303869, 10CFR50.59 Evaluation for Modifications to Incorporate New Pressure Transmitters and New Backwash Discharge Pumps
- A/R 00304335, 10CFR50.59 Screen for OP/1(2)/A/6400/006, Nuclear Service Water Revisions 202/158
- A/R 00304336, 10CFR50.59 Screen for OP/1(2)/A/6400/006, Nuclear Service Water Revisions 203/159
- OMP 12-1, Dedicated RN Strainer Backwash Operator is Required, Rev. 2 dated 5/6/2009
- SOMP 01-13, Designated RN Back-Flush Operator for Loss of VI, Rev. 1 dated 6/22/2009

Modifications

MGMM-3794, Editorial Minor Modification to Allow Downgrade of the function of the RN Strainers, 8/12/1993

MGMM-8444, Install New ITT Diaphragm valves at Outlet of RN Strainers on Unit 2, 4/18/2001

MGMM-11224, Install New ITT Diaphragm valves at Outlet of RN Strainers on Unit 1, 9/7/2001

MGMM-14403, Reclassify RN Strainers as QA-1 due to Recent Macro-Fouling Events, 8/11/2003

MD101360, Temporary Modification to Install Ball Thrust Bearing on 1RN0022A and Mechanical Gag on 1RN0023, 8/8/2007

MD101361, Temporary Modification to Install Ball Thrust Bearing on 1RN0026B and Mechanical Gag on 1RN0027, 8/8/2007

MD201362, Temporary Modification to Install Ball Thrust Bearing on 2RN0022A and Mechanical Gag on 2RN0023, 8/8/2007

MD201363, Temporary Modification to Install Ball Thrust Bearing on 2RN0026A and Mechanical Gag on 2RN0027, 8/8/2007

MD102035, Permanently Install Ball Thrust Bearing on 1RN0022A/26B and Remove Mechanical Gag on 1RN0023/27, 11/5/2008

MD202037, Permanently Install Ball Thrust Bearing on 1RN0022A/26B and Remove Mechanical Gag on 1RN0023/27, 11/5/2008

MD501561 - LLI macrofouling barrier

MD101813 - RN Strainer 1A Backwash Instrumentation

MD101624 - RN Strainer 1B Backwash Instrumentation

MD201814 - RN Strainer 2A Backwash Instrumentation

MD201629 - RN Strainer 2B Backwash Instrumentation

EC 101543, Installation of an Assured Air Supply for 1-RN-21A

EC 101545, Installation of an Assured Air Supply for 1-RN-25B

EC 101544, Installation of an Assured Air Supply for 2-RN-21A

EC 101546, Installation of an Assured Air Supply for 2-RN-25B

EC 101547, Improved Piping Layout for Manual Strainer Backwash from 1A RN Strainer to WZ Sump

EC 101549, Improved Piping Layout for Manual Strainer Backwash from 1B RN Strainer to WZ Sump

EC 101548, Improved Piping Layout for Manual Strainer Backwash from 2A RN Strainer to WZ Sump

EC 101550, Improved Piping Layout for Manual Strainer Backwash from 2B RN Strainer to WZ Sump

EC 102477, Installation of RN Strainer Backwash Discharge Pump for 1A RN Strainer

EC 102478, Installation of RN Strainer Backwash Discharge Pump for 1B RN Strainer

EC 102479, Installation of RN Strainer Backwash Discharge Pump for 2A RN Strainer

EC 102482, Installation of RN Strainer Backwash Discharge Pump for 2B RN Strainer

ECR 2081, Provide Remote Throttling Capability to Unit 1 KC HX Supply Isolation Valves

ECR 2087, Provide Remote Throttling Capability to Unit 2 KC HX Supply Isolation Valves

Calculations

MCC-1223.24-00-00P1, Mechanical/ Civil Design Inputs for Assured Air Supply for Strainer Backwash Valves, Rev. 0
MCC-1223.24-00-00P2, Mechanical/ Civil Design Inputs for Piping Layout for Manual Strainer Backwash, Rev. 0
MCC-1223.24-00-00P3, Mechanical/ Civil Design Inputs for RN Strainer Backwash Discharge Pumps, Rev. 0
MCC-1223.24-00-0096, RN System Flow Balance Acceptance Criteria Calculation, Rev. 4
MCC-1223.24-00-0100, FMEA of RN Strainer Modifications MD101813, MD101624, MD201814, and MD201629, Rev. 1
MCC-1223.24-00-0102, RN Pump NPSH Calculation, Rev. 3
MCC-1223.24-00-0103, RN Strainer Macrofouling Source Calculation, Rev. 3
MCC-1223.24-00-0107, FMEA of RN Strainer Backwash Discharge Modifications, Rev. 3
MCC-1223.31-00-0010, Groundwater Drainage System Flow Analysis, Rev. 3
MCC-1331.16-00-0410, Electrical Discipline Design Inputs for EC 101543, EC 101544, EC 101545, EC 101546, Rev. 0
MCC-1331.16-00-0411, Electrical Discipline Design Inputs for EC 102477, EC 102478, EC 102479, EC 102482, Rev. 1

PIPs generated as a result of this inspection

PIP M-10-1429, NRC Inspector Questioned Basis and Conclusion of the Applicability Determination for Procedure Change That Allowed Throttling of KC Flow
PIP M-10-1430, NRC Inspector Questioned Classification of Strainer Backwash as a Functional Failure
PIP M-10-1448, NRC 95001 Supplemental Inspection Items to be Resolved
PIP M-10-1516, Evaluate the Quality of Root Cause Evaluations and Associated Process Guidance Based on NRC 95001 Supplemental Inspection Results