



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

April 24, 2008

Mr. Bruce. Hamilton  
Vice President  
Duke Power Company, LLC  
d/b/a Duke Energy Carolinas, LLC  
McGuire Nuclear Station  
12700 Hagers Ferry Road  
Huntersville, NC 28078-8985

**SUBJECT: MCGUIRE NUCLEAR STATION - NRC INTEGRATED INSPECTION REPORT  
05000369/2008002 AND 05000370/2008002**

Dear Mr. Hamilton:

On March 31, 2008, the US Nuclear Regulatory Commission (NRC) completed an inspection at your McGuire Nuclear Station. The enclosed report documents the inspection findings which were discussed on April 3, 2008, with you and members of your staff.

The inspection examined activities conducted under your licenses as they relate to safety and compliance with the Commission's rules and regulations, and with the conditions of your licenses. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

This report documents three findings (two NRC-identified and one self-revealing) of very low safety significance (Green) which were determined to be violations of NRC requirements. However, because of their very low safety significance, and because they were entered into your corrective action program, the NRC is treating these findings as non-cited violations (NCVs) consistent with Section VI.A of the NRC Enforcement Policy. If you deny these non-cited violations, you should provide a response with the basis for your denial, within 30 days of the date of this inspection report, 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.

DEC

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In accordance with 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 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).

Sincerely,

***/RA/***

Kathy Weaver, Acting 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 05000369/2008002 and 05000370/2008002  
w/Attachment - Supplemental Information

cc w/encl: (See page 3)

DEC

2

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**/RA/**

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Letter to Bruce Hamilton from Kathy D. Weaver dated April 24, 2008

SUBJECT: MCGUIRE NUCLEAR STATION - NRC INTEGRATED INSPECTION REPORT  
05000369/2008002 AND 05000370/2008002

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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: 05000369/2008002, 05000370/2008002

Licensee: Duke Power Company, LLC

Facility: McGuire Nuclear Station, Units 1 and 2

Location: 12700 Hagers Ferry Road  
Huntersville, NC 28078

Dates: January 1, 2008 through March 31, 2008

Inspectors: J. Brady, Senior Resident Inspector  
R. Eul, Resident Inspector  
R. Chou, Reactor Inspector (Section 1R08)  
R. Hamilton, Senior Health Physicist (Sections  
2OS2, 2PS1, 4OA1, 4OA5)  
W. Loo, Senior Health Physicist (Sections 2PS2)  
R. Moore, Senior Reactor Inspector (Section 4OA5.2)  
A. Nielsen, Health Physicist (Sections 2OS1, 4OA1)

Accompanying  
Personnel: R. Mackowski, Reactor Inspector (in training)

Approved by: Kathy Weaver, Acting Chief  
Reactor Projects Branch 1  
Division of Reactor Projects

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## SUMMARY OF FINDINGS

IR05000369/2008002, IR05000370/2008002; 1/1/2008 - 3/31/2008; McGuire Nuclear Station, Units 1 and 2; Licensed Operator Requalification, Maintenance Effectiveness, Other.

The report covered a three month period of inspection by resident inspectors and announced inspections by three health physicists and two reactor inspectors. Three Green non-cited violations (NCVs) were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using IMC 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. 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.

### A. NRC-Identified and Self-Revealing Findings

#### Cornerstone: Mitigating Systems

- Green. The inspectors identified a non-cited violation (NCV) of Technical Specification (TS) 5.4.1.a. for failure to adequately establish and maintain procedures required by Regulatory Guide 1.33, Appendix A, Section 5, Procedures for Abnormal Conditions. Specifically, loss of nuclear service water (RN) procedures were not established and maintained with an adequate safety analysis for the sharing of nuclear service water between units.

This finding is more than minor because it affects the availability, reliability, and capability of the RN system (ultimate heat sink) and is related to the design control and procedure quality attributes of the mitigating systems cornerstone. In addition, this finding could be reasonably viewed as a precursor to a significant event (i.e. loss of RN on both units). The issue was determined to be of very low safety significance in IMC 0609 SDP Phase 1 screening based on the fact that this finding did not represent an actual loss of system safety function nor a loss of a single train of RN for greater than its Technical Specification allowed outage time, because these procedural steps had never been used. This finding has a cross-cutting aspect of resources in the area of human performance [H.2.c] because the licensee failed to ensure that procedures had complete, accurate and up-to-date design documentation to assure nuclear safety. (Section 1R11)

- Green. A self-revealing NCV of TS 5.4.1.a, for failure to adequately implement procedures required by Regulatory Guide 1.33, Appendix A, Section 9, Procedures for Performing Maintenance, was identified. Specifically, foreign material exclusion control procedures as described in work orders were not implemented.

This finding is more than minor because it affects the availability, reliability, and capability of one train of the RN system (ultimate heat sink) and is related to the

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human performance and procedure quality attributes of the mitigating systems cornerstone. This finding was considered self-revealing because the foreign material (i.e., diver's knife) was discovered in the 2A RN strainer as a result of the loss of safety equipment functionality. Data related to the frequency of high RN strainer differential pressure alarms was reviewed by the NRC staff for the seasonal macro-fouling periods of 2006 and 2007 to determine the total actual exposure time that macro-fouling occurred. Based on the data, a collective period of less than 30 days was selected as a conservative, bounding exposure number to determine the significance of the collective seasonal macro-fouling for the period from 2006 until January 28, 2008. The issue is of very low safety significance based on review IMC 0609 Appendix A pre-solved risk tables for loss of one train of nuclear service water for less than 30 days. This finding has a cross-cutting aspect of decision making in the area of human performance [H.1.b] because the licensee failed to use conservative assumptions in decision making when deciding not to implement foreign material procedures. (Section 1R13)

- Green. The inspectors identified a NCV of 10 CFR 50, Appendix B, Criterion III, Design Control, for failure to establish measures to verify the design capability of the RN pumps. Specifically, the licensee did not perform system hydraulic analyses or use other means to demonstrate that RN pumps 1A and 1B could perform their safety function under the most limiting design basis conditions.

This finding is more than minor because it affected the design control attribute of the mitigating systems cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The inspectors assessed the finding using the SDP and determined that the finding was of very low safety significance because subsequent engineering analysis, completed in March 2008, demonstrated there was no loss of RN system safety function capability when the worst case design basis accident (DBA) limiting values were input into the RN system flow analysis. (Section 4OA5.2)

B. Licensee-Identified Violations

None.

## Report Details

### Summary of Plant Status:

Unit 1 began the inspection period at approximately 100 percent rated thermal power and remained there for the remainder of the period.

Unit 2 began the inspection period at approximately 100 percent rated thermal power. Unit 2 shut down for a refueling outage on March 1, 2008, and remained shut down for the remainder of the period.

#### 1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

#### 1R04 Equipment Alignment

##### .1 Partial Walkdown

###### a. Inspection Scope

The inspectors performed a partial walkdown of the three systems listed below to assess the operability of redundant or diverse trains and components when safety equipment was inoperable. The inspectors attempted to identify any discrepancies that could impact the function of the system, and, therefore, potentially increase risk. The inspectors reviewed applicable operating procedures, walked down control system components, and verified that selected breakers, valves, and support equipment were in the correct position to support system operation. The inspectors also verified that the licensee had properly identified and resolved equipment alignment problems that could cause initiating events or impact the capability of mitigating systems or barriers, and entered them into the corrective action program. Documents reviewed are listed in the Attachment to this report.

- Unit 2 train B chemical and volume control system with train A out-of-service on January 8
- Unit 2 train A emergency diesel generator with train B out of service on January 22
- Unit 1 train B emergency diesel generator with train A out of service on February 12

###### b. Findings

No findings of significance were identified.

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## 1R05 Fire Protection

### .1 Fire Protection - Tours

#### a. Inspection Scope

For the seven areas identified below, the inspectors reviewed the licensee's control of transient combustible material and ignition sources, fire detection and suppression capabilities, fire barriers, and any related compensatory measures, to determine whether those items were consistent with Updated Final Safety Analysis Report (UFSAR) Section 9.5.1, Fire Protection System, and the fire protection program as described in the Design Basis Specification for Fire Protection, MCS-1465.00-00-0008. To determine whether conditions in these areas were consistent with descriptions of the areas in the Design Basis Specification, the inspectors walked down accessible portions of each area, as well as reviewed the associated pre-fire plan strategy and the results from related surveillance tests. Documents reviewed during this inspection are listed in the Attachment to this report.

The inspected Areas included:

- Unit 1 motor generator set room (fire area 22)
- Unit 2 motor generator set room (fire area 23)
- Unit 1 turbine building (fire area TBG)
- Unit 1 feed pump area (fire area MFPT)
- Unit 2 annulus (fire area RB1)
- Unit 2 reactor building pipe chase (fire area RB2)
- Unit 2 reactor building inside crane wall (fire area RB3)

#### b. Findings

No findings of significance were identified.

## 1R07 Heat Sink Performance - Annual Resident Inspection

#### a. Inspection Scope

The inspectors selected the heat exchangers listed below based on their risk significance and reviewed the results of the associated inspections (including the digital pictures of the inlet channels and tube sheets) to determine whether the heat exchangers were ready and available to perform their intended functions as described in the UFSAR. Through review of digital pictures from the previous two refueling outages and comparing the as-found conditions for the three outages, the inspectors evaluated whether the frequency of inspection was sufficient to detect degradation prior to loss of heat removal capabilities below design requirements. The inspectors also reviewed heat

exchanger differential pressure alarm history for the two heat exchangers with the heat exchanger engineer. The documents reviewed during this inspection are listed in the Attachment to this report.

- 2B component cooling heat exchanger
- 2A component cooling heat exchanger

b. Findings

No findings of significance were identified.

1R08 In-service Inspection (ISI) Activities (Unit 2)

.1 Piping Systems ISI

a. Inspection Scope

The inspectors reviewed the implementation of the licensee's ISI program for monitoring degradation of the reactor coolant system (RCS) boundary and risk significant piping system boundaries. The inspectors reviewed a sample from activities performed during the Unit 2 end-of-cycle 18 (Spring 2008) refueling outage, including: (1) nondestructive examinations (NDE) required by the 1998 Edition through 2000 Addenda, of American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI with a Risk Informed ISI Program; (2) Boric Acid Program activities done in response to GL 88-05; and (3) augmented examination commitments. The inspectors also reviewed the procedures, equipment, personnel qualifications, and work packages, observed Ultrasonic Examinations, and walked down the containment to examine boric acid leakages. The inspectors reviewed Self Assessment MCE-SA07-05, Boric Acid Corrosion Control Program and GO-07-014, 2007 Maintenance and Work Control Functional Area Evaluation. An Ultrasonic Examination (UT) report for Weld Overlay 2NC2FW2-NW6 for the Pressurizer 14" diameter surge line nozzle to safe end dissimilar weld was reviewed for Temporary Instruction (TI) 2515/172, Reactor Coolant System Dissimilar Metal Butt Welds.

Specifically, the inspectors reviewed NDE procedures, reports, equipment calibration and certification records, personnel qualification records, for the following NDE activities.

- UT Report UT-08-001 of Pressurizer 14" diameter surge line, nozzle to safe end dissimilar overlay weld 2NC2FW2-NW6
- UT Report UT-08-004 of 2" diameter pipe weld 2NV2FW215-48
- UT Report UT-08-005 of 2" diameter pipe weld 2NV2FW215-49
- UT Report UT-08-006 of 3" diameter pipe weld 2NV2FW215-37
- Liquid Penetrant Examinations (PT) of 1" suck welds NC2FW101.8 & 101.18
- PT of 1-1/2" suck welds NI2FW89.5 & 89.6
- Visual Examinations (VT) of 1" suck welds NC2FW101.8 & 101.18
- VT of 1-1/2" suck welds NI2FW89.5 & 89.6

Recordable indications accepted by the licensee for continued service since the previous refueling outage.

- UT Reports UT-06-281, 283, 285, & 350 of Pressurizer 8" diameter spray line, nozzle to head dissimilar weld 2PZR-12
- UT Report UT-06-347 of Steam Generator C Tube Sheet to Lower Head weld 2-SGC-W22

The inspectors reviewed the following Repair/Replacement Activities for compliance with ASME Code. Specifically, the inspectors reviewed weld process control sheets, welder operating instructions, welding procedure specifications, welding procedure qualification records, welder qualification records, Certified Material Test Reports for weld material, and NDE reports.

- Weld Repair/Replacement Work Order 01750537 for welds NC2FW101.8 & 101.18 for 1" diameter reactor head vent line valve replacement
- Weld Repair/Replacement Work Order 01718559 for welds NI2FW89.5 & 89.6 for 1-1/2" diameter steam generator cold leg vent line check valve replacement

b. Findings

No findings of significance were identified.

.2 PWR Vessel Upper Head

The inspection for the vessel upper head and head penetrations in accordance with NRC Order EA-03-009 was completed during the last outage and documented under Section 4OA.5.2 of NRC Inspection Report 05000369/2006005, 05000370/2006005, and 072000038/2006002, NRC TI 2515/150, Reactor Pressure Vessel Head and Vessel Head Penetration Nozzles. The licensee was not required to perform the head inspection during this outage, because it is in the low susceptibility category described in the Order. The next inspection is scheduled for the Unit 2 EOC 20 (Spring 2011) Refueling Outage.

.3 Boric Acid Corrosion Control (BACC) Program

a. Inspection Scope

The inspectors reviewed the licensee's Boric Acid Corrosion Control Program to ensure compliance with commitments made in response to NRC Generic Letter 88-05, "Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary," and Bulletin 2002-01, "Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity."

The inspectors conducted an on-site record review, and an independent walk-down of the containment building, which is not normally accessible during at-power operations, to evaluate licensee compliance with their program procedures and applicable industry guidance. In particular, the inspectors verified that the licensee's visual examinations

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focused on locations where boric acid leaks could cause degradation of safety-related components and that degraded or non-conforming conditions were properly identified in the licensee's corrective action program.

b. Findings

No findings of significance were identified.

.4 Steam Generators

The licensee did not perform the steam generator in-service inspection during this outage and delayed the inspection to the next outage. The licensee performed an evaluation which concluded that the steam generator in-service inspection could be delayed to the next outage. The inspectors reviewed the evaluation for the delayed inspection.

.5 Identification and Resolution of Problems

a. Inspection Scope

The inspectors performed a review of ISI related problems, including welding, and BACC program that were identified by the licensee and entered into the corrective action program as PIPs. The inspectors reviewed the PIPs to confirm that the licensee had appropriately described the scope of the problem and had initiated corrective actions. The review also included the licensee's consideration and assessment of operating experience events applicable to the plant. The inspectors performed this review to ensure compliance with 10CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," requirements. The corrective action documents reviewed by the inspectors are listed in the Attachment to this report.

b. Findings

No findings of significance were identified.

1R11 Licensed Operator Regualification

a. Inspection Scope

On January 30, 2008, the inspectors observed licensed operator performance during requalification simulator training for shift B, to determine whether operator performance was consistent with expected operator performance, as described in Exercise Guide OP-MC-SRT-40. This training tested the operators' ability to perform abnormal and emergency procedures dealing with pressurizer pressure abnormalities, loss of electrical power, faulted steam generator, reactor trip, safety injection, and safety injection termination. The inspectors focused on clarity and formality of communication, use of procedures, alarm response, control board manipulations, group dynamics and

supervisory oversight. The inspectors observed the post-exercise critique to determine whether the licensee identified deficiencies and discrepancies that occurred during the simulator training.

The inspectors reviewed PIP-M-07-6207, Acceptability of Using Operable Train of Nuclear Service Water to Feed Opposite Unit, to determine whether the licensee identified and implemented appropriate corrective actions.

b. Findings

Introduction: The inspectors identified a Green NCV of TS 5.4.1.a. for failure to adequately establish and maintain procedures required by Regulatory Guide 1.33, Appendix A, Section 5, Procedures for Abnormal Conditions. Specifically, loss of nuclear service water procedures were not established and maintained with an adequate safety analysis for the sharing of nuclear service water between units.

Description: While observing licensed operator simulator training (Exercise Guide OP-MC-SRT-75) in November 2007, the inspectors identified steps in the abnormal procedure for loss of nuclear service water (AP/1/A/5500/20, AP/2/A/5500/20) that allowed cross-connecting the nuclear service water (RN) of one unit's safety train discharge headers to the other unit's safety train discharge headers. Upon a complete loss of RN, abnormal procedures first direct the operators to align the same unit's containment ventilation cooling water (RV) pumps to the RN system to maintain safety function. If no RV pumps are available to provide this defense in depth, the procedure response not obtained column then directs the operators to enclosure 1, which aligns an operating train of RN from the other unit (donor unit) through manual locked closed cross-connect valves which connect the RN systems of both units. When these cross-connect valves are opened, water from the donor unit's operating RN system will be diverted to the other unit. The amount of water diverted from the donor unit is dependent on the throttling of the valves in the system. The procedure has some minimal guidance on overall pump flow rates, based on the suction source (Lake Norman or standby nuclear service water pond), and guidance to monitor for alarms on equipment.

The licensee's UFSAR was submitted in accordance with Regulatory Guide 1.70, which states that the UFSAR shall include a failure analysis to demonstrate any safety implications related to sharing of the service water system (Section 9.2.1). The licensee's UFSAR section 3.1 commits to 10 CFR 50, Appendix A, General Design Criterion 5 (GDC 5), which states that systems shall not be shared among nuclear power units unless it can be shown that such sharing will not significantly impair their ability to perform their safety function. When requested by the inspectors, the licensee could not provide a safety analysis which showed that the procedural guidance to share the RN discharge safety trains between units would not significantly impair the operable RN system's ability to perform its safety function. License amendments 78 for Unit 1 and 59 for Unit 2 were previously approved to clarify that portions of the RN system are shared between the two McGuire units, but that the system is not shared in its entirety. The RN discharge headers were specifically designated as not shared in these amendments.

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The licensee could not provide a subsequent license amendment that changed the designation of the shared portions of the RN system. The licensee subsequently informed the inspectors that a calculation did not exist.

Analysis: This finding is more than minor because it affects the availability, reliability, and capability of the RN system (ultimate heat sink) and is related to the design control and procedure quality attributes of the mitigating systems cornerstone. In addition, this finding could be reasonably viewed as a precursor to a significant event (i.e., loss of RN on both units). The issue was determined to be of very low safety significance (Green) in IMC 0609 SDP Phase 1 screening based on the fact that this finding did not represent an actual loss of system safety function nor a loss of a single train of RN for greater than its TS allowed outage time, because these procedural steps had never been used. This finding has a cross-cutting aspect of resources in the area of human performance [H.2.c] because the licensee failed to ensure that procedures had complete, accurate and up-to-date design documentation to assure nuclear safety.

Enforcement: TS 5.4.1.a requires that written procedures be established, implemented, and maintained covering activities described in Regulatory Guide 1.33, Revision 2, Appendix A, 1978, which includes procedures for abnormal conditions (Section 5). 10CFR50, Appendix B, Criterion III, Design Control, states that measures shall be established to assure that the applicable regulatory requirements and the design basis, as specified in the license application, for those structures, systems, and components, to which this appendix applies are correctly translated into specifications, drawings, procedures, and instructions. UFSAR Section 3.1 commits to 10 CFR 50, Appendix A, General Design Criterion 5 (GDC 5), which states that systems shall not be shared among nuclear power units unless it can be shown that such sharing will not significantly impair their ability to perform their safety function. Contrary to the above, prior to March 2008, the licensee failed to adequately establish and maintain abnormal procedures for loss of nuclear service water (AP/1/A/5500/20, AP/2/A/5500/20), in that the procedures required operation of the nuclear service water system outside the bounds of the approved licensing basis. Specifically, these abnormal procedures required operators to cross-connect an operable RN train from one unit to the RN system on the other unit without a safety analysis showing that such sharing would not significantly impair the RN system's ability to perform its intended safety function for its original assigned unit. Because this violation was determined to be of very low safety significance and was placed in the corrective action program as PIP M-07-6207, this violation is being treated as a NCV in accordance with Section VI.A.1 of the Enforcement Policy: NCV 05000369,370/2008002-01, Failure to Establish and Maintain Abnormal Procedures for Loss of Nuclear Service Water.

## 1R12 Maintenance Effectiveness

### a. Inspection Scope

The inspectors reviewed the samples listed below for items such as: (1) appropriate work practices; (2) identifying and addressing common cause failures; (3) scoping in accordance with 10 CFR 50.65(b) of the maintenance rule; (4) characterizing reliability

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issues for performance; (5) trending key parameters for condition monitoring; (6) charging unavailability for performance; (7) classification and reclassification in accordance with 10 CFR 50.65(a)(1) or (a)(2); and (8) appropriateness of performance criteria for structures, systems, and components (SSCs)/functions classified as (a)(2) and/or appropriateness and adequacy of goals and corrective actions for SSCs/functions classified as (a)(1). Documents reviewed are listed in the Attachment to the report.

- Main feedwater pump turbine control failures
- Residual heat removal heat exchanger outlet isolation valve control failures

c. Findings

No findings of significance were identified.

1R13 Maintenance Risk Assessments and Emergent Work Evaluation

a. Inspection Scope

The inspectors reviewed the licensee's risk assessments and the risk management actions used to manage risk for the plant configurations associated with the nine activities listed below. The inspectors assessed whether the licensee performed adequate risk assessments, and implemented appropriate risk management actions when required by 10CFR50.65(a)(4). For emergent work, the inspectors also verified that any increase in risk was promptly assessed, and that appropriate risk management actions were promptly implemented. The inspectors also reviewed associated PIPs to determine whether the licensee identified and implemented appropriate corrective actions.

- Work associated with removing the Unit 1 switchyard red bus line from service for maintenance activities on January 7
- Work associated with unit one, train "A" nuclear service water maintenance activities and associated elevated risk on January 15
- Work associated with unit one, train "A" main feedwater pump control failure troubleshooting and repair on January 15
- Work associated with unit one wet tap, for valve 1RN-400, located upstream of the inlet to the 1A diesel generator cooling water heat exchanger
- Emergent work associated with 2A nuclear service water strainer backwash motor problems that resulted in an orange risk condition, and main feed pump digital controller issues that occurred at the same time
- Emergent work associated with a ground on the 2B emergency diesel generator fuel oil booster pump on February 19 - 21
- Emergent Unit 2 Orange risk on March 4 due to tornado watch causing a change in the power availability defense-in-depth key safety function assessment

- Emergent Unit 2 Orange risk on March 7 due to discovery of valve 2KF-122, fuel transfer tube isolation valve, not in the open position to credit long term injection source in decay heat removal key safety function assessment
- Emergent issue associated with Unit 1 turbine building siding blowing off in area of Unit 1 main transformers

b. Findings

Introduction: A Green NCV of TS 5.4.1.a, for failure to adequately implement procedures required by Regulatory Guide 1.33, Appendix A, Section 9, Procedures for Performing Maintenance, was identified. Specifically, foreign material exclusion control procedures as described in work orders were not implemented.

Description: On January 28, 2008, the Unit 2 train A RN pump suction strainer motor experienced a motor overload alarm. The strainer motor was quickly secured to prevent damage and the A train of RN was declared inoperable. The function of the strainer is to prevent macro-fouling of the RN system. The strainer is maintained un-fouled from debris by backwashing a section of the strainer at a time. The motor performs a rotation function to ensure that all sections are backwashed over a set period of time. The licensee found that the strainer had been fouled by a diver's knife, which was lodged in between the strainer basket and backwash chamber during rotation.

The licensee's apparent cause determined that the foreign material (diver's knife) came from maintenance activities associated with diving inspections of the RN suction piping conducted in 2006. While the work orders for those maintenance activities included foreign material control procedures, the procedures were never implemented by the job manager, because he believed the diving inspections of the suction piping did not formally constitute a breach of the RN system. Had the foreign control procedures been implemented, they would have directed the licensee to designate a monitor to log all items in and out of the suction piping to ensure no material (including a diver's knife) was left inside the system after completion of work that could affect the operability of the system.

Analysis: This finding is more than minor because it affects the availability, reliability, and capability of one train of the RN system (ultimate heat sink) and is related to the human performance and procedure quality attributes of the mitigating systems cornerstone. This finding was considered self-revealing because the foreign material was discovered as a result of the loss of safety equipment functionality. Data related to the frequency of high RN strainer differential pressure alarms was reviewed by the NRC staff for the seasonal macro-fouling periods of 2006 and 2007 to determine the total actual exposure time that macro-fouling occurred. Based on the data, a collective period of less than 30 days was selected as a conservative, bounding exposure number to determine the significance of the collective seasonal macro-fouling for the period from 2006 until January 28, 2008. The issue is of very low safety significance (Green) based on review of IMC 0609 Appendix A pre-solved risk tables for loss of one train of RN for less than 30 days. This finding has a cross-cutting aspect of decision making in the area

of human performance [H.1.b] because the licensee failed to use conservative assumptions in decision making when deciding not to implement foreign material procedures.

Enforcement: TS 5.4.1.a requires the implementation of written procedures described in Regulatory Guide 1.33, Revision 2, Appendix A, including procedures for performing maintenance that can affect the performance of safety-related equipment. Duke Work Process Manual 700 requires that work execution comply with the requirements of the work order. Contrary to the above, prior to January 2008, the licensee failed to adequately implement work order instructions related to diving activities in the safety-related RN system. Specifically, foreign material exclusion control procedures, as described in work orders associated with diving inspections conducted on the safety-related RN system intake piping, were never implemented. As a result, a diver's knife was lost and not retrieved, which resulted in the inoperability of the Unit 2 train A RN strainer. Because this violation was determined to be of very low safety significance and was placed in the corrective action program as PIP M-08-0514, this violation is being treated as a non-cited violation in accordance with Section VI.A.1 of the Enforcement Policy: NCV 05000370/2008002-02, Failure to Implement Foreign Material Exclusion Control Procedures.

#### 1R15 Operability Evaluation

##### a. Inspection Scope

The inspectors reviewed the operability determinations the licensee had generated that warranted selection on the basis of risk insights. The selected samples are addressed in the PIPs listed below. The inspectors assessed the accuracy of the evaluations, the use and control of any necessary compensatory measures, and compliance with the TS. The inspectors verified that the operability determinations were made as specified by Nuclear System Directive 203, Operability. The inspectors compared the arguments made in the determination to the requirements from the TS, the UFSAR, and associated design-basis documents, to determine whether operability was properly justified and the subject component or system remained available, such that no unrecognized increase in risk occurred.

- M-07-6071, Possible scenario that could prevent auto-swap of Turbine-Driven Auxiliary Feedwater pump
- M-07-6079, Possible scenario that could allow air to be transported to Auxiliary Feedwater (CA) pumps on Unit 1
- M-08-1321, Valve actuator for 2NI0332A is a post-78 design that has 10CFR21 applicable
- M-08-1532, 2B Emergency Diesel Generator (EDG) battery capacity test at 75%
- M-07-5624, 2B Containment Spray (NS) train found in an over-pressurized condition

##### b. Findings

No findings of significance were identified.

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1R19 Post Maintenance Testinga. Inspection Scope

The inspectors reviewed the seven post-maintenance tests listed below to determine whether procedures and test activities ensured system operability and functional capability. The inspectors reviewed the licensee's test procedure to determine: whether the procedure adequately tested the safety function(s) that may have been affected by the maintenance activity; if the acceptance criteria in the procedure were consistent with information in the applicable licensing basis and/or design basis documents; and whether the procedure had been properly reviewed and approved. The inspectors also witnessed the test or reviewed the test data, to determine whether test results adequately demonstrated restoration of the affected safety function(s).

- PT/2/A/4255/004 A, SV Train A Valve Stroke Timing - Quarterly (replacement of 2SV-19AB actuator)
- PT/2/A/4208/002 A, Enclosure 13.2, NS Train A Valve Stroke Timing - Quarterly (after closing force test maintenance on 2NS-32A)
- PT/2/A/4209/001 A, 2A Chemical and Volume Control Pump Performance Test (following 2A chemical and volume control oil pump, mechanical seal, and pump breaker maintenance)
- PT/2/A/4350/002 B, 2B EDG Operability Test (following various 2B EDG mechanical, electrical, and valve maintenance activities)
- Work Order 01793869 tasks 2, 25, 44; OP/2/A/6400/006, Nuclear Service Water System; PT/2/A/4200/038, Venting of CA System Suction Piping; and PT/2/A/4200/039, Venting of Nuclear Service Water System Following Maintenance (Removal of foreign material from the 2A Nuclear Service Water suction strainer)
- PT/1/A/4350/002 A, 1A EDG operability test (following various 1A EDG mechanical, electrical, and valve maintenance activities)
- PT/2/A/4350/002 B, 2B EDG Operability Test (following replacement of the fuel oil booster pump motor)

b. Findings

No findings of significance were identified.

1R20 Refueling and Outage Activitiesa. Inspection Scope

The inspectors evaluated licensee outage activities to determine whether the licensee: considered risk in developing outage schedules; adhered to administrative risk reduction methodologies they developed to control plant configuration, adhered to operating license and TS requirements that maintained defense-in-depth, and developed

mitigation strategies for losses of the key safety functions identified below:

- Decay Heat Removal
- Inventory Control
- Power Availability
- Reactivity Control
- Containment

Prior to the outage, the inspectors reviewed the licensee's outage risk control plan to determine whether the licensee had performed adequate risk assessments and had implemented appropriate risk management strategies when required by 10CFR50.65(a)(4).

The inspectors observed portions of the cooldown process to determine whether TS cooldown restrictions were followed. The inspectors observed the items or activities described below, to determine whether the licensee maintained defense-in-depth commensurate with the outage risk control plan for the key safety functions identified above and applicable TS when taking equipment out-of-service.

- Clearance Activities
- Reactor Coolant System Instrumentation
- Electrical Power
- Decay Heat Removal
- Spent Fuel Pool Cooling
- Inventory Control
- Reactivity Control
- Containment Closure

The inspectors reviewed the licensee's responses to emergent work and unexpected conditions, to determine whether resulting configuration changes were controlled in accordance with the outage risk control plan. The inspectors also observed fuel handling operations (removal, sipping, and insertion) and other ongoing activities, including control rod latching, to determine whether those operations and activities were being performed in accordance with TS and procedure PT/0/A/4150/037, Total Core Unloading. Additionally, the inspectors observed refueling activities to determine whether the location of the fuel assemblies was tracked, including new fuel, from core offload through core reload.

Prior to mode changes and on a sampling basis, the inspectors reviewed system lineups and/or control board indications to determine whether TSs, license conditions, and other requirements, commitments, and administrative procedure prerequisites for mode changes were met prior to changing modes or plant configurations. Also, the inspectors periodically reviewed reactor coolant system boundary leakage data, and observed the setting of containment integrity, to determine whether the reactor coolant system and containment boundaries were in place and had integrity when necessary.

Periodically, the inspectors reviewed the items that had been entered into the licensee's corrective action program, to determine whether the licensee had identified problems related to outage activities at an appropriate threshold and had entered them into the corrective action program. For the significant problems documented in the corrective action program and listed in the Attachment to this report, the inspectors reviewed the results of the licensee's investigations to assess whether the licensee had determined the root cause and implemented appropriate immediate corrective actions, as required by 10CFR50, Appendix B, Criterion XVI, Corrective Action.

The inspectors reviewed the licensee's compliance with Enforcement Guidance Memorandum (EGM) 07-006, Enforcement Discretion for Heavy Load Handling Activities, to determine whether the licensee's action for the lift and set of the reactor vessel head justified enforcement discretion. Specifically, the inspectors evaluated whether the licensee had complied with the following:

- (1) For all heavy load lifts within the reactor building, the licensee has defined and implemented safe load paths, load handling procedures, and standards for training of crane operators, use of special lifting devices, use of slings, and design, inspection, testing, and maintenance of the reactor building polar crane.

The inspectors reviewed the documents listed in the Attachment to this report, including lift procedures, crane and lift device inspection results, and training records.

- (2) Perform the lift with an accepted safety basis that bounds the planned lifts with respect to load weight, load height, and medium present under the load, and implement procedures for moving the head that reflect the safety basis.

The inspectors reviewed calculation MCC-1134.02-00-0043, Reactor Vessel Head Load Drop Analysis, that was performed by Westinghouse for McGuire and Catawba, and observed the head lifts to determine whether the bounds of the calculation and the procedures listed in the Attachment to this report were followed.

- (3) Include the movement of heavy loads as a configuration management activity in administrative controls established to implement 10CFR 50.65(a)(4).

The inspectors observed the licensee's risk assessment process and discussed their methodology with licensee personnel.

b. Findings

No findings of significance were identified. The inspectors did find that the licensee's UFSAR had not yet been updated for the site specific load lift analysis described in calculation MCC-1134.02-00-0043. However, because the inspectors determined that the licensee has complied with the intent of Enforcement Guidance Memorandum 07-006 for the reactor vessel head lift and set during the Unit 2 refueling outage, enforcement discretion (EA-08-035) is continuing to be exercised (as previously stated in NRC Inspection Report 05000369,370/2007005) in accordance with Section VII.B.6 of the NRC Enforcement Policy without any enforcement action being taken.

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1R22 Surveillance Testinga. Inspection Scope

For the surveillance tests identified below, the inspectors witnessed testing and/or reviewed the test data, to determine: (1) whether the SSCs involved in these tests satisfied the requirements described in the TSs, the UFSAR, and applicable licensee procedures; and (2) if the tests demonstrated whether the SSCs were capable of performing their intended safety functions.

- PT/2/A/4252/001B, 2B Auxiliary Feedwater (CA) Pump Performance Test (including PT/2/A/4252/028B, Slave Start CA Pump 2B)\*
- PT/2/A/4252/002B, CA Valve Stroke Timing – Quarterly 2B Motor Driven Pump Flowpath\*
- PT/1/A/4204/001B, 1B Residual Heat Removal (ND) Pump Performance Test\*
- PT/1/A/4204/002B, Residual Heat Removal Train B Valve Stroke Timing – Quarterly\*
- PT/1/A/4252/002A, CA Valve Stroke Timing – Quarterly 1A Motor Driven Pump Flowpath\*
- PT/0/A/4200/032, Periodic Inspection of Ice Condenser Lower Inlet Doors
- PT/0/A/4200/018, Ice Bed Analysis (including MP/0/A/7150/076 Ice Basket Weight Determination)
- PT/2/A/4403/007, RN Train 2A Flow Balance\*
- PT/2/A/4200/009 A, Engineered Safety Features Actuation Periodic Test Train A
- PT/2/A/4200/009 B, Engineered Safety Features Actuation Periodic Test Train B
- PT/2/A/4200/001, Containment Integrated Leak Rate Test\*\*

\*This procedure included inservice testing requirements.

\*\*This procedure included testing of a large containment isolation valve.

b. Findings

No findings of significance were identified.

1EP6 Drill Evaluationa. Inspection Scope

Resident inspectors evaluated the conduct of a routine licensee emergency drill on February 20 to identify any weaknesses and deficiencies in classification, notification, and protective action recommendation development activities in accordance with 10CFR50, Appendix E. The inspectors observed emergency response operations in the simulated control room to determine whether event classification and notifications were done in accordance with EPIP-1, Emergency Plan Classification Matrix. The inspectors also attended the licensee critique of the drill to compare any inspector-observed weakness with those identified by the licensee in order to verify whether the licensee was properly identifying failures.

b. Findings

No findings of significance were identified.

2. RADIATION SAFETY

Cornerstone: Occupational Radiation Safety (OS)

2OS1 Access Control To Radiologically Significant Areas

a. Inspection Scope

Access Controls - The inspectors evaluated licensee performance in controlling worker access to radiologically significant areas and monitoring jobs in-progress associated with the 2EOC18 outage. The inspectors directly observed implementation of administrative and physical radiological controls; evaluated radiation worker (radworker) and health physics technician (HPT) knowledge of and proficiency in implementing radiation protection requirements; and assessed worker exposures to radiation and radioactive material.

During facility tours, the inspectors directly observed postings and physical controls for radiation areas, high radiation areas (HRAs), and potential airborne radioactivity areas established within the radiologically controlled area (RCA) of the Unit 2 containment, Unit 1 and Unit 2 auxiliary buildings, and radioactive waste (radwaste) processing and storage locations. The inspectors independently measured radiation dose rates or directly observed conduct of licensee radiation surveys for selected RCA areas. Results were compared to current licensee surveys and assessed against established postings and Radiation Work Permit (RWP) controls. Licensee key control and access barrier effectiveness were evaluated for selected Unit 1 and Unit 2 Locked High Radiation Area (LHRA) and Very High Radiation Area (VHRA) locations. Changes to procedural guidance for LHRA and VHRA controls were discussed with health physics (HP) supervisors. Controls and their implementation for storage of irradiated material within the spent fuel pool (SFP) were reviewed and discussed. Established radiological controls were evaluated for selected Unit 2 EOC18 tasks including cavity liner plate grinding/welding and entry into the upper cavity area near the reactor head. In addition, licensee controls for areas where dose rates could change significantly as a result of plant shutdown and refueling operations were reviewed and discussed.

For selected tasks, the inspectors attended pre-job briefings and reviewed RWP details to assess communication of radiological control requirements to workers. Occupational workers' adherence to selected RWPs and HPT proficiency in providing job coverage were evaluated through direct observations and interviews with licensee staff. Electronic dosimeter (ED) alarm set points were evaluated against area radiation survey results for cavity liner plate grinding/welding near the Unit 2 transfer canal.

The inspectors evaluated the effectiveness of radiation exposure controls, including air sampling, barrier integrity, engineering controls, and postings through a review of both internal and external exposure results. Worker exposure as measured by ED and by

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licensee evaluations of skin doses resulting from discrete radioactive particle or dispersed skin contamination events were reviewed and assessed. For high radiation area tasks involving significant dose rate gradients (i.e., work in the transfer canal), the inspectors evaluated the use and placement of whole body and extremity dosimetry to monitor worker exposure.

Radiation protection activities were evaluated against the requirements of UFSAR Section 12; TS Sections 5.4 and 5.7; 10 Code of Federal Regulations (CFR) Parts 19 and 20; and approved licensee procedures. Records reviewed are listed in Section 2OS1 of the Attachment to this report

Problem Identification and Resolution - Licensee Corrective Action Program (CAP) documents associated with access control to radiologically significant areas were reviewed and assessed. This included review of selected PIPs related to radworker and HPT performance. The inspectors evaluated the licensee's ability to identify, characterize, prioritize, and resolve the identified issues in accordance with procedure NSD 208, Problem Investigation Process, Rev. 28. The inspectors also reviewed recent self-assessment results. Licensee CAP documents reviewed are listed in Section 2OS1 of the Attachment to this report. The inspectors completed 21 of the required line-item samples described in Inspection Procedure (IP) 71121.01.

b. Findings

No findings of significance were identified.

2OS2 ALARA Planning and Controls

a. Inspection Scope

As Low As Reasonably Achievable (ALARA) - Implementation of the licensee's ALARA program during Unit 2 EOC 18 refueling outage was observed and evaluated by the inspectors. The inspectors reviewed ALARA planning, dose estimates, and prescribed ALARA controls for outage work tasks expected to incur the maximum collective exposures. Reviewed activities included cavity liner repair and ECCS sump modifications. Also, incorporation of planning, established work controls, expected dose rates and dose expenditure into the ALARA pre-job briefings and RWPs for those activities were reviewed. The inspectors directly observed performance of these activities while evaluating the licensee's use of engineering controls, low-dose waiting areas, and on-the-job supervision.

Select elements of the licensee's source term reduction and control program were examined to evaluate the effectiveness of the program in supporting implementation of the ALARA program goals. Shutdown chemistry program implementation and the resultant effect on containment and auxiliary building dose rate trending data were reviewed and discussed with cognizant licensee representatives; this included a significant reduction in dose rates from what was observed in previous outages that was

being attributed to the implementation of zinc injection, reduced inventory cleanup, and ultrasonic fuel cleaning.

Trends in individual and collective personnel exposures were reviewed. Records of year-to-date individual radiation exposures sorted by work groups were examined for significant variations of exposures among workers. The inspectors examined the dose records of all declared pregnant workers from 2007 and 2008 to evaluate total or current gestation dose. The applicable RP procedure was reviewed to assess licensee controls for declared pregnant workers. Trends in the plant's three-year rolling average collective exposure history, outage, non-outage, and total annual doses for select years were reviewed and discussed with licensee representatives.

The licensee's ALARA program implementation and practices were evaluated for consistency with UFSAR Chapter 12, Radiation Protection; 10 CFR Part 20 requirements; Regulatory Guide 8.29, Instruction Concerning Risks from Occupational Radiation Exposure, February 1996; and licensee procedures. Documents reviewed during the inspection of this program area are listed in Section 2OS2 of the Attachment to this report.

Problem Identification and Resolution - The inspectors reviewed CAP documents listed in Section 2OS2 of the report Attachment that were related to the ALARA program. The inspectors assessed the licensee's ability to identify, characterize, prioritize, and resolve the identified issues in accordance with SPP-3.1, Corrective Action Program, Rev. 12. The inspectors completed 25 of the samples detailed in IP 71121.02.

b. Findings

No findings of significance were identified.

Cornerstone: Public Radiation Safety

2PS1 Radioactive Gaseous and Liquid Effluent Treatment and Monitoring Systems

Groundwater Monitoring

a. Inspection Scope

The inspectors reviewed the licensee's implementation of the NEI Groundwater Protection initiative. The review included the review of two voluntary reports made to the NRC and State and Local Authorities. The reports were for water that had already been radiologically monitored for release but was being treated to meet NPDES criteria for foaming. The inspectors walked down the systems involved and the corrective actions that had been taken. Additionally, the inspectors reviewed an inspection report made by the Mecklenburg County Land Use and Environmental Services Agency regarding their on-site inspection and independent sampling performed in response to the voluntary reports.

The licensee has a system of 55 on-site monitoring wells that are routinely sampled and analyzed for tritium and other mobile nuclides. All of the sample results were well below the EPA drinking water limit for tritium of 20,000 pico-Curies/ liter. Most of the wells showed levels comparable to the background levels found local area lakes. Three wells showed elevated levels, one of which showed approximately 60% of the EPA drinking water limit. The nearest drinking water well is approximately 4000 feet away, and based on topography, could not reasonably be expected to be affected.

b. Findings

No findings of significance were identified.

Cornerstone: Public Radiation Safety

2PS2 Radioactive Material Processing and Transportation

a. Inspection Scope

Waste Processing and Characterization - The inspectors reviewed and discussed the currently installed radioactive waste (radwaste) processing system as described in the UFSAR Section 11. In addition, stored and disposed radwaste types and quantities as documented in Effluent Release Reports for Calendar Year 2006 were discussed with responsible licensee representatives.

During the inspection, the operability and configuration of selected liquid and solid radwaste processing systems and equipment were evaluated. Inspection activities included reviews of procedures and records, interviews with plant personnel, and direct inspection of processing equipment and piping. The inspectors directly observed equipment material condition and configuration for liquid and solid radwaste processing systems. Licensee staff was interviewed regarding equipment function and operability. The licensee's policy regarding abandoned radwaste equipment was reviewed and discussed with cognizant licensee representatives. Chemistry staff was interviewed to assess knowledge of radwaste system processing operations. Procedural guidance involving transfer of resin and filling of waste packages was reviewed for consistency with the licensee's Process Control Program (PCP) and UFSAR details.

Licensee radionuclide characterizations of each major waste stream were evaluated. For dry active waste (DAW), primary resin, secondary resin, and filters, the inspectors evaluated PCP and licensee procedural guidance against 10 CFR 61.55 and the Branch Technical Position (BTP) on Radioactive Waste Classification details. Part 61 data and scaling factors were reviewed and discussed with licensee representatives for radwaste processed or transferred to licensed burial facilities from October 1, 2006, through March 20, 2008. The licensee's analyses and current scaling factors for quantifying hard-to-detect nuclides were assessed.

The inspectors discussed potential for changes to plant operating conditions and reviewed selected DAW waste stream radionuclide data to determine if known plant changes were assessed and radionuclide composition remained consistent for the

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period reviewed. Effects of zinc addition on primary chemistry and waste streams were discussed with chemistry and radwaste staff.

Transportation - The inspectors evaluated the licensee's activities related to transportation of radioactive material. The evaluation included review of shipping records and procedures, assessment of worker training and proficiency, and direct observation of shipping activities.

The inspectors assessed shipping-related procedures for compliance with applicable regulatory requirements. Selected shipping records were reviewed for completeness and accuracy, and for consistency with licensee procedures. Training records for individuals qualified to ship radioactive material were verified. Inspectors directly observed radiation and contamination surveys for a shipment of dry active waste.

The inspectors directly observed radiation surveys of the boxes and the transport vehicle being prepared for shipment. Responsible staff was interviewed to assess their knowledge of package radiation and contamination controls and applicable limits.

Transportation program guidance and implementation were reviewed against regulations detailed in 10 CFR 71.5, 49 CFR 170-189, and applicable licensee procedures listed in the Attachment to this report. In addition, training activities were assessed against 49 CFR 172 Subpart H, and the guidance documented in NRC Bulletin 79-19.

Problem Identification and Resolution - Licensee CAP documents associated with radwaste processing and transportation activities were reviewed and assessed. The inspectors evaluated the licensee's ability to identify, characterize, prioritize, and resolve the identified issues in accordance with NSD-208, Problem Investigation Process, Rev. 28. Specific assessments and PIP documents reviewed in detail for this inspection area are identified in Section 2PS2 of the Attachment to this report. The inspectors completed six of the required line-item samples described in IP 71122.02.

b. Findings

No findings of significance were identified.

4OA1 Performance Indicator (PI) Verification

a. Inspection Scope

Cornerstone: Occupational Radiation Safety

- Occupational Exposure Control Effectiveness

The inspectors reviewed the Occupational Exposure Control Effectiveness PI results for the Occupational Radiation Safety Cornerstone from December 2007 to February 2008. For the assessment period, the inspectors reviewed ED alarm logs and selected PIPs related to controls for exposure significant areas. The inspectors also reviewed licensee

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procedural guidance for collecting and documenting PI data. Documents reviewed are listed in sections 2OS1 and 4OA1 in the Attachment to this report.

#### Cornerstone Public Radiation Safety

- RETS/ODCM Radiological Effluents Occurrence

The inspectors reviewed and evaluated selected radiological liquid and gaseous effluent release data, abnormal release results, cumulative and projected doses to the public, and selected PERs for the period of January through December 2007. Documents reviewed are listed in section 4OA1 in the Attachment to this report.

#### b. Findings

No findings of significance were identified.

### 4OA2 Problem Identification and Resolution

#### .1 Daily Screening of Corrective Action Items

As required by Inspection Procedure 71152, "Identification and Resolution of Problems", and in order to help identify repetitive equipment failures or specific human performance issues for followup, the inspectors performed a daily screening of items entered into the licensee's corrective action program. This review was accomplished by reviewing hard copies of condition reports, attending daily screening meetings, and accessing the licensee's computerized database.

#### .2 Annual Sample Review

##### a. Inspection Scope

The inspectors selected PIPs: M-07-03099, Reactor Vessel Head Lift Risk Analysis; M-07-4759, Heavy Lift Phase I and II Assessment; M-07-3992, Discrepancies with Generic Letter 81-07; and M-07-5268, EGM 07-006; for detailed review. These PIPs were associated with the Reactor Vessel Head Lift. The inspectors reviewed these corrective action documents to determine whether the licensee identified the full extent of the issue, performed an appropriate evaluation, and specified and prioritized appropriate corrective actions. The inspectors evaluated the report against the requirements of the licensee's corrective action program as delineated in corporate procedure Nuclear System Directive 208, Problem Identification Process, and 10 CFR 50, Appendix B .

##### b. Observations and Findings

From the review of these PIPs, no findings of significance were identified.

40A3 Event Follow-upa. Inspection Scope

The inspectors reviewed the below non-routine evolutions to determine whether the licensee appropriately implemented procedures and whether operator performance was as expected:

- Unit 1 Turbine Valve Movement Testing on January 4, 2008
- Unit 1 Train "A" Feedwater Pump control failure on January 15, 2008
- Unit 2 shutdown for refueling outage 2EOC18 on March 1, 2008

b. Findings

No Findings of significance were identified.

40A5 Other Activities.1 Independent Spent Fuel Storage Installation (ISFSI)a. Inspection Scope

The inspectors toured the McGuire ISFSI installation and reviewed radiological access controls and environmental dosimetry placement. The inspectors compared dose rates to documented survey results. The inspectors reviewed TLD and surveillance data associated with the installation.

b. Findings

No findings of significance were identified

.2 (Closed) Unresolved Item (URI) 05000369,370/2006007-004, Nuclear Service Water (RN) System Flow Analysisa. Inspection Scope

During the 2006 component design basis inspection (CDBI) an URI was indentified related to a design control finding for the licensee's failure to perform adequate analysis to verify that RN pumps 1A and 1B could perform their safety function under most limiting design basis conditions. The CDBI identified several design input deficiencies in the existing RN system flow analysis. These deficiencies were design basis accident (DBA) limiting conditions which were not input into previous system analyses to assure RN system capability during the DBA. These included the following:

- TS allowed EDG frequency variations (over and under) on pump performance
- RN pump NPSH margin – projection of actual test values to DBA conditions
- Pump degradation permitted by IWP

- Impact from SNSWP evaporation during DBA on RN pump performance
- Maximum number of tubes plugged in heat exchangers (HX)
- Maximum RN flow
- Minimum tube plugging
- Validation of HX tube plugging limit based on 60/40 % mud/water assumption

The item was unresolved pending the completion of the licensee's RN system flow analysis model. The flow analysis model was completed in March, 2008.

b. Findings

Introduction: The inspectors identified a Green NCV of 10 CFR 50, Appendix B, Criterion III, Design Control, for failure to establish measures to verify the design capability of the RN pumps. Specifically, the licensee did not perform system hydraulic analyses or use other means to demonstrate that RN Pumps 1A and 1B could perform their safety function under the most limiting design basis conditions.

Description: The CDBI identified that the licensee did not perform system hydraulic analyses, nor use other means to demonstrate that RN Pumps 1A and 1B would be able to deliver the required flows to the safety-related components and HXs under the limiting design basis conditions. Some of the limiting design basis conditions included: maximum allowable pump degradation; maximum number of tubes plugged in the HXs; minimum ultimate heat sink (UHS) level; and EDG under-frequency. The CDBI also identified a lack of analysis to demonstrate that the RN pumps would be protected from cavitation under the limiting design basis conditions such as minimum allowed UHS level, EDG over-frequency, maximum RN flow, minimum HX tube plugging, etc. The team also questioned how the 60/40% mud/water assumption used to establish the heat exchanger tube plugging limits was validated. Operation of the RN pumps under the most limiting design basis conditions could have affected the system's ability to deliver the required flows to the safety related HXs, or resulted in cavitation conditions. The licensee initiated PIP M-06-1593, to address these issues.

Analysis: Failure to perform analyses to demonstrate that RN Pumps 1A and 1B could perform their safety function under the most limiting design basis conditions is a performance deficiency. This finding is more than minor because it affected the design control attribute of the mitigating systems cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The inspectors assessed this finding for significance in accordance with NRC Manual Chapter 0609, Appendix A, Attachment 1, Significance Determination Process (SDP) for Reactor Inspection Findings for At-Power Situations, and determined that it was of very low safety significance (Green) because subsequent engineering analysis, completed in December 2007, demonstrated that there was no loss of RN system safety function capability when the worst case DBA limiting values were input into the RN system flow analysis. This finding was reviewed for cross-cutting aspects and none were identified.

Enforcement: 10 CFR 50, Appendix B, Criterion III, Design Control states, in part, that the design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculation methods, or by the performance of a suitable testing program. Contrary to the above, the team identified on April 20, 2006, that the licensee did not perform a system hydraulic analysis or use other means to demonstrate that RN Pumps 1A and 1B could perform their safety function under the most limiting design basis conditions. This condition had existed since original plant licensing and was applicable to RN Pumps 2A and 2B also. This finding was entered into the licensee's corrective action program as PIP M-06-1593 with actions to evaluate the RN system capability under limiting design basis conditions. Because the finding was of very low safety significance and has been entered into the licensee's corrective action program (PIP M-06-1593), this violation is being treated as a non-cited violation (NCV), consistent with Section VI.A of the NRC Enforcement Policy: NCV 05000369,370/2008002-03, Nuclear Service Water System Flow Analysis Deficiencies.

4OA6 Meetings, Including Exit

On April 3, 2008, the resident inspectors presented the inspection results to Mr. Bruce Hamilton and other members of his staff. The inspectors confirmed that proprietary information was not provided or examined during the inspection.

## **SUPPLEMENTAL INFORMATION**

### **KEY POINTS OF CONTACT**

#### **Licensee**

K. Ashe, Manager, Regulatory Compliance  
D. Black, Security Manager  
S. Bradshaw, Training Manager  
S. Capps, Manager, Engineering  
K. Crane, Regulatory Compliance  
J. Dalrymple, Project Manager, Modifications  
K. Evans, Superintendent, Maintenance  
B. Hamilton, Site Vice President, McGuire Nuclear Station  
P. Hull, Chemistry Manager  
J. Kammer, Manager, Safety Assurance  
S. Mooneyhan, Radiation Protection Manager  
J. Nolin, Manager, Mechanical and Civil Engineering (MCE)  
R. Parker, Superintendent, Work Control  
R. Repko, Station Manager, McGuire Nuclear Station  
T. Simril, Superintendent, Plant Operations  
S. Snider, Manager, Reactor and Electrical Systems Engineering

#### **NRC personnel**

J. Moorman, III, Chief, Reactor Projects Branch 1  
J. Stang, Project Manager, NRR  
K. Weaver, Acting Chief, Reactor Projects Branch 1

### **LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED**

#### **Opened and Closed**

05000369,370/2008002-01	NCV	Failure to Establish and Maintain Abnormal Procedures for Loss of Nuclear Service Water (Section 1R11)
05000370/2008002-02	NCV	Failure to Implement Foreign Material Exclusion Control Procedures (Section 1R13)
05000369,370/2008-03	NCV	Nuclear Service Water System Flow Analysis Deficiencies (Section 4OA5.2)

#### **Closed**

05000369,370/2006007-004	URI	Nuclear Service Water System Flow Analysis (Section 4OA5.2)
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Attachment

## DOCUMENTS REVIEWED

### **Section 1R04: Equipment Alignment**

#### Partial System Walkdown

##### Chemical and Volume Control System 2B:

Drawing MCFD-2554-01.00, Flow Diagram of the Chemical and Volume Control System

Drawing MCFD-2554-02.00, Flow Diagram of the Chemical and Volume Control System

Drawing MCFD-2554-03.00, Flow Diagram of the Chemical and Volume Control System

##### Emergency Diesel Generator 2A

Drawing MCFD-2609-04.00, Flow Diagram of the Diesel Generator Starting Air System

Drawing MCFD-2609-03.00, Flow Diagram of the Diesel Generator Engine 2A Fuel Oil System

Drawing MCFD-2609-02.00, Flow Diagram of the Diesel Generator Engine Lube Oil System

Drawing MCFD-2609-01.00, Flow Diagram of the Diesel Generator Engine Cooling Water System

##### Emergency Diesel Generator 1B

Drawing MCFD-1609-04.00, Flow Diagram of the Diesel Generator Starting Air System

Drawing MCFD-1609-03.01, Flow Diagram of the Diesel Generator Engine 1B Fuel Oil System

Drawing MCFD-1609-02.00, Flow Diagram of the Diesel Generator Engine Lube Oil System

Drawing MCFD-1609-01.00, Flow Diagram of the Diesel Generator Engine Cooling Water System

### **Section 1R05: Fire Protection**

#### Procedures:

McGuire Nuclear Station IPEEE Submittal Report dated June 1, 1994

McGuire Nuclear Station Supplemental IPEEE Fire Analysis Report dated August 1, 1996

MCS-1465.00-00-0008, R4, Design Basis Specification for Fire Protection

#### Drawings:

McGuire fire protection pre-plan diagrams

### **Section 1R07: Heat Sink Performance**

Laboratory Analysis Reports for samples taken from the 2B KC heat exchanger from SanAir Technologies and Nalco.

### **Section 1R08: In-service Inspection Activities**

#### Procedures

PDI-UT-8, Generic Procedure for the Ultrasonic Examination of Weld Overlaid Similar and Dissimilar Metal Welds, Rev. F

NDE-600, Ultrasonic Examination of Similar Metal Welds in Ferritic and Austenitic Piping

NDE-640, Ultrasonic Examination Using Longitudinal Wave and Shear Wave, Straight Beam Techniques

MP/0/A/7700/080, Inspection, Evaluation, and Cleanup of Boric Acid on Plant Materials, Rev. 010

PT/0/A/4150/046, Containment Walkdown, Rev. 003

SM/0/A/8140/001, Welding of QA and Non-QA Piping, Valves, and Components, Rev. 021

#### Corrective Action and Evaluation Documents

PIP G-06-00256, Three Weld Examinations for ISI Were Not Performed

PIP M-06-02995, ISI Examinations Missing During the 2<sup>nd</sup> Interval

PIP M-06-03968, In-service Inspection (ISI) Indications Detected During Ultrasonic Examination

PIP M-06-04611, Results of 2EOC17 Reactor Vessel Head Bare Metal Inspection

PIP M-07-00323, Heat Exchangers in Systems ND, NS, and NV Were not Performed for the In-service Inspection During Prior 10-Year Interval

PIP M-07-05534, Examination Coverage Limitations Were Discovered During 2EOC17 in Fall 2006

PIP M-08-00866, Documentation of Decision to Skip Steam Generator In-service Inspection During McGuire Unit 2 EOC18 Outage

PIP M-08-01192, Due to the Unusual Design of the Containment Spray Heat Exchanger 2B, the Seismic Lugs Were not Categorized Correctly

PIP M-08-01370, Relief Valve 2NI-52 (2A Cold Leg Accumulation Relief) failed its 2EOC18 1<sup>st</sup> Set Pressure Test

PIP M-06-5445, Boric Acid Evaluation for Relief Valve 2ND-56

PIP M-07-3928, Boric Acid Leak Evaluation for Various Leaks in the Unit 2 Pipechase Inspection

PIP M-07-5340, Engineering Evaluation for Boric Acid Leaks at 2NV-371

#### Other Records

Work Order (WO) 01718559, Replace 1-1/2" Check Valve in Steam Generator Cold Leg Vent Line

WO 01750537, Replace Reactor Vessel Head 1" Vent Line Valve

PT/0/A/4150/038, Enclosure 13.16 RPV Head PWSCC Susceptibility Category Calculation, Rev.2

Calculation MCC-2201.37-00-0038, Steam Generator Foreign Object Assessment for McGuire Unit 2 Operation for an Additional Cycle with Known Foreign Objects (BWC Report 079X-LR-02)

Calculation MCC-2201.37-00-0005, CFR-80 Steam Generator Tube Integrity Assessment, Rev. 2

Self-Assessment MCE-SA07-05, Boric Acid Corrosion Control Program

Assessment GO-07-014, 2007 Maintenance and Work Control Functional Area Evaluation

#### **Section1R13: Maintenance Risk Assessments and Emergent Work Evaluation**

PIPs generated: M-08-0315, associated with risk assessment for unit 1 wet tap

**Section1R15: Operability Evaluations**

PIP M-08-1532

SLC 16.8.3, Diesel Generator Supplemental Testing Requirements, TR 16.8.3.5, and bases  
Test Acceptance Criteria: MCTC-191-EPSQ.S002-01, MCTC-191-EPSQ.S002-02

**Section1R17: Permanent Plant Modifications**

MD 200347, U2 NS Pump Full Flow test Loop

Design Basis Document MCS-1563.NS-00-0001, Design Basis Specification for the NS System  
Updated Final Safety Analysis Report Section 6.5 and 7.6.3

Post- modification test procedures: PT/2/A/4208/021B, 2B NS Pump Head Curve and  
Comprehensive Pump Performance Test and PT/2/A/4208/021A, 2A NS Pump Head Curve and  
Comprehensive Pump Performance Test

Drawings: MCFD-2571-01.00, Flow Diagram of Refueling Water System

MCFD-2563-01.00, Flow Diagram of Containment Spray System

**Section1R20: Refueling and Outage Activities**

OP/2/A/6100/SD-2, Cooldown to 400 degrees F

OP/2/A/6100/SD-4, Cooldown to 240 degrees F

OP/2/A/6100/SO-1, Maintaining NC System Level

OP/2/A/6100/SO-2, Filling the Refueling Cavity

MCEI-0400-41, "McGuire 2 Cycle 17 Final Core Map", Rev. 12

PT/0/A/4150/033, "Core Verification", Rev. 15

PT/0/A/4150/033, "Total Core Reloading", Rev. 43

MP/2/A/7150/073, "Rod Cluster Control Assembly Heavy Drive Rod Unlatching and Latching",  
Rev. 14

OP/2/A/6100/003, Controlling Procedure for Unit Operation

MCEI-0400-47, Unit 2 Cycle 19 Core Operating Limits Report

OP/2/A/6100/SU-3, Mode 5 Checklist

Head Lift documents reviewed:

(see 4OA2)

PIP M-08-1471, Loss of Unit 1 Turbine building siding

PIP M-08-1242, 2B Residual Heat Removal Heat Exchanger control issue

PIP M-08-1267, Unplanned reduction in thermal margin due to NC system not intact

PIP M-08-1524, 2CA-168 failed its as found pressure test

**2OS1 Access Control To Radiologically Significant Areas**Procedures, Guidance Documents, and Manuals

SH/0/B/2000/003, Preparation of a Radiation Work Permit, Rev. 7

SH/0/B/2000/007, Placement of Personnel Dosimetry for Non-Uniform Radiation Fields, Rev. 1

SH/0/B/2000/012, Access Controls for High, Locked High, and Very High Radiation Areas,  
Rev. 8

SH/0/B/2001/003, Investigation of Skin and Clothing Contaminations, Rev. 10  
 HP/2/B/1006/024, Crud Burst Controls  
 RPMP 7-1, Radiological Key Control, Rev. 9  
 NSD 208, Problem Investigation Process, Rev. 28

#### Records and Data

RWP No. 5018, U-1 and U-2 AB Access to Locked High Radiation Areas, Rev. 12  
 RWP No. 2134, U2 Rx Bldg; Weld Repair of Refueling Cavity Liner Plate, Rev. 0  
 Radiological Survey No. M-0221108-12, U-1 Lower Containment Pipechase Floor, 2/21/08  
 Radiological Survey No. M-071807-2, Room 728 Volume Control Tank, 7/18/07  
 Radiological Survey No. M-022908-4, U-2 Deep End Refueling Canal, 2/29/08  
 Air Sample No. 080305069, U2 Deep End during Grinding/Welding, 3/5/08  
 Air Sample No. 080305073, U2 Cleanside during Grinding/Welding, 3/5/08  
 Personnel Contamination Event No. 07-045, Summary and Dose Evaluation, 5/23/07  
 Personnel Contamination Event No. 07-014, Summary and Dose Evaluation, 3/13/07

#### CAP Documents

PIP M-07-06507, Results of RP self-assessment, 12/31/07  
 PIP M-07-0612, Evaluate whether ED alarm set points are reasonable for low dose rate areas,  
 12/6/07  
 PIP M-07-01476, Personnel Contamination Event, 3/13/07  
 PIP G-08-00212, Review and evaluate method of reporting hot particle dose, 3/5/08

## **2OS2 ALARA Planning and Controls**

#### Procedures, Instructions, Guidance Documents, and Operating Manuals

Duke Power Company, System ALARA Manual, Sections 1-10 and Appendix C.  
 SH/0/B/2000/003 Preparation of a Radiation Work Permit, Rev. 7  
 NSD 208, Problem Investigation Process, Rev. 28

#### Records and Data

ALARA Committee Meeting Minutes 3/14/07, 4/4/07, 4/18/07, 5/7/07, 5/15/07, 8/6/07, 11/5/07,  
 and 12/11/07  
 ALARA Planning Package: 1EOC18 PZR WOL's (weld overlays) & support activities, Parts 1-3,  
 3/14/07  
 ALARA Planning Package: 1EOC18 Rx head bare metal visual inspection & ISI, 3/12/07  
 ALARA Planning Package: 1EOC18 Rx Head Removal & Replacement, 3/12/07  
 ALARA Planning Package: 1EOC18 Rx Head volumetric Inspection (AREVA), 3/12/08  
 ALARA Planning Package: 1EOC18 ECCS Sump Expansion Modification, 3/6/07  
 White Paper: McGuire Source Term History  
 Self-Assessment: RP-SA-06-07, 2006 Source Term Removal, 9/17/05- 5/9/06  
 Self-Assessment: RP SA-07-01, 1EOC18 RP S&C Supervisor Lessons Learned Assessment,  
 3/1/07- 5/3/07  
 Self-Assessment: RP SA 07-02, Valve Cobalt Reduction Program Assessment, 9/24/07  
 Self-Assessment: RP SA07-03, Comparison of MNS RP procedures and processes to INPO's  
 How to Evaluate SOER 2001-01 Recommendations  
 Self-Assessment: RP SA08-01, Review of Dosimetry Program, 2/28/08

NPAS Audit GO-07-02(NPA)(RP)(ALL) Radiation Protection FAE, 2/32/07  
 McGuire Nuclear Station ALARA Summary Report, 4/3/08

### Corrective Action Program Documents

PIP M-06-03406, Dose rates on the NV system increased on Unit 2 throughout the Aux. Bldg.  
 PIP M-06-04603, Reinstallation of the Reactor Head Insulation exceeded the job dose estimate.  
 PIP M-06-05068, Workers arrived to do work and it had to be deferred because the appropriate ALARA planning had not been done.  
 PIP M-07-04538, Chemistry flushed mixed bed ion exchanger without coordinating with RP.  
 PIP M-08-00038, Slightly higher than expected doses received painting the floor in the equipment staging building.  
 PIP M-08-00412, Higher doses were received installing shielding on letdown line than planned.  
 PIP M-08-01828, Current trend indicates that welding work RWP will exceed its exposure estimate. (Work scope expansion)

### **2PS1 Radioactive Gaseous and Liquid Effluent Treatment and Monitoring Systems**

#### CAP Documents

PIP M-08-00692, Sample flow associated with WC discharge instrumentation drains to final hold up pond valve pit. The valve pit drains to a ditch.  
 PIP M-08-00585, Final Hold up Pond level appears to be dropping.

#### Other Documents

Mecklenburg County Land Use and Environmental Services Agency- Water and Land Resources Report, McGuire Tritium Release, 2/27/08

### **Section 2PS2 Radioactive Material Processing and Transportation**

#### Procedures, Instructions, and Guidance Documents

Duke Power Company, Radiation Protection Policy Manual, 10 CFR Part 61 Waste Classification Implementation Program, Policy IV-08, Rev. 0  
 HP/0/B/1004/012, Utilization of Polyethylene High Integrity Containers, Rev. 5  
 HP/0/B/1004/026, Waste Handling and Segregation, Rev. 9  
 HP/0/B/1004/032, Procedure for Packaging Radioactive Filters, Rev. 7  
 HP/0/B/1009/025, Off-Site Radiological Transportation Incidents, Rev. 5  
 MNS 10 CFR 61 Waste Classification and Waste Form Implementation Program, Dated 03/01/06  
 MP/0/A/7150/115, Irradiation Capsule Off-Site Shipment, Rev. 3  
 MP/0/A/7550/011, Chem-Nuclear Cask CNS 14-195H Lid Handling, Rev. 6  
 MP/0/A/7550/023, Duratek Cask 10-160B Lid Handling, Rev. 5  
 NSD-208, Problem Investigation Process, Rev. 28  
 OP/0/B/6200/029, WM Operation, Rev. 50  
 PT/0/B/4600/069, Sample Analysis Requirements for Determination of Waste Classification Scaling Factors, Rev. 5  
 Radioactive Waste Process Control Program Manual, Rev. 14

Radioactive Waste Process Control Program Manual, Appendix B, McGuire Nuclear Station, Process Control Program, Rev. 17

SH/0/B/2004/001, Preparation and Shipment of Radioactive Material, Rev. 6

SH/0/B/2004/002, Preparation and Shipment of Radioactive Waste, Rev. 6

#### Records and Data Reviewed

Chem-Nuclear Systems, Inc., CNS 10-160B Radwaste Shipping Cask

McGuire Nuclear Station (MNS), 2006 Annual Radioactive Effluent Release Report

Memorandums to File, McGuire Nuclear Site, New Standard Filter Waste Stream, Dated 11/05/07; and DAW Sample Comparisons, Dated 11/12/07

MNS Employee Qualification Report printouts for select Radwaste personnel

MNS Radwaste and Radioactive Material Shipping Logs, 08/01/06 - 03/20/08

MNS One Liner Survey Report, Survey Numbers (Nos.) O-030608-3, Dated 03/10/08;

O-031408-2, Dated 03/17/08; O-031808-2, Dated 03/18/08; O-031908-3, Dated 03/19/08

MNS Survey Nos. M-031808-16, Flatbed 1, Dated 03/18/08; and M-031908-23, Sealand Shipment, Dated 03/19/08

Radioactive Shipment Record (RSR) 06-0032, Mixed Ion Exchange Resin (LSA-II), Dated 12/07/06

RSR No. 07-0023, Radioactive Material Surface Contaminated Object (SCO-II), Dated 06/21/07

RSR No. 07-0037, Mechanical Filter (Type B), Dated 12/06/07

RSR No. 08-0005, Reactor Specimen in Metal Box (Type A), Dated 02/07/08

RSR No. 08-0020, Metal Box (LQ), Dated 03/17/08

#### CAP Documents

PIP Serial No. (S/N) M-06-06076, This PIP documented Radiation Protection Group Assessment RP SA06-06, Control of Radioactive Sources, Dated 12/28/06

PIP S/N G-07-00457, Level 1 Self Assessment of Annual Radiation Protection Source Term Data Review for McGuire Nuclear Station for year 2006, Dated 06/04/07

PIP S/N G-07-00814, EPRI Waste Storage Assessment Report, Dated 10/09/07

PIP S/N G-07-00815, EPRI Assessment Report regarding Class B/C Waste Strategy Analysis Assessment Report, Dated 10/09/07

PIP S/N M-08-00611, Water discovered in radioactive package received from Catawba, Dated 02/04/08

### **40A1 Performance Indicator Verification**

#### Procedures

SRPMP 10-1, NRC Performance Indicator Data Collection, Validation, Review and Approval, Rev.2

#### Records and Data

Electronic dosimeter alarm logs, December 2007 – February 2008

Gaseous Waste Release Permit 2007073, Unit 1 Containment Air

Gaseous Waste Release Permit 2007074, Unit 2 Containment Air

Liquid Waste Release Permit 2007270, Waste Monitor Tank "B"

CAP Documents

PIP M-08-01228, ED malfunction prior to entry into Lower Containment, 3/1/08  
 PIP M-08-00193, HP lock on LHRA door accidentally replaced with security lock, 1/13/08  
 PIP M-08-00692, Sample flow associated with WC discharge instrumentation drains to final hold up pond valve pit. The valve pit drains to a ditch.  
 PIP M-08-00585, Final Hold up Pond level appears to be dropping

**Section 4OA2: Identification and Resolution of Problems**

Calculation MCC-1134.02-00-0043, Reactor Vessel Head Load Drop Analysis  
 EGM 07-006, Enforcement Discretion for Heavy Load Handling Activities  
 WCAP-9198, Reactor Vessel head Drop Analysis, Revision 1  
 MP/0/A/7150/136 Inspection of Reactor Vessel Head and Internal Lift Rigs  
 MP/0/A/7700/096, Quarterly/Annual Inspection and Servicing of Overhead and Gantry Cranes  
 IP/0B/3262/001, Overhead cranes and Hoists Electrical Inspection and Maintenance  
 MP/2/A/7150/057A Reactor Vessel Head Removal  
 MP/2/A/7150/057B Reactor Vessel Head Installation  
 Crane and Head lift inspection: WO's 1790606, 1792931, 1750788, 0551389  
 PIP M-07-03099, Reactor Vessel Head Lift Risk Analysis  
 PIP M-07-4759, Heavy Lift Phase I and II Assessment  
 PIP M-07-3992, Discrepancies with Generic Letter 81-07  
 PIP M-07-5268, EGM 07-006  
 Duke Energy Nuclear Lifting Program, Appendix E, Lift Plan Checklist  
 2EOC18 Reactor Vessel Head/Upper Internals Complex Plan  
 WCAP-9198, R1, Reactor Vessel Head Drop Analysis  
 Summary of December 13, 2007 Meeting on the Industry Initiative on Heavy Load Lifts  
 Summary of February 1, 2008 Meeting on the Industry Initiative on Heavy Load Lifts  
 RIS 2005-25 including supplement 1

**Section 4OA3: Event Follow-up**

PT/1/A/4250/004 A, Turbine Valve Movement Test  
 AP/1/A/5500/006, S/G Feedwater Malfunction  
 OP/2/A/6100/003, Controlling Procedure for Unit Operation

**4OA5.1: ISFSI**Procedures

RPMP 7-8, Maintaining RCZs Associated with ISFSI, Rev. 1  
 HP/0/B/1003/063, Routine Surveillance, Rev. 22  
 HP/1/B/1006/027, Radiation Protection Controls for Loading Spent Fuel Assemblies into NAC-UMS Dry Storage Casks, Rev. 1  
 HP/2/B/1006/027, Radiation Protection Controls for Loading Spent Fuel Assemblies into NAC-UMS Dry Storage Casks, Rev. 7

Records and Data

ISFSI Quarterly Routine Surveys for 3<sup>rd</sup> and 4<sup>th</sup> quarter 2006 and 1<sup>st</sup> through 4<sup>th</sup> quarters of 2007  
 ISFSI Boundary Quarterly TLD results 1<sup>st</sup> quarter 2004 through 2<sup>nd</sup> Quarter 2007  
 McGuire Nuclear Station ISFSI 2006 Annual Radiological Effluent Report

CAP Documents

PIP M-06-03551, Minor discrepancies found in ISFSI routine documentation  
 PIP M-07-00944, ISFSI Routine Quarterly Trending 1<sup>st</sup> Quarter 2007  
 PIP M-07-05093, 2007 ISFSI Radiation Survey Assessment

**40A5.2: Other Activities - RN System Flow Analysis**

PT/2/A/4700/055, Unit 2 Containment Building Civil Structures Inspection, Rev. 11  
 Letter, Sulzer Pumps Inc. to Duke Energy Corporation, Low NPSHa Affect on emergency RN Pumps, dated 2/13/08  
 Calculation MCC-1223.24-00-0088, AFT Fathom Hydraulic Model of RN System, Rev. 1  
 Calculation MCC-1223.24-00-0097, AFT Fathom Hydraulic Model of the 1A RN Train, Rev. 1  
 Calculation MCC-1223.24-00-0089, RN System Hydraulic Model Runs in Support of 2A RN to CA Modifications, Rev. 1  
 PIP M-06-1593, CDBI Identified Issues Related to RN System Flow Analysis

**LIST OF ACRONYMS**

ALARA	-	As Low As Reasonably Achievable
BACC		Boric Acid Corrosion Control
CA		Auxiliary Feedwater
CAP		Corrective Action Program
DBA		Design Basis Accident
DOT		Department of Transportation
EDG		Emergency Diesel Generator
GM		Geiger-Mueller
HPT		Health Physics Technician
ISFSI		Independent Spent Fuel Storage Installation
ISI		In-Service Inspection
LHRA		Locked High Radiation Area
mrem/hr		millirem/hour
NCV		Non-Cited Violation
NDE		Non-Destructive Examination
HRC		Nuclear Regulatory Commission
NS		Containment Spray
PCP		Process Control Program
PI		Performance Indicator
PIP		Problem Investigation Process report
PT		Penetrant Examination
radwaste		Radioactive Waste
RCS		Reactor Coolant System

RP	Radiation Protection
RV	Containment Ventilation Cooling Water
RWP	Radiation Work Permit
SSC	Structures, Systems and Components
TI	Temporary Instruction
TS	Technical Specifications
UFSAR	Updated Final Safety Analysis Report
UT	Ultrasonic Examination
VHRA	Very High Radiation Area
VT	Visual Examination