UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 24, 2017

Mr. Steven D. Capps
Vice President
McGuire Nuclear Station
Duke Energy Carolinas, LLC
12700 Hagers Ferry Road
Huntersville, NC 28078-8985

SUBJECT: MCGUIRE NUCLEAR STATION, UNITS 1 AND 2 – ISSUANCE OF AMENDMENTS REGARDING CHANGE TO TECHNICAL SPECIFICATION (TS) 3.6.13, "ICE CONDENSER DOORS" (CAC NOS. MF7526 and MF7527)

Dear Mr. Capps:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 292 to Renewed Facility Operating License No. NPF-9 and Amendment No. 271 to Renewed Facility Operating License No. NPF-17 for the McGuire Nuclear Station, Units 1 and 2, respectively. The amendments are in response to your application dated March 24, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16089A228), as supplemented by letter dated August 11, 2016 (ADAMS Accession No. ML16230A006).

The amendments modify Technical Specification 3.6.13, "Ice Condenser Doors," to revise Condition B for an ice condenser lower inlet door invalid open alarm to preclude plant shutdown caused by an invalid "OPEN" alarm from the "Inlet Door Position Monitoring System."

A copy of the related Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

Michael Mahoney, Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-369 and 50-370

Enclosures:
1. Amendment No. 292 to NPF-9
2. Amendment No. 271 to NPF-17
3. Safety Evaluation

cc w/enclosures: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
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DUKE ENERGY CAROLINAS, LLC

DOCKET NO. 50-369

MCGUIRE NUCLEAR STATION, UNIT 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 292
Renewed License No. NPF-9

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment to the McGuire Nuclear Station, Unit 1 (the facility), Renewed Facility Operating License No. NPF-9, filed by Duke Energy Carolinas, LLC (licensee), dated March 24, 2016, as supplemented by letter dated August 11, 2016, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations as set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations set forth in 10 CFR Chapter I;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is hereby amended by page changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Renewed Facility Operating License No. NPF-9 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 292, are hereby incorporated into this renewed operating license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance and shall be implemented within 120 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Michael T. Markley, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to License No. NPF-9
and Technical Specifications

Date of Issuance: February 24, 2017

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

DUKE ENERGY CAROLINAS, LLC

DOCKET NO. 50-370

MCGUIRE NUCLEAR STATION, UNIT 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 271
Renewed License No. NPF-17

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment to the McGuire Nuclear Station, Unit 2 (the facility), Renewed Facility Operating License No. NPF-17, filed by the Duke Energy Carolinas, LLC (the licensee), dated March 24, 2016, as supplemented by letter dated August 11, 2016, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations as set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations set forth in 10 CFR Chapter I;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is hereby amended by page changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Renewed Facility Operating License No. NPF-17 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 271, are hereby incorporated into this renewed operating license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance and shall be implemented within 120 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Michael T. Markley, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to License No. NPF-17
and Technical Specifications

Date of Issuance: February 24, 2017

ATTACHMENT

MCGUIRE NUCLEAR STATION, UNITS 1 AND 2

LICENSE AMENDMENT NO. 292

RENEWED FACILITY OPERATING LICENSE NO. NPF-9

DOCKET NO. 50-369

AND

LICENSE AMENDMENT NO. 271

RENEWED FACILITY OPERATING LICENSE NO. NPF-17

DOCKET NO. 50-370

Replace the following pages of the Renewed Facility Operating Licenses and the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove	Insert
NPF-9, page 3	NPF-9, page 3
NPF-17, page 3	NPF-17, page 3
3.6.13-1	3.6.13-1
3.6.13-2	3.6.13-2
3.6.13-3	3.6.13-3

(4) Pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components;

(5) Pursuant to the Act and 10 CFR Parts, 30, 40 and 70, to possess, but not separate, such byproducts and special nuclear materials as my be produced by the operation of McGuire Nuclear Station, Units 1 and 2; and,

(6) Pursuant to the Act and 10 CFR Parts 30 and 40, to receive, possess and process for release or transfer such by product material as may be produced by the Duke Training and Technology Center.

C. This renewed operating license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or thereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

The licensee is authorized to operate the facility at a reactor core full steady state power level of 3469 megawatts thermal (100%).

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 292 are hereby incorporated into this renewed operating license. The licensee shall operate the facility in accordance with the Technical Specifications.

(3) Updated Final Safety Analysis Report

The Updated Final Safety Analysis Report supplement submitted pursuant to 10 CFR 54.21(d), as revised on December 16, 2002, describes certain future activities to be completed before the period of extended operation. Duke shall complete these activities no later than March 3, 2023, and shall notify the NRC in writing when implementation of these activities is complete and can be verified by NRC inspection.

The Updated Final Safety Analysis Report supplement as revised on December 16, 2002, described above, shall be included in the next scheduled update to the Updated Final Safety Analysis Report required by 10 CFR 50.71(e)(4), following issuance of this renewed operating license. Until that update is complete, Duke may make changes to the programs described in such supplement without prior Commission approval, provided that Duke evaluates each such change pursuant to the criteria set forth in 10 CFR 50.59, and otherwise complies with the requirements in that section.

(4) Pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components;

(5) Pursuant to the Act and 10 CFR Parts, 30, 40 and 70, to possess, but not separate, such byproducts and special nuclear materials as my be produced by the operation of McGuire Nuclear Station, Units 1 and 2; and,

(6) Pursuant to the Act and 10 CFR Parts 30 and 40, to receive, possess and process for release or transfer such by product material as may be produced by the Duke Training and Technology Center.

C. This renewed operating license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or thereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

The licensee is authorized to operate the facility at a reactor core full steady state power level of 3469 megawatts thermal (100%).

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 271 are hereby incorporated into this renewed operating license. The licensee shall operate the facility in accordance with the Technical Specifications.

(3) Updated Final Safety Analysis Report

The Updated Final Safety Analysis Report supplement submitted pursuant to 10 CFR 54.21(d), as revised on December 16, 2002, describes certain future activities to be completed before the period of extended operation. Duke shall complete these activities no later than March 3, 2023, and shall notify the NRC in writing when implementation of these activities is complete and can be verified by NRC inspection.

The Updated Final Safety Analysis Report supplement as revised on December 16, 2002, described above, shall be included in the next scheduled update to the Updated Final Safety Analysis Report required by 10 CFR 50.71(e)(4), following issuance of this renewed operating license. Until that update is complete, Duke may make changes to the programs described in such supplement without prior Commission approval, provided that Duke evaluates each such change pursuant to the criteria set forth in 10 CFR 50.59, and otherwise complies with the requirements in that section.

3.6 CONTAINMENT SYSTEMS

3.6.13 Ice Condenser Doors

LCO 3.6.13 The ice condenser lower inlet doors, intermediate deck doors, and top deck doors shall be OPERABLE and closed.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

----------NOTE----------

1. Separate Condition entry is allowed for each ice condenser door.
2. Entry into Condition B is not required due to personnel standing on or opening an intermediate deck or top deck door for short durations to perform required surveillances, minor maintenance such as ice removal or routine tasks such as system walkdowns.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more ice condenser lower inlet doors inoperable due to being physically restrained from opening.	A.1 Restore lower inlet door to OPERABLE status.	1 hour

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One or more ice condenser doors inoperable for reasons other than Condition A or not closed.	B.1 Verify maximum ice bed temperature is ≤ 27°F. AND ----------NOTE---------- Required Action B.2.1 applies only when one or more ice condenser lower inlet doors are inoperable due to having an invalid open alarm. ---------- B.2.1 Verify affected lower inlet door is closed. OR B.2.2 Restore ice condenser door to OPERABLE status and closed positions.	Once per 4 hours Once per 14 days 14 days
C. Required Action and associated Completion Time of Condition B not met.	C.1 Restore ice condenser door to OPERABLE status and closed position.	48 hours
D. Required Action and associated Completion Time of Condition A or C not met.	D.1 Be in MODE 3. AND D.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.13.1	Verify all lower inlet doors indicate closed by the Inlet Door Position Monitoring System.	In accordance with the Surveillance Frequency Control Program
SR 3.6.13.2	Verify, by visual inspection, each intermediate deck door is closed and not impaired by ice, frost, or debris.	In accordance with the Surveillance Frequency Control Program
SR 3.6.13.3	Verify, by visual inspection, each top deck door: a. Is in place; and b. Has no condensation, frost, or ice formed on the door that would restrict its opening.	In accordance with the Surveillance Frequency Control Program
SR 3.6.13.4	Verify, by visual inspection, each lower inlet door is not impaired by ice, frost, or debris.	In accordance with the Surveillance Frequency Control Program
SR 3.6.13.5	Verify torque required to cause each lower inlet door to begin to open is $\leq$ 675 in-lb, and verify free movement of the door.	In accordance with the Surveillance Frequency Control Program
SR 3.6.13.6	(deleted)	
SR 3.6.13.7	Verify for each intermediate deck door: a. No visual evidence of structural deterioration; b. Free movement of the vent assemblies; and c. Free movement of the door.	In accordance with the Surveillance Frequency Control Program

UNITED STATES
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO

AMENDMENT NO. 292 TO RENEWED FACILITY OPERATING LICENSE NO. NPF-9

AND

AMENDMENT NO. 271 TO RENEWED FACILITY OPERATING LICENSE NO. NPF-17

DUKE ENERGY CAROLINAS, LLC

MCGUIRE NUCLEAR STATION, UNITS 1 AND 2

DOCKET NOS. 50-369 AND 50-370

1.0 INTRODUCTION

By letter to the United States Nuclear Regulatory Commision (NRC) dated March 24, 2016, as supplemented by letter dated August 11, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML16089A228 and ML16230A006, respectively), Duke Energy Carolinas, LLC (Duke Energy) submitted an application to modify the Technical Specifications (TSs) for McGuire Nuclear Station, Units 1 and 2 (MNS). The supplement dated August 11, 2016, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on June 6, 2016 (81 FR 36617).

This license amendment request (LAR) would revise TS 3.6.13 "Ice Condenser Doors" to allow for an alternate method of verifying that the ice condenser doors are closed in addition to that described in the current licensing basis. The LAR would revise TS 3.6.13, "Ice Condenser Doors" Condition B to add a new alternate Required Action when one or more ice condenser lower inlet doors (LIDs) are inoperable due to having an invalid open LID signal. The new Required Action will include verifying that the lower inlet doors are closed every 14 days in accordance with an alternate method that does not rely on the faulted alarm. Current Required Action B.1 would continue to include verification that ice bed temperature is less than or equal to 27 degrees Farenhiet (°F) every four hours which provides additional assurance that the doors remain closed. A temperature of greater than 27°F would be an indication that a door may be open.

The existing MNS TS 3.6.13 Limiting Condition for Operation (LCO) requires the ice condenser LIDs, intermediate deck doors, and top deck doors be OPERABLE and closed during Modes 1, 2, 3, and 4. MNS TS Surveillance Requirement (SR) 3.6.13.1 requires verification that all LIDs indicate closed by the Inlet Door Position Monitoring System. This TS SR interval is

maintained and adjusted in accordance with the licensee's Surveillance Frequency Control Program. In its letter dated March 24, 2016, the licensee states the LAR states that this TS SR is performed on a frequency of every 12 hours. The LAR describes the path through multiple TS conditions which ultimately leads to shutting the plant down if the doors cannot be verified to be closed using the Inlet Door Position Monitoring System regardless if the doors can be verified to be closed by alternate methods

The ice condenser LIDs are equipped with position limit switches that provide a signal to the ice condenser door position monitoring system that the doors are either fully closed or are not fully closed. The door position monitoring system provides position indication lights at a local door position display panel located in upper containment by aggregated zone groupings each of four pairs of doors and collectively by a single annunciator in the control room (CR). If one or more doors in a zone is not fully shut the position indication light for that zone would indicate as much on the status panel on the upper containment level. If one or more doors in any zone was not fully shut, the annunciator in the CR would alarm. When one or more of the ice condenser LIDs cannot be verified closed by the Inlet Door Position Monitoring System, TS 3.6.13 existing Condition B requires a verification that the maximum indicated ice bed temperature is less than or equal to 27°F or less every four hours and that an affected LID is restored to Operable status (closed position with closed position indicated) within 14 days. If Condition B cannot be met, Condition C requires restoration of the LID to Operable status (closed position) within 48 hours. If Condition C cannot be met, the Unit shall be in Mode 3 in six hours and Mode 5 in 36 hours.

In 2013, the licensee began experiencing invalid "ICE CONDENSER INLET DOORS OPEN" alarms. The licensee confirmed that the doors were, in fact, closed using alternate methods, however the TS still require the unit to be shutdown if the doors cannot be shown to be operable using the Inlet Door Position Monitoring System. The licensee determined that the invalid alarms were a result of changes to the position of limit switches on the lower inlet doors as result of differences in differential pressure (caused by changes to fan settings and temperatures) and differences in the compression of new door seals that were installed just prior to the initiation of the invalid alarms.

Several attempts were made to adjust the switches to prevent recurrence of the invalid alarms, however it is unclear if the repairs will be effective when the unit is at power. High dose rates in the area prevent additional adjustments while the unit is at power. The licensee has developed and described alternate means of confirming that the doors are closed when invalid ice condenser LID open door alarms occur.

The LAR indicated this change would avoid a potential plant shutdown to correct an invalid LID open position signal. The license described its experience in addressing an invalid open door indication which the plant staff was able to restore after considerable effort. A reactor shutdown would have been required after 14 days.

2.0 REGULATORY EVALUATION

Title 10 of the *Code of Federal Regulations* (CFR) Section 50.36, "Technical specifications" states that the TSs include items in five specific categories. These categories include: (1) safety limits, limiting safety system settings, and limiting control settings; (2) LCOs; (3) SRs; (4) design features; and (5) administrative controls. 10 CFR 50.36(c)(2)(i) states that LCOs are the lowest functional capability or performance levels of equipment required for safe operation of

the facility and that when a limiting condition for operation of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the technical specifications until the condition can be met.

NRC human factors reviews address programs, procedures, training, plant design features, and operator manual actions related to operator performance during normal and accident conditions. The NRC staff conducted a human factors evaluation to confirm that operator performance would not be affected adversely as a result of changes to the MNS TSs and the associated operator manual actions. The review was based on the following regulatory guidance:

- NUREG-0800, "Standard Review Plan," Chapter 18, "Human Factors Engineering," Revision 2, which provides guidance for NRC staff review of the human factors engineering (HFE) aspects of modifications affecting risk-important human actions, to ensure the modifications are acceptable.
- NUREG-0711, "Human Factors Engineering Program Review Model," Revision 3, which provides guidance for NRC staff review of HFE programs to verify that the applicant's HFE program incorporates HFE practices and guidelines accepted by the NRC staff.
- NUREG-1764, "Guidance for the Review of Changes to Human Actions," Revision 1, which provides guidance for NRC staff review of changes in human actions.
- NUREG-1431, "Standard Technical Specifications – Westinghouse Plants," Revision 4, which contains the improved Standard Technical Specifications for Westinghouse plants.

3.0 TECHNICAL EVALUATION

As described in sections 6.2.2, "Ice Condenser System" and 7.6.5, "Ice Condenser System" of the MNS, Units 1 and 2 Updated Final Safety Evaluation Report (UFSAR), MNS, Units 1 and 2 are Westinghouse design four-loop pressurized water reactors within ice-condenser pressure suppression design containments. The primary containment consists of a free standing welded plate steel vessel in the form of a vertical cylinder with a hemispherical dome and a flat base. The containment vessel has a diameter of 115 feet and overall height of 171 feet, three inches. A reinforced concrete reactor building of similar shape but with a shallow dome roof surrounds the containment vessel with an annular gap in between and provides radiation shielding and protection of the containment vessel from external missiles and ambient conditions. The primary containment provides the "leak tight" barrier against the potential uncontrolled release of fission products during a design basis loss of coolant accident (DBA-LOCA).

The containment is divided in three volumes, the lower compartment where the reactor vessel, steam generators and reactor coolant and steam line piping are located, the upper compartment, and the ice condenser, through which steam from a primary or secondary system pipe break and lower compartment air would be channeled for condensation of the steam and cooling of the atmosphere before release to the upper compartment. The ice condenser is an annular compartment enclosing approximately 300 degrees of the perimeter of the upper containment compartment and contains the 48 foot high baskets filled with borated ice. The top deck doors are above the ice bed at the top of the ice condenser and with sufficient differential pressure open into the atmosphere of the upper compartment. The intermediate deck doors, located below the top deck doors, form the floor of a plenum at the upper part of the ice condenser above the ice baskets. This upper plenum area is used to facilitate surveillance and

maintenance of the ice bed and contains the air handling units that remove heat from the ice bed. Equalization vents, located at the periphery of the intermediate and top decks, are provided to balance small pressure differentials occurring across the decks during normal operation. The ice baskets held in the ice bed within the ice condenser are arranged to promote heat transfer from steam to ice. The LIDs provide part of the insulated barrier between the ice condenser and the lower containment compartment. There are 48 LIDs arranged in pairs of two (24 bays in all).

In the event of a DBA-LOCA or main steam line break, the ice condenser LIDs open due to the pressure rise in the lower compartment. This allows air and steam to flow from the lower compartment into the ice condenser. The resulting pressure increase within the ice condenser causes the intermediate deck doors and the top deck doors to open, which allows the air to flow out of the ice condenser into the upper compartment. Steam condensation within the ice condenser limits the pressure and temperature buildup in containment. A divider barrier separates the upper and lower compartments and ensures that the steam is directed into the ice condenser through the LIDs. The ice serves as a containment heat removal system and is adequate to absorb the initial blowdown of steam and water from a Design-Basis Accident (DBA). The borated water from the melted ice drains to the containment sump in the lower compartment where it serves as a source for the Emergency Core Cooling System (ECCS) and the Containment Spray System in the recirculation mode.

The ice condenser doors being closed ensure that the ice mass in the ice bed is preserved during normal operation and that the ice condenser functions as designed as a passive heat sink following a DBA. The LIDs are provided with tension spring mechanisms that produce a small closing torque on the door panels as they open. The zero-load position of the spring mechanisms is set such that, with zero-differential pressure across the door panels, the gasket holds the door slightly open. The cooler, dryer and thus denser air in the ice condenser relative to the lower compartment results in a slightly higher pressure (cold head) on the ice condenser side of the LIDs which assists with compression of the LID gasket seals. The cold head also serves to re-close the LIDs should the doors briefly break away from their full closed position seal during normal operation. Small rates of leakage past the LIDs will be from the ice condenser into the lower compartment due to the cold head. If significant developed ice condenser cold head is lost through open LIDs, the remainder of the doors will also tend to open slightly, providing numerous pathways for the relatively warmer and more humid lower compartment atmosphere to enter the ice condenser.

For LID closed position monitoring purposes, the ice condenser is divided into six zones. Each zone contains four inlet door assemblies, or a total of eight door panels. Each lower inlet door is provided with a limit switch for position indication and alarm input. Each zone is provided a pair of monitor lights (one for "Door Open" (not closed) indication and one for "Door Closed" indication) on the door position display panel in the upper compartment. A "Door Open" indication is given if any door panel within a zone is not fully closed. A control room alarm "ICE COND LOWER INLET DOORS OPEN" is provided on an annunciator panel. This control room annunciator alarm is activated if any door panel in any zone is opened. The door position display panel is accessible during normal plant operation in the event an ice condenser door open alarm is annunciated in the Control Room.

Resistance temperature detectors (RTDs) and temperature switches are located in various parts of the ice condenser for ice bed temperature monitoring. They serve to verify attainment and

maintenance of proper temperature in the ice bed and to detect general gradual temperature rise in the ice bed. Ice bed RTDs include two that are plenum mounted and 45 that are probe assembly mounted, attaching to the lattice frame located throughout the ice bed. These ice bed RTDs are connected to a temperature scanner unit which multiplexes the RTDs signals to a recorder in the control room. There are also six temperature switches located at various points in the ice bed that provide inputs to an alarm on a control room annunciator panel as backup warning of rising ice bed temperatures should the RTD indications not be available.

3.1 Licensee's Proposed Changes

Current TS LCO 3.6.13, CONDITION B states:

> One or more ice condenser doors inoperable for reasons other than Condition A or not closed

Current TS LCO 3.6.13, CONDITION B, REQUIRED ACTION and COMPLETION TIME states:

> B.1 Verify that the maximum ice bed temperature is ≤ 27° F, once per 4 hours
>
> AND
>
> B.2 Restore the ice condenser door to OPERABLE status and closed positions, 14 days.

Revised TS LCO 3.6.13, CONDITION B, REQUIRED ACTION and COMPLETION TIME would state:

> B.1 Verify that the maximum ice bed temperature is ≤ 27° F, once per 4 hours
>
> AND
>
> Note: Required Action B.2.1 applies only when one or more ice condenser lower inlet doors are inoperable due to having an invalid open alarm.
>
> B.2.1 Verify affected lower inlet door is closed, once per 14 days
>
> OR
>
> B.2.2 Restore ice condenser door to OPERABLE status and closed positions, 14 days

3.2 NRC Staff's Evaluation of Licensee's Proposed Changes

NUREG-1431, Revision 4.0, is the applicable reference TS for MNS. NUREG-1431, TS 3.6.16, "Ice Condenser Doors," contents are identical to the existing MNS TS 3.6.13.

The LIDs must be closed to be operable to ensure the ice condenser ice bed contains the ice mass, both total mass and distribution between ice condenser zones, needed for pressure suppression by condensation of steam released during a LOCA or secondary steam line break in the lower compartment. An open or partially open LID could result in the warm humid air of

the lower compartment entering the ice bed and resulting in ice melting or accelerated sublimation ice mass loss, especially in the vicinity of the open LID. An additional concern is that ice or frost buildup on or around the door could impair proper opening of the door when needed during an event. The doors are designed to modulate during a design basis event and provide for even distribution of steam and heated atmosphere from the lower compartment and avoid uneven local depletion of the ice bed thereby adversely affecting the accident pressure mitigating capability.

The LAR indicated that a LID position limit switch could fail or be out of proper adjustment and thus not provide a closed position indication even with the LID closed and otherwise operable. With significant radiation levels in the vicinity of the LIDs during normal plant operation high personnel doses would be required to correct the condition or the reactor shut down. With a misadjusted or otherwise failed LID position indication, TS SR 3.6.13.1 cannot be completed successfully for the affected LID. The LAR indicated that the LID positions can be visually verified closed from the ice condenser intermediate deck by lowering a camera and light down the length of the ice baskets to the affected LIDs. In addition to a qualitative determination of physical door position this visual inspection would verify no ice or frost buildup at a LID which would indicate acceptable door gasket contact. The licensee also noted that operators would be alerted to a substantial door seal gap as it would result in loss of much of the cold head pressure difference and likely additional LIDs no longer indicating closed position as they eased off their seal gasket as well as rising ice bed temperatures.

Current TSs require, that if any LID closed position indication is not available, the ice bed temperatures be monitored to ensure significant ice melt or sublimation acceleration would not occur before the LID closed position indication could be restored. The completion time of 14 days for ensuring the LID is closed and closed indication is restored considers the likely limited impact on ice bed mass that could be taking place with acceptable ice bed temperatures being maintained during that period. Either restoring LID closed position indication or verifying the LID to be closed by means of remote visual inspection as described in the LAR within the same 14 days allowed to restore the LID closed position indication would provide a comparable level of assurance that ice condenser capability is being maintained. The requested alternate REQUIRED ACTION B.2.1 does not have a limitation on how long the condition can continue (as long as every 14 days it is verified that the affected LID is closed), therefore, it would not restrict entering other plant operating modes while in REQUIRED ACTION B.2.1. This is acceptable to the NRC staff since the affected LID is being visually verified as being closed every 14 days and ice bed temperatures are monitored every four hours until the LID closed position indication is restored. The NRC staff concludes that this verification provides reasonable assurance that the ice condenser bed is not losing ice mass at an accelerated rate due to an open LID and that the affected LID is not encumbered by ice or frost buildup and remains capable of performing its open function when needed.

The following sections describe the licensee approach to meeting relevant review criteria and the evaluations conducted by NRC staff to ensure that the criteria are met.

3.1 Description of Operator Actions and their Safety Significance

The licensee proposes using operator actions and alternate indications to monitor the status of the LIDs in place of relying on control room indications when alarms are confirmed to be faulted.

Section 2.2 "Description of Proposed License Amendment" of the submittal dated March 24, 2016, indicates that alternate methods will only be used for verification of Operability. This includes two separate actions that operators must conduct: (1) verify that ice bed temperature is less than or equal to 27°F every four hours, and (2) verify that each LID is closed every 14 days.

3.1.1 Verification of Ice Bed Temperature

Section 3.1 "Background" of the submittal dated March 24, 2016, describes the RTDs and temperature switches used in the ice condenser. The RTDs send a signal to a scanner unit and recorder in the main control room. Six temperature switches are used for backup indication in the case that the scanner unit or recorder fails. The temperature switches feed a control room annunciator panel which activates based on preset deviations from limits of the ice bed equilibrium temperature.

Operators must verify that the temperature of the ice bed is less than or equal to 27°F every four hours using the RTDs when the "ICE CONDENSER INLET DOORS OPEN" alarm is determined to be invalid.

3.1.2 Verification that LIDs are Closed

The license proposes several means for verifying that the LIDs are closed. Each is described below.

3.1.2.1 Using the LID Indications when they are Functioning Properly

Section 3.1 "Background" of the submittal dated March 24, 2016, describes the equipment normally used to verify that the LIDs are closed.

The control room currently has an alarm" ICE COND LOWER INLET DOORS OPEN" on the annunciator panel. The alarm is activated if any of the door panels are open. The ice condenser is divided into six zones, each with eight door panels. Each zone has two monitor lights (one indicates that there is a door open, the other indicates that the doors are closed). The door position display panel is accessible during normal operating conditions.

3.1.2.2 Dispatching an Operator when Dose Rates Allow

When dose rates allow, operators can be dispatched to visually confirm that the LIDs are closed. Specialized tooling can be used to gently press on the doors to attempt to clear the alarm. Operators will also verify that the maximum ice bed temperature is less than or equal to 27°F.

3.1.2.3 Using a Camera System

When dose rates prohibit visual inspection of the LIDs, TSs would allow the licensee to verify the affected LIC is closed. A camera and light will be lowered 54 feet from intermediate deck through the flow channels. The camera will then be used to look for frost and condensation on

the door surface, vapor/mist coming from the top of the door, ice formation on the floor, and air movement (detected by a flag attached to the camera).

3.1.3 Safety Significance of Operator Actions

Because this is a new human action (HA), it was not modeled in the plant-specific MNS Standard Plan Analysis Risk model, which aligns with guidance in NRC's NUREG-1764, Revision 1 "Guidance for the Review of Changes to Human Actions." Quantification of risk importance of the HA is difficult without significant changes to the model, but the HA can be evaluated qualitatively. A number of important questions need to be answered to qualitatively estimate the risk-importance of the change to the associated HA. In particular, the impact of its failure on the key safety function(s) it supports needs to be identified. A failure of the associated HA would be a loss of redundancy for a single system (ice condenser) supporting a key safety function (containment), but the effect would be minor due to the design, construction, and operation of the ice condenser system.

The NRC staff evaulated the risk significance of HAs that the licensee may have to rely on to verify proper position of the ice condenser lower doors to ensure the ice condenser stays operable and able to provide its safety function. To that end, the following were examined (a) the plant baseline core damage frequency (CDF) and large early release frequency (LERF), (b) the frequencies of various initiating events requiring ice condenser operation and the likelihood of impact to ice condenser operation based on operator error in the assessment of door position, and (c) the consequences of the improper assessment of lower inlet door position. Based on these assessments, the NRC staff determined that the risk significance of the HAs required to verify the position of the ice condenser lower inlet doors is negligible and does not need to be modeled in the plant-specific MNS Standard Plan Analysis Risk model.

From MNS Updated Final Safety Analysis Report, Chapter 6:

Section 6.2.2.8, "Lower Inlet Doors," states, in part:

> For small incidents, initial inlet door opening (location and magnitude) is determined by local lower compartment pressure. As the developed ice condenser cold head is lost through open doors, the remainder of the doors will also tend to open, providing numerous pathways for steam to enter the ice condenser.

Section 6.2.2.15 states, "Ice Condenser Instrumentation," in part:

> Since the ice bed has a very large thermal capacity, postulated off normal conditions can be successfully tolerated for a week to two weeks. Therefore, the ice condenser instrumentation provides an early warning of any incipient ice condenser anomalies. In this way the operator can evaluate the anomaly and take the proper remedial action.

Section 6.2.2.15.2, "Design Description," states, in part:

> Forty-eight resistance thermometer bulbs are mounted on ice bed probes which are attached to lattice frames throughout the ice bed. The forty-eight resistance thermometer bulbs tie into one scanner unit suitably enclosed for mounting inside the Containment. A recorder is mounted in the Main Control Room, and an annunciator panel provides an alarm for a preset deviation from limits of ice bed equilibrium temperature.

A failure of the HA would not result in the complete loss of the system (ice condenser) and subsequently would not result in total failure of the key safety function (containment) over a period of 14 days. Further, the HA failure would be self-revealing and would either have to be ignored over multiple shifts of different operators, or the error would have to be repeated multiple times for any substantial consequences to be observed (for example, an open LID will allow thermal energy from lower containment to enter the ice bed, challenging the available ice inventory). Based on the above, the risk-significance of the subject operator manual action that the licensee may have to rely on is determined to be negligible and is, there, acceptable.

The operator actions described above were assessed according to NUREG-1764. This assessment indicated that the risk profile associated with this change is negligible because a failure of the operator actions described in this amendment would not result in the complete loss of the system and subsequently would not result in total failure of the key safety function. This assessment supports the determination that a Level III Probabalistic Risk Assessment review is appropriate for this license amendment, which is the lowest of the graded reviews under the guidance in NUREG-1764.

3.2 General Review Criteria

NUREG-1764, Criterion 1

This criterion indicates that licensees should provide adequate assurance that the proposed change meets current regulations.

Section 4.1 of the submittal dated March 24, 2016, indicates the applicable regulatory requirements. The alternate method to verify ice condenser LID position as proposed by this amendment does not alter or revise the bounding Ice Condenser System safety analysis in anyway, because the ice bed temperatue will still be verified that is less than or equal to 27°F every four hours. Therefore, the applicable regulations will continue to be met if this amendment is approved. The NRC concludes this treatment is acceptable to meet this NUREG-1764 criterion.

NUREG-1764, Criterion 2

Criterion 2 indicates that the licensee should not reduce defense-in-depth. The licensee is not removing the LID indicators as a result of this LAR. These indications remain available to operators, even though operators may not find them always to be reliable (the licensee describes methods that will be used to prevent operator complacency in its letter dated August 11, 2016).

The proposed changes to the TS will allow additional means of door position verification to be used. When dose rates allow, operators can still confirm that the doors are closed visually. When dose rates do not allow, operators can use the camera system described above to confirm that the doors are, in fact, closed. Verifying that the ice bed temperature remains less than or equal to 27°F is a redundant and diverse form of indication that provides additional evidence of the actual position of the doors.

The proposed revision to the TS maintains the original methods of verifying that the doors are closed and adds additional methods for use when the control room indications are not reliable. There is no decrease in defense-in-depth, therefore, NRC staff finds this to be acceptable.

3.3 NRC Staff Technical Conclusions

The NRC staff finds that the licensee proposed change to MNS TS LCO 3.6.13, CONDITION B REQUIRED ACTIONS will continue to provide reasonable assurance that ice condenser condition is being maintained and thus the proposed change is acceptable.

This is acceptable to the NRC staff since the affected LID is being visually verified closed every 14 days and ice bed temperatures are monitored every four hours until the LID closed position indication is restored. The NRC staff finds that the visual verification every 14 days and monitoring of the ice bed temperatures every four hours for the affected LID, provides reasonable assurance that the ice condenser bed is not losing ice mass at an accelerated rate due to an open LID and that the affected LID is not encumbered by ice or frost buildup and remains capable of performing its open function when needed

The proposed revision to the TS maintains the original methods of verifying that the doors are closed and adds additional methods for use when the control room indications are not reliable. There is no decrease in defense-in-depth, therefore staff finds this to be acceptable. The NRC staff determined that the changes proposed by this amendment modify a TS Condition and Required Action and do not alter or revise the current bounding Ice Condenser System safety analyses of record because of the temperature montoring of the ice bed and visual verification. Therefore, the applicable regulations will continue to be met if this amendment is approved.

The NRC staff completed a review of the operator manual actions proposed by this LAR. Based on the information provided in the LAR and the supplement dated August 11, 2016, the NRC concludes the actions are in accordance with NUREG-1764 are, therefore, acceptable.

Based on the above, the NRC staff concludes that the new alternate Required Action continues to contain the appropriate administrative controls to verify that the ice condenser doors are closed and that the revised TSs continue to provide the appropriate administrative controls to ensure that the requirements of 10 CFR 50.36(c)(2)(i) are satisfied.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the North Carolina State official was notified on January 23, 2017 of the proposed issuance of the amendments. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to the installation or use of facility components located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve no significant increase in the amounts and no significant change in the types of any effluents that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on this finding (81 FR 36617: June 6, 2016). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: J. Bettle, NRR
B. Green, NRO

Date: February 24, 2017

A copy of the related Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

/RA/

Michael Mahoney, Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-369 and 50-370
Enclosures:
1. Amendment No. 292 to NPF-9
2. Amendment No. 271 to NPF-17
3. Safety Evaluation
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DATE	1/04/17	2/06/17	2/24/17	2/24/17	

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