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December 12, 2017
Serial No. MNS-17-049

10 CFR 50.90

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

Duke Energy Carolinas, LLC
McGuire Nuclear Station, Units 1 and 2
Docket Nos. 50-369 and 50-370
Renewed License Nos. NPF-9 and NPF-17

Subject: Response to the Request for Additional Information regarding the License Amendment Request for Temporary Changes to Technical Specifications to address the 'A' Train Nuclear Service Water System (NSWS) Non-Conforming Condition

By letter dated September 14, 2017 (ADAMS Accession No. ML17262A090), Duke Energy requested temporary changes to the McGuire Nuclear Station Technical Specifications. The proposed License Amendment Request (LAR) will permit the 'A' Train NSWS to be inoperable for a total of 14 days to address a non-conforming condition on the 'A' Train supply piping from the Standby Nuclear Service Water Pond (SNSWP).

This letter provides the additional information requested by the NRC staff via electronic mail from Michael Mahoney dated November 21, 2017 (ADAMS Accession No. ML17331B149). The NRC staff's questions and Duke Energy's responses are provided in the Attachment.

The conclusions reached in the original determination that the LAR contains No Significant Hazards Considerations and the basis for the categorical exclusion from performing an Environmental Impact Statement have not changed as a result of these responses to the request for additional information.

A001
NRR

Please contact Lee A. Hentz at 980-875-4187 if additional questions arise regarding this LAR.

I declare under penalty of perjury that the foregoing is true and correct. Executed on December 12, 2017.

Sincerely,

Jimmy Glenn
for

Thomas D. Ray
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Attachment

cc w/ Attachments:

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By letter to the U.S. Nuclear Regulatory Commission (NRC) dated September 14, 2017 ADAMS Accession No. ML17262A090), Duke Energy requested changes to the Technical Specifications (TSs) for McGuire Nuclear Station, Units 1 and 2 (McGuire). The proposed amendment will permit the 'A' Train NSWS to be inoperable for a total of 14 days to address a non-conforming condition on the 'A' Train supply piping from the Standby Nuclear Service Water Pond (SNSWP).

In order to complete its review, the U.S. Nuclear Regulatory Commission staff requests the following additional information. Please provide your response to the following requests for additional information (RAIs) within 30 days of the date of this correspondence.

RAI-01

McGuire described a defense-in-depth consideration where procedures and designated operators will be available to align the 'B' Train Standby Nuclear Service Water Pond (SNSWP) suction path to the 'A' Train Nuclear Service Water System (NSWS) pump suction following an earthquake that exceeds operating basis earthquake (OBE) or causes damage to the Cowan's Ford Dam or low level intake (LLI) piping. These events would cause loss of the 1A and 2A NSWS pumps. McGuire further stated that if a failure of a 'B' Train NSWS pump occurred subsequent to the events described above, an additional defense in depth contingency would be available, i.e. procedures and designated operators will be available to align the affected unit 'A' NSWS pump to the SNSWP via the shared 'B' NSWS piping to restore NSW flow to the affected unit.

McGuire has stated, in support of the contingency, the following conditions will be established before the start of activities in the LAR:

- The 'A' train supply header crossover valve (ORN-14A) will be opened prior to the evolution and power will be removed from the valve operator.

- 'B' train supply header crossover valve (ORN-15B) will be maintained closed with the ESFAS signal from each unit blocked prior to the evolution. Maintaining valve ORN-15B closed with power removed satisfies operability requirements for the 'B' Train NSWS. Valve ORN-15B can be opened from the control room after power is restored if conditions warrant the use of this contingency.

The NRC staff observed that until the 'A' NSWS pumps could be realigned to the 'B' NSWS header, the 1A and 2A diesel generators would not have required cooling. With the absence of cooling to the 1A and 2A diesel generators and the loss of off-site power caused by the seismic event, MOVs 0RN148A,C and 0RN147A,C and 0RN149A may not have power available, since these MOVs have emergency power from either the 1A or 2A diesel generator. Yet these MOV's have to be repositioned to align the 'A' NSWS pumps to the 'B' NSWS header as shown in Figures 6 and 7 of the LAR.

With loss of cooling to the 1A and 2A diesel generators causing the possible unavailability of these diesel generators, and the loss of offsite power caused by the seismic event:

a) Describe how the licensee will affect the lineup required by Figure 7 of the LAR, including repositioning MOVs 0RN148A,C and 0RN147A,C and 0RN149A, in order to supply the 'A' NSWS pumps from the 'B' NSWS header, which in turn would supply the 1A and 2A diesel generators.

b) With the loss of cooling to the 1A and 2A diesel generators during this event, discuss the effects on safety loads powered from the diesel generators and the effect on nuclear safety.

Duke Energy Response:

RAI-01 is associated with a loss of supply to the 'A' Train NSWS pumps from Lake Norman, followed by a loss of the 'B' Train NSWS pumps. The loss of the 'A' train NSWS pumps will result in securing of the 'A' diesel generators. With the associated loss of off-site power caused by the seismic event, 'A' train components would have no power available in this scenario. Therefore, in order to avoid such an event, the 'A' train NSWS pumps must remain in service with adequate net positive suction head (NPSH) being provided, or must be secured. The scenario described in RAI-01 must be analyzed with two different failure mechanisms. These mechanisms are:

1. Loss of Cowans Ford Dam
2. Piping Failure between Cowans Ford Dam and the Auxiliary Building

The required response time to realign from Lake Norman to the SNSWP has the potential to be different for each of these failures, and therefore, must be independently discussed.

1. Loss of Cowans Ford Dam

As stated in Section 3.0 of the LAR submittal, the Cowans Ford Dam is only qualified to an Operating Basis Earthquake (OBE). However, as also stated in Section 3.0, a seismic Fragility Assessment was performed for Duke Energy in 2011. The conclusion from this assessment is that the damn and water supply would withstand a safe shutdown earthquake (SSE). This conclusion is restated in Section 3.1 of the LAR submittal.

In the event that the Cowans Ford Dam is breached, an analysis has been performed to determine the time required to realign the supply of the NSWS pumps from Lake Norman to the SNSWP. Duke Energy calculation titled Cowans Ford Reservoir Depletion Analysis documents an analysis that was performed utilizing breach parameters found in the UFSAR. The conclusion of this analysis is that under worst case dam breach conditions, seventy (70) minutes are available to realign the supply of the NSWS pumps from Lake Norman to the SNSWP during a lake level decrease from Elevation 749 feet to Elevation 745 feet. The minimum allowable lake level to provide NSWS pump required NPSH is 745 feet. Additional margin exists, with respect to the required timeframe, as lake level is normally maintained at or above Elevation 754 feet and the 70 minute allowance begins at Elevation 749 feet.

Based on the above analysis, there is ample time available to realign from Lake Norman to the SNSWP prior to challenging NPSH conditions of the NSWS pumps on a loss of the Cowans Ford Dam. The realignment will occur in accordance with the Loss of NSWS Abnormal Procedures. These procedures require realignment to the SNSWP within 60 minutes, and therefore, the realign will occur prior to lake level decreasing below Elevation 745 feet.

There is an additional, separate 60 minute requirement, documented in the SNSWP Thermal Analysis Calculation that analyzes SNSWP depletion. This analysis considers the alignment where the NSWS supply side has been realigned to the SNSWP, while the NSWS discharge side remains aligned to Lake Norman. The analysis determines that this alignment is acceptable for 60 minutes under worst case flow conditions without affecting SNSWP inventory in an unacceptable manner. The Abnormal Procedures require the discharge to be realigned within 60 minutes of the suction.

2. Piping Failure between Cowans Ford Dam and the Auxiliary Building

Similar to the Cowans Ford Dam, the 42 inch NSWS piping between valve 1RN-1 and the auxiliary building is not nuclear safety related nor is the piping rated for an SSE (referenced in Section 3.0 of LAR Submittal). However, the seismic Fragility Assessment that was discussed in the Cowans Ford Dam failure evaluation above also pertains to the associated piping. The conclusion of that assessment is that the piping will likely withstand a SSE.

In addition to the seismic Fragility Assessment, an additional McGuire calculation was created to demonstrate that the NSWS piping from the Low Level Intake (LLI) will remain intact and functional long enough for the 'A' train NSWS suction to be aligned to the SNSWP before catastrophic failure of the NSWS piping occurs. This evaluation analyzed the piping for missile concerns and seismic effects. The conclusion of this calculation is that there is a high confidence that the piping will remain intact long enough for the NSWS supply to be realigned over to the SNSWP.

The LLI piping was also evaluated for design loads. This evaluation references a published analysis ("Seismic Design of Buried Piping" by Iqbal and Goodling) that states the most common failure modes due to earthquakes are:

- Axial compression and tension of the pipe produced by seismic waves traveling through the soil.
- Bending of the pipe also produced by seismic waves traveling through the soil.
- Differential displacements at location of restraint such as building connections.
- Differential displacements caused by soils with dynamically different properties.

Each of the above failure modes were analyzed to ensure that the LLI piping could withstand a seismic event. The conclusion of this analysis was that the LLI piping had margin with respect to required wall thickness.

It is Duke Energy's judgement that the piping will not fail in such a manner that the suction of the NSWS pumps will lose communication with Lake Norman. The piping will remain sufficiently intact to provide enough time for 'A' train suction to be re-aligned to the SNSWP, if needed.

Conclusion:

To summarize the above discussion, there is ample time during a loss of the Cowans Ford Dam or LLI piping to allow either realignment of the 'A' train NSWS pumps to the SNSWP or to secure the 'A' train diesel generators and 'A' train NSWS pumps prior to loss of adequate NPSH. The Cowans Ford Dam and LLI piping have a small probability of failure, but if a failure were to occur there is ample time to secure 'A' train NSWS pumps prior to loss of suction. Securing the 'A' train NSWS pumps prior to loss of adequate NPSH will allow these pumps to be utilized later in the event, if needed. Even in the event of a failure, nuclear safety would be maintained. The scenario would unfold as follows:

- A seismic event results in the loss of Cowans Ford Dam or a LLI piping failure. The seismic event results in a loss of offsite power.
- The 1B and 2B NSWS pumps would operate from the SNSWP (1B and 2B diesel generators would also be in service). This alignment was made prior to entering the LCO, as stated in the LAR submittal.
- The 1A and 2A NSWS pump suctions will continue to be aligned to the LLI at the beginning of the event. The 1A and 2A NSWS pump discharges will be manually aligned to the SNSWP in accordance with the Abnormal Procedure associated with loss of the NSWS. This procedure will realign the discharge valves (0RN-147AC, 0RN-148AC, 0RN-149A) prior to securing the 'A' train NSWS pumps and the associated diesel generators, as there will be ample time to make this alignment. The 1A and 2A NSWS pumps would be secured prior to loss of required NPSH to ensure capability for use later in the event. The associated diesel generators would also be secured prior to the loss of cooling.
- There is an assumed failure of one 'B' train NSWS pump.
- 'A' train NSWS pump suction would be realigned to the 'B' train SNSWP piping supply through a designated operator by opening 0RN-15B and closing 0RN-12AC and/or 0RN-13A. These actions are in accordance with the Abnormal Procedures associated with loss of the NSWS.
- The diesel generators (1A or 2A) would be started by resetting the Emergency Stop. The applicable Emergency Procedure would start the respective 'A' train NSWS pump along with other required safety equipment.

a) *Describe how the licensee will affect the lineup required by Figure 7 of the LAR, including repositioning MOVs 0RN148A,C and 0RN147A,C and 0RN149A, in order to supply the 'A' NSWS pumps from the 'B' NSWS header, which in turn would supply the 1A and 2A diesel generators.*

As discussed above, the LLI piping and the Cowans Ford Dam are highly unlikely to fail, even during a SSE. However, in the event that a failure did occur, there is ample time to realign the 'A' train NSWS train discharge valves (0RN-147AC, 0RN-148AC and 0RN-149A) prior to securing the 'A' train NSWS pumps due to inadequate NPSH. The Abnormal Procedure

associated with loss of the NSWS will align these valves within sixty (60) minutes of the start of the event. Therefore, based on the analysis of the Cowans Ford Dam and associated LLI piping, there is ample time to realign these valves prior to the need to secure the 'A' train NSWS pumps.

b) With the loss of cooling to the 1A and 2A diesel generators during this event, discuss the effects on safety loads powered from the diesel generators and the effect on nuclear safety.

The Defense In Depth section of the LAR does describe a scenario where the 'A' train diesel generators would be secured. This would require a loss of Lake Norman (Cowans Ford Dam or LLI piping) along with a subsequent loss of 'B' train NSWS pump(s).

The 1A and 2A diesel generators will remain in service as long as 'A' train NSWS pumps can remain aligned to Lake Norman. The 1A and 2A diesel generators would be secured prior to securing the 1A and 2A NSWS pumps. At that time, 'A' train will remain in standby, thereby not challenging the integrity of any equipment.

'B' train equipment would be in service as a result of the loss of offsite power. In the event that one of the 'B' train NSWS pumps failed, the realignment of 'A' train NSWS suction to the SNSWP would be completed and the 'A' train equipment would be restarted with adequate cooling. Nuclear safety would be maintained.

RAI-02

Figure 9, "Personnel Access Manway," of the LAR, as presented in the original package provided to the NRC, is not legible.

Please provide a legible copy of Figure 9.

Duke Energy Response:

See attached an 18 inch by 24 inch copy of Drawing MC-1027-01.00, which is LAR Figure 9.