

July 03, 2012

MEMORANDUM TO: Nancy L. Salgado, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

FROM: Alexander R. Klein, Chief */RA/*
Fire Protection Branch
Division of Risk Assessment
Office of Nuclear Reactor Regulation

SUBJECT: MCGUIRE NUCLEAR STATION, UNITS 1 AND 2 – FIRE PROTECTION
FIRE PROTECTION SAFETY EVALUATION INPUT REGARDING
LICENSE AMENDMENT REQUEST RE: MEASUREMENT
UNCERTAINTY RECAPTURE POWER UPRATE
(TAC NOS. ME8213 AND ME8214)

By letter dated March 5, 2012, Duke Energy Carolinas, LLC (Duke Energy), the licensee of the McGuire Nuclear Station (McGuire), Units 1 and 2, submitted a license amendment request (LAR). In accordance with Title 10 of the *Code of Federal Regulations*, Section 50.90, the licensee requested an amendment to the McGuire, Units 1 and 2, operating license, which proposed changes to the technical specifications to allow plant operations at an increased reactor thermal power level of 3469 megawatts thermal (MWt), approximately 1.7% above the currently licensed power level of 3411 MWt, by means of a measurement uncertainty recapture power uprate.

The Fire Protection Branch (AFPB) has reviewed this LAR and Duke Energy's response to the staff request for additional information. Enclosed is our safety evaluation of the applicable area of the licensee's submittal for which AFBP has the primary review responsibility.

Based on our review, AFBP has concluded that the proposed MUR power uprate will not have a significant impact on the fire protection program and, therefore, finds the proposed amendment acceptable. This completes our efforts on TAC Nos. ME8213 and ME8214. If you have any questions regarding this input, please contact us.

Docket Nos.: 50-369 and 50-370
Renewed Facility Operating License Nos.: NPF-9 and NPF-17

Enclosure:
As stated

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FIRE PROTECTION SAFETY EVALUATION INPUT REGARDING
LICENSE AMENDMENT REQUEST FOR
MEASUREMENT UNCERTAINTY RECAPTURE POWER UPRATE

MCGUIRE NUCLEAR STATION, UNITS 1 AND 2
DOCKET NOS.: 50-369 and 50-370
TAC NOS.: ME8213 AND ME8214

Office of Nuclear Reactor Regulation
Division of Risk Assessment
Fire Protection Branch

1.0 INTRODUCTION

By letter dated March 5, 2012, Duke Energy Carolinas, LLC (Duke Energy), the licensee of the McGuire Nuclear Station (McGuire), Units 1 and 2, submitted a license amendment request (LAR). In accordance with Title 10 of the *Code of Federal Regulations*, Section 50.90, the licensee requested an amendment to the McGuire, Units 1 and 2, operating license, which proposed changes to the technical specifications to allow plant operations at an increased reactor thermal power level of 3469 megawatts thermal (MWt), approximately 1.7% above the currently licensed power level of 3411 MWt by means of a measurement uncertainty recapture power uprate. This will result in an increase in electrical power from 3411 MW MWe to 3469 MW MWe. The licensee's proposed power increase will be achieved by the installation of the Caldon LEFM [leading edge flow meter] CheckPlus™ system with ultrasonic transducers, which allows for a more accurate measurement of feedwater (FW) flow. The purpose of the proposed change is to obtain a power uprate on the basis of a plant modification that would result in an improved accuracy of FW flow measurement, which is used to calculate reactor thermal power. Installation of an ultrasonic flow meter (UFM), called LEFM Check Plus System, to measure FW flow would allow the licensee to operate the plant with a reduced instrument uncertainty margin and an increased power level of approximately 1.7% of the licensed thermal power. The Nuclear Regulatory Commission (NRC) staff approved Caldon Topical Report ER-157P, "Basis for a Power Uprate with the LEFM Check™ or LEFM CheckPlus™ System," by a Safety Evaluation Report (SER) in Agencywide Documents and Management System (ADAMS) Accession No. ML013540256 for use in justifying MUR power uprates up to 1.7%.

2.0 REGULATORY EVALUATION

The purpose of the fire protection program is to provide assurance, through a defense-in-depth design, that a fire will not prevent the performance of necessary plant safe-shutdown functions, nor will it significantly increase the risk of radioactive releases to the environment. The NRC staff's review focused on the effects of the increased decay heat due to the MUR power uprate on the plant's safe-shutdown analysis to ensure that structures, systems, and components (SSCs) required for the safe-shutdown of the plant are protected from the effects of the fire and will continue to be able to achieve and maintain safe-shutdown following a fire. The NRC's acceptance criteria for the fire protection program are based on (1) 10 CFR 50.48, "Fire

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protection,” insofar as it requires the development of a fire protection program to ensure, among other things, the capability to safely shutdown the plant; (2) General Design Criterion 3 (GDC) of Appendix A to 10 CFR Part 50, insofar as it requires that [a] SSCs important to safety be designed and located to minimize the probability and effect of fires, [b] noncombustible and heat resistant materials be used, and [c] fire detection and suppression systems be provided and designed to minimize the adverse effects of fires on SSCs important to safety; and (3) GDC 5 of Appendix A to 10 CFR Part 50, insofar as it requires that SSCs important to safety not be shared among nuclear power units unless it can be shown that sharing will not significantly impair their ability to perform their safety functions.

A revision to 10 CFR Part 50, Appendix K, effective July 31, 2000, allowed licensees to use a power uncertainty of less than 2% in design basis loss-of-coolant accident analyses, based on the use of state-of-the-art FW flow measurement devices that provide for a more accurate calculation of reactor power. Appendix K to 10 CFR Part 50 did not originally require that the reactor power measurement uncertainty be determined, but instead required a 2% margin. The revision allows licensees to justify a smaller margin for power measurement uncertainty based on power level instrumentation error. This type of change is also commonly referred to as an MUR power uprate.

Regulatory Information Summary (RIS) 2002-03, “Guidance on the Content of Measurement Uncertainty Recapture Power Uprate Applications,” January 31, 2002, Attachment 1, Sections II and III (ADAMS Accession No. ML013530183) recommends that, to improve the efficiency of the staff’s review, licensees requesting an MUR power uprate should identify current accident and transient analyses of record which bound plant operation at the proposed uprated power level. For any design basis accident for which the existing analyses of record do not bound the proposed uprated power level, the licensee should provide a detailed discussion of the reanalysis.

3.0 TECHNICAL EVALUATION

Duke Energy developed the LAR consistent with the guidelines in RIS 2002-03. In the LAR, the licensee re-evaluated the applicable SSCs and safety analyses at the proposed MUR core power level of 3469 MWt against the previously analyzed core power level of 3411 MWt.

The Fire Protection Branch (AFPB) reviewed Enclosure 2, “Summary of RIS 2002-03 Requested Information,” to the License Amendment Request (LAR), Section VII.6.A, “Fire Protection Program,” and Section 47, “Safe Shutdown Fire.” The staff also reviewed the licensee’s commitment to 10 CFR 50.48, “Fire protection” (i.e., approved fire protection program). The review covered the impact of the proposed MUR power uprate on the results of the safe-shutdown fire analysis as noted in RIS 2002-03, Attachment 1, Sections II and III. The review focused on the effects of the MUR power uprate on the post-fire safe-shutdown capability and increase in decay heat generation following plant trips.

The staff’s review of the March 5, 2012, LAR, Enclosure Section VII.6.A and Section 47, identified areas in which additional information was necessary to complete the review of the proposed MUR power uprate LAR. By letter dated June 21, 2012, Duke Energy responded to the staff request for additional information (RAI) as discussed below.

In RAI # 1, the staff noted that Enclosure 2, "Summary of RIS 2002-03 Requested Information," to the License Amendment Request (LAR), Section VII.6.A, "Fire Protection Program," states that "...Additional building heat-up will be minimal such that currently credited fire protection manual actions will not be prevented from being accomplished by their required time..." The staff requested the licensee to verify that the measurement uncertainty recapture (MUR) power uprate will not require any new operator actions.

In a letter to NRC dated June 21, 2012, the licensee provided additional information outlined as follows in response to the above RAI. In its response the licensee stated that no new operator manual actions are required as a result of MUR power uprate. The licensee's response satisfactorily addresses the staff's concerns, and this RAI issue is considered resolved based on the response. Note that this safety evaluation does not approve any new or existing operator manual actions concerning the McGuire Unit 1 and 2 fire safe shutdown analysis.

In RAI # 2, the staff noted that Enclosure 2, "Summary of RIS 2002-03 Requested Information," to LAR, Section 47, "Safe Shutdown Fire," states that, "...For specific site fire area, the Standby Shutdown Facility is the assured method to achieve and maintain the unit in a stable hot shutdown condition. While the plant is in the hot standby mode, damage control measures can be taken, as necessary, to restore the capability to achieve cold shutdown..." The staff requested the licensee to verify that the plant can meet the 72-hour requirements in both 10 CFR Part 50, Appendix R, Sections III.G.1.b and III.L, with increased decay heat at MUR power uprate conditions.

In a letter to NRC dated June 21, 2012, the licensee provided additional information outlined as follows in response to the above RAI. The licensee stated that a review of the impact of the MUR power uprate on the design of the standby shutdown system (SSS) identified three impacts due to the small (<2%) increase in decay heat: (1) as part of the SSS function, the main steam safety valves are credited to release steam from the steam generators to maintain hot shutdown conditions. The small increase in decay heat at MUR power uprate conditions would result in a slightly higher frequency of main steam safety valve cycling; (2) upon commencement of the unit cooldown, the operator throttles the credited main steam power operated relief valves, but the small increase in decay heat at MUR power uprate conditions would result in only an incremental increase in valve opening position; and (3) the McGuire Unit 1 and 2 auxiliary feedwater source is from the plant main condenser intake and discharge embedded piping. Each unit's respective embedded piping gravity flow comes from Lake Norman. This is a sufficient supply of cooling water to accommodate the small increase in decay heat at MUR power uprate conditions and ensure that McGuire continues to meet the 72-hour requirements contained in 10 CFR Part 50, Appendix R, Section III.G.b and III.L.

The licensee's response satisfactorily addresses the staff's concerns, and this RAI issue is considered resolved based on the following. For the MUR power uprate condition, the licensee reviewed its systems to obtain and maintain plant in cold shutdown condition. The licensee stated that McGuire Unit 1 and 2 can be placed in cold shutdown following a fire within the required 72 hours. Further, the licensee indicated that additional decay heat removal would not impact the ability to reach and maintain cold shutdown within 72 hours.

In RAI # 3, the staff stated that some plants credit aspects of their fire protection system for other than fire protection activities, e.g., utilizing the fire water pumps and water supply as

backup cooling or inventory for non-primary reactor systems. If McGuire, Units, 1 and 2, credit the fire protection system in this way, the staff requested that the MUR power uprate LAR identify the specific situations and discuss to what extent, if any, the MUR uprate affects these “non-fire protection” aspects of the plant fire protection system. If McGuire, Units, 1 and 2, do not take such credit, the staff requested that the licensee verify this as well. Further, the staff requested that the licensee discuss how any non-fire suppression use of fire protection water will impact the ability to meet the fire protection system design demands.

In a letter to NRC dated March 16, 2012, the licensee provided additional information outlined as follows in response to the above RAI. In its response the licensee stated that at McGuire the fire suppression system water is used for two non-fire protection beyond design basis events. For a loss of feedwater/auxiliary feedwater event, the system may supply 300 gallons per minute to steam generators as a secondary side heat sink. The fire suppression system water may also be used to supply backup make-up water to the spent fuel pool for a loss of spent fuel level event. The licensee further stated that MUR power uprate will not impact the non-fire-protection aspects of the McGuire fire suppression system.

The licensee’s response satisfactorily addresses the staff’s concerns, and this RAI issue is considered resolved based on the following. The licensee identified the following two provisions to use other features of the fire protection system for non-fire protection functions beyond design basis events. In the first beyond design basis event, the fire water is utilized to backup the water supply for the steam generators in the event of a loss of feedwater/auxiliary feedwater. In the second event, the fire protection system provides backup water to add inventory to the spent fuel pool. The licensee analyzed and concluded that all these beyond design basis events crediting the fire protection system are unaffected by the MUR power uprate. Therefore, the staff finds the response to the RAI acceptable because the licensee’s analysis concluded that all above functions of non-fire suppression uses of fire protection water are beyond design basis and are not affected by the proposed MUR power uprate.

Based on the licensee’s fire-related safe-shutdown assessment and responses to the RAIs, the staff concludes that the licensee has adequately accounted for the effects of the 1.7% increase in decay heat on the ability of the required systems to achieve and maintain safe-shutdown conditions. The staff finds this aspect of the capability of the associated SSCs to perform their design basis functions at an increased core power level of 3469 MWt acceptable with respect to fire protection.

4.0 CONCLUSION

Based on our review, AFB has concluded that the proposed MUR power uprate will not have a significant impact on the fire protection program or post-fire safe shutdown capability and, therefore, finds the proposed amendment acceptable.