Duke Power
A Duke Energy Company

GARY R. PETERSON
Vice President
McGuire Nuclear Station

Duke Power
MG01VP / 12700 Hagers Ferry Road
Huntersville, NC 28078-9340

704 875 5333
704 875 4809 fax
grpeters@duke-energy.com

July 29, 2004

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

Subject: Duke Energy Corporation (Duke)
McGuire Nuclear Station Units 1 and 2
Docket Numbers 50-369 and 50-370
Technical Specifications Amendment
Request for Additional Information (RAI); TS 3.7.15 - Spent Fuel Assembly Storage, and TS 4.3 - Fuel Storage

Reference: (1) Duke letter to NRC, dated September 29, 2003, and (2) NRC letter to Duke, dated June 30, 2004 (TAC NOS. MC0945 AND MC0946)

This letter provides additional information that was requested by the NRC staff in the above referenced NRC letter and further clarified during a teleconference call on June 22, 2004. The NRC staff's questions and Duke's responses are provided in the following attachment. Please note in the response to NRC's question No. 4, Duke makes a commitment that by December 1, 2004, a maintenance procedure will be revised to strengthen the administrative controls that are in place. Also in the response to NRC's question No. 2, Duke makes a commitment every two years to review and, if necessary revise the main McGuire spent fuel pool criticality calculation to maintain adequate margins of conservatisms in the reactivity of the spent fuel pool.

Please contact Norman T. Simms of Regulatory Compliance at 704-875-4685 with any questions with respect to this matter.

Very truly yours,

G. R. Peterson

G. R. Peterson

Attachment

A001

xc: (w/attachment)

W.D. Travers
Regional Administrator, Region II
U.S. Nuclear Regulatory Commission
Atlanta Federal Center
61 Forsyth Street, SW, Suite 23T85
Atlanta, GA. 30303

J.B. Brady
NRC Senior Resident Inspector
McGuire Nuclear Station

J.J. Shea, Project Manager (addressee only)
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
One White Flint North, Mail Stop O8 H12
11555 Rockville Pike
Rockville, MD 20852-2738

Beverly O. Hall, Section Chief
Radiation Protection Section
1645 Mail Service Center
Raleigh, N.C. 27699-1645

Gary R. Peterson, being duly sworn, states that he is Vice President of McGuire Nuclear Station; that he is authorized on the part of Duke Energy Corporation to sign and file with the U.S. Nuclear Regulatory Commission these revisions to the McGuire Nuclear Station Facility Operating Licenses Nos. NPF-9 and NPF-17; and, that all statements and matters set forth therein are true and correct to the best of his knowledge.

Gary R. Peterson, Vice President
McGuire Nuclear Station
Duke Energy Corporation

Subscribed and sworn to before me on July 29, 2004.

Freda K. Crump
Notary Public

My Commission Expires: August 17, 2006

ATTACHMENT

Responses to Nuclear Regulatory Commission Request for Additional Information Related to McGuire Nuclear Station's License Amendment Request for No-Boraflex Credit

Question 1

In Duke's response to RAI Question #8 from the April 22 letter, the licensee stated that, "It was assumed that the maximum burnup computational uncertainty calculated over the range of elevated burnups, 0.00454 Δk, would occur at 50 gigawatt days per metric ton (GWD/MTU) and would be zero at 0 GWD/MTU." Therefore, the licensee assumed a linear relationship between the burnup uncertainty and the burnup over the range of 0 to 50 GWD/MTU. Based on the NRC staff's understanding of the RAI response, burnups greater than 50 GWD/MTU would be assumed to have the maximum burnup computational uncertainty of 0.00454 Δk. Therefore, the NRC staff requests the licensee provide the following information:

a. For storage configurations which credit fuel assembly burnups in excess of 50 GWD/MTU, the NRC staff requests the licensee identify the value of the burnup computational uncertainty used.

b. If a burnup computational uncertainty of 0.00454 Δk was applied to storage configurations which credit burnups in excess of 50 GWD/MTU, the staff requests the licensee provide additional information to justify why this value remains conservative and a larger uncertainty was not needed.

Response

For storage configurations which credit fuel assembly burnups in excess of 50 GWD/MTU, the burnup computational uncertainty is linearly extrapolated based on the data points of 0 Δk at 0 GWD/MTU and 0.00454 Δk at 50 GWD/MTU. As noted on page 15 in Attachment 6 to the LAR, the following formula was used in calculating the burnup computational uncertainty for a given system-average burnup:

$$\Delta k_{CalculatedBurnupUncertainty} = \pm \{0.00454 * BU / 50\}$$

Where *BU* is the assembly burnup in GWD/MTU.

Following the above equation, the burnup computational uncertainty for the Unrestricted storage configuration of a W-STD fuel assembly at 5.00 wt % U-235 and 0 years cooling time (64.63 GWD/MTU) would be 0.00587 Δk.

Question 2

In response to RAI Question #10 from the April 22 letter, the licensee stated that, "Discharge data from 'best-estimate' future core designs were used to quantify the isotopic content of W-RFA fuel, because this design has only recently been introduced into the McGuire reactors, and so the historic W-RFA data are currently limited." As stated on pages 25 and 26 of Attachment 6, the staff agrees that the licensee's modeling of integral burnable poisons as discrete burnable poisons will provide conservative results due to the effects this will have on the assumed neutron spectrum around the fuel assemblies. However, the NRC staff requests that since the licensee is relying on "best-estimate" assumptions of reactivity-important core parameters during future cycle reloads, the licensee should provide a description of the process it will use to confirm that each fuel assembly was exposed to more conservative core parameters than assumed in the analysis, prior to placing it in the spent fuel pool.

Response

Duke has specified the main McGuire spent fuel pool criticality calculation to have a required two-year review frequency. This calculation documents the McGuire SFP analyses that support the information provided in Attachment 6 to the LAR. In each of these calculation reviews, the following steps will be performed:

- Ensure that all assumptions made for normal and accident conditions in the McGuire SFPs remain valid.
- Confirm that there are no new or modified fuel assembly types to be stored in the McGuire SFPs that are not bounded by one of the designs currently specified.
- Check the core follow predicted-to-measured boron concentration differences for any McGuire operational cycles that have concluded since the last review. Verify that the reactivity errors associated with these boron differences do not increase the previously-determined burnup computational uncertainty.

- Analyze the latest McGuire reactor discharge fuel information. For each additional fuel assembly since the last calculation review, evaluate the SFP Region 2 k_{eff} difference between a case using the actual core follow axial history profiles for that assembly, and a case using the pertinent "average" axial profiles shown in Tables 10 through 16 in Attachment 6 to the LAR. If the new discharge fuel data are trending in a non-conservative direction, compare with the available reactivity margin for that fuel type (e.g., ~ 0.005 Δk margin for W-RFA fuel due to modeling integral burnable poisons as discrete burnable poisons). Ensure that the overall model for each fuel design, as described in the LAR, remains bounding.

These periodic calculation reviews are not expected to uncover non-conservatisms greater than the excess reactivity margin available. However, if any of the above steps yields results that require a revision or addition to the fuel assembly minimum burnup requirements provided in Tables 18 through 21 of Attachment 6, Duke will submit a TS amendment request to allow the storage of these new or revised assembly designs.

Question 3

In response to RAI Question #15 from the April 22 letter, the licensee stated, "Each month, the burnup and isotopic weights for each fuel assembly is determined based on flux maps taken during cycle operation." The NRC staff requests the licensee identify the NRC approved methodology used to perform flux maps and determine cycle burnup.

Response

Flux maps are taken periodically as required by Technical Specifications. The conversion of measured reaction rates into 3-D power distributions and experimental verification of power distribution is described in DPC-NE-1004A, "Nuclear Design Methodology Using CASMO-3/Simulate-3P", DPC-NF-2010A, "McGuire Nuclear Station/Catawba Nuclear Station Nuclear Physics Methodology for Reload Design", and UFSAR 4.3.2.27. Initial NRC approval of Topical Reports DPC-NE-1004A and DPC-NF-2010A were provided by letters dated November 23, 1992 and March 13, 1985, respectively.

The measured assembly burnup distribution is determined using the measured power distribution, reactor power level, time, and as-built assembly loadings. This measured assembly burnup distribution is used to determine isotopic masses based on the fuel characteristics (fuel enrichment, burnable poison, and burnup). The measured assembly burnups are used to determine the reactivity of the fuel for placement in the spent fuel pool, dry storage cask or transportation casks.

Question 4

In the cover letter for its September 29, 2003 license amendment request, Duke stated that this amendment would change McGuire Nuclear Station spent fuel pools' licensing bases to 10 CFR 50.68 from 10 CFR 70.24 with an exemption. The NRC staff requests that Duke provide a brief summary of how it will satisfy each of the requirements in 10 CFR 50.68(b) upon approval and implementation of this amendment.

Response

10 CFR 50.68(b) states:

(1) Plant procedures shall prohibit the handling and storage at any one time of more fuel assemblies than have been determined to be safely subcritical under the most adverse moderation conditions feasible by unborated water.

Summary of compliance:
All storage locations have been evaluated to ensure that fuel can be stored safely at all times, under the most adverse moderator conditions as specified by appropriate regulations. Controls and procedures are in place to ensure that fuel assemblies are only placed into an acceptable storage configuration as allowed by appropriate regulatory criteria. Procedures and other administrative controls for the handling of fuel assemblies ensure that the movement of a fuel assembly is performed safely and that the fuel assembly being moved remains subcritical even under the most adverse moderation conditions. In addition, by December 1, 2004 a maintenance procedure will be revised to strengthen the administrative controls that are in place.

(2) The estimated ratio of neutron production to neutron absorption and leakage (k-effective) of the fresh fuel in the fresh fuel storage racks shall be calculated assuming the racks are loaded with fuel of the maximum fuel assembly reactivity and flooded with unborated water and must not exceed 0.95, at a 95 percent probability, 95 percent confidence level. This evaluation need not be performed if administrative controls

and/or design features prevent such flooding or if fresh fuel storage racks are not used.

Summary of Compliance:
Duke has calculated a maximum 95/95 k-effective of 0.9498 for the fresh fuel storage racks loaded with fuel of the maximum fuel assembly reactivity and flooded with full density unborated water.

(3) If optimum moderation of fresh fuel in the fresh fuel storage racks occurs when the racks are assumed to be loaded with fuel of the maximum fuel assembly reactivity and filled with low-density hydrogenous fluid, the k-effective corresponding to this optimum moderation must not exceed 0.98, at a 95 percent probability, 95 percent confidence level. This evaluation need not be performed if administrative controls and/or design features prevent such moderation or if fresh fuel storage racks are not used.

Summary of Compliance:
Duke has calculated a maximum 95/95 k-effective of 0.9618 for the fresh fuel storage racks loaded with fuel of the maximum fuel assembly reactivity and flooded with optimum density unborated water.

(4) If no credit for soluble boron is taken, the k-effective of the spent fuel storage racks loaded with fuel of the maximum fuel assembly reactivity must not exceed 0.95, at a 95 percent probability, 95 percent confidence level, if flooded with unborated water. If credit is taken for soluble boron, the k-effective of the spent fuel storage racks loaded with fuel of the maximum fuel assembly reactivity must not exceed 0.95, at a 95 percent probability, 95 percent confidence level, if flooded with borated water, and the k-effective must remain below 1.0 (subcritical), at a 95 percent probability, 95 percent confidence level, if flooded with unborated water.

Summary of Compliance:
Duke is taking credit for 800 ppm soluble boron in the McGuire SFPs. A maximum 95/95 k-effective of 0.99888 has been determined for the spent fuel storage racks loaded with fuel of the maximum fuel assembly reactivity and flooded with unborated water. The maximum 95/95 k-effective for the spent fuel storage racks loaded with fuel of the maximum fuel assembly reactivity and flooded with 800 ppm of borated water is well below 0.95.

(5) The quantity of SNM, other than nuclear fuel stored onsite, is less than the quantity necessary for a critical mass.

Summary of compliance:
Excluding the nuclear fuel, there is a limited amount of SNM stored at various locations onsite at MNS (fission chambers, Pu-Be neutron sources, fission foils (dosimeters)). The total quantity of non-fuel SNM (<0.1 grams of fissile material) is significantly below the amount necessary for a critical mass (1.15 kilograms of fissile material).

(6) Radiation monitors are provided in storage and associated handling areas when fuel is present to detect excessive radiation levels and to initiate appropriated safety actions.

Summary of compliance:
Fuel assemblies are stored and handled in areas of the plant discussed below. Radiation monitoring is provided for these areas to detect excessive radiation levels and will provide an alarm to alert personnel if a potential radiation hazard is present.

1. Unit 1 and 2 Fuel Building; includes the fuel receiving area, the new fuel vault area and the Decon area.
2. Unit 1 and 2 Spent Fuel Pool; includes the cask pool area, the new fuel elevator, the fuel transfer tube area and the spent fuel storage area/racks.
3. Unit 1 and 2 Reactor Building; includes the fuel transfer tube area, the reactor core and the refueling canal.

Another area in which fuel assemblies are stored at McGuire is the ISFSI, which has been licensed in accordance with 10 CFR Part 72. As such, this area of McGuire is not addressed by this response.

(7) The maximum nominal U-235 enrichment of the fresh fuel assemblies is limited to five (5.0) percent by weight.

Summary of compliance:
The maximum nominal U-235 enrichment will be limited to 5.0 weight percent, upon approval of Duke's license amendment request submitted to the NRC on September 29, 2003.

(8) The FSAR is amended no later than the next update which section 50.71(e) of this part requires, indicating that the licensee has chosen to comply with section 50.68(b).

Summary of compliance:
The McGuire FSAR will be amended in accordance with section 50.71(e), following approval of Duke's license amendment request.