August 13, 2008

Mr. Bruce H. Hamilton
McGuire Nuclear Station
Duke Power Company LLC
12700 Hagers Ferry Road
Huntersville, NC 28078-8985

SUBJECT: MCGUIRE NUCLEAR STATION - SPENT FUEL CHARACTERIZATION

Dear Mr. Hamilton:

Staff from the U.S. Nuclear Regulatory Commission (NRC) conducted inspections at the McGuire Nuclear Station Independent Spent Fuel Storage Installation (ISFSI) from January 16, to February 2, 2001, and from November 29, to December 22, 2004. During the inspections, McGuire personnel provided information regarding classifying the spent fuel assemblies stored in the plant's spent fuel pool as either intact or damaged, as well as a description of the inspection and evaluation methods used to characterize the spent fuel assemblies. Specifically, the spent fuel was characterized based on a four-sided visual examination.

Subsequently, in a 2007 inspection at the Catawba plant, the NRC identified deficiencies with the four-sided visual examination method (see enclosure), namely, that such a method would not view significant portions of the surface of the interior fuel rods in an assembly. As such, gross rod breaches in the interior rods may be missed. In addition, the NRC has identified that some spent fuel in dry cask storage at McGuire, has a potential top nozzle stress corrosion cracking issue, and has determined that a visual inspection alone is not sufficient to evaluate whether such corrosion has occurred.

Based upon the above NRC determinations regarding visual inspections, the NRC staff has concluded that the spent fuel assemblies cannot be characterized as intact. Therefore, McGuire Nuclear Station should take further action to: (1) ensure compliance with its Part 72 ISFSI license prior to further loading of spent fuel in the ISFSI, and (2) assess the integrity of the stored fuel in existing loaded casks prior to any transport under Part 71. In the absence of additional supporting justification, the NRC recommends that all of the McGuire spent fuel assemblies be evaluated according to the ISFSI license and all applicable cask Certificate of Compliance Technical Specifications. The enclosure to this letter, and "Interim Staff Guidance 1, Revision 1, Damaged Fuel," (ISG-1) [http://www.nrc.gov/reading-rm/doc-collections/isg/isg-1r1.pdf] provide more detailed discussions of the staff's position.

The NRC staff has verified that McGuire personnel loaded the spent fuel into casks at your ISFSI by normal means and with no identified loading operation issues. Thus, there is no immediate safety concern for continued storage of this fuel as there are no external stresses to exacerbate any potential cladding deficiencies. Based on the low risk of hazard in the *current* condition, the NRC has concluded that no action to unload the already loaded casks is required at this time.

If you have any questions, please contact me at 301-492-3371 or via email, BJennifer.Davis@nrc.gov.

Sincerely,

/RA/
B. Jennifer Davis, Sr. Project Manager
Licensing Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety
and Safeguards

Docket No. 72-38

Enclosure:
NRC Staff Position on Catawba Fuel
Characterization

cc: McGuire Service List

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Enclosure:
NRC Staff Position on McGuire Fuel
Characterization

cc: McGuire Service List

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cc:
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Docket No.: 72-38

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Identification of Damaged Fuel Assemblies from Catawba for Storing and Transporting in the NAC-UMS System

Visual Identification of Damaged Fuel rods

Two separate issues were identified with how Duke classified fuel assemblies as intact. The first issue involved the ability to classify fuel assemblies as intact based on a visual examination of the exterior portion of the fuel assembly. The second issue involved classifying fuel assemblies as intact which have top nozzle corrosion that require the use of a special handling tool. These issues are described in further detail below.

In accordance with CoC 1015, Technical Specification B.2.1.1, only intact fuel assemblies can be stored in the NAC-UMS System for plants other than Maine Yankee. Section A.1.1 of the NAC-UMS technical specification defines Intact Fuel as "A fuel assembly or fuel rod with no fuel rod cladding defects, or with known or suspected fuel rod cladding defects not greater than pinhole leaks or hairline cracks." A four-sided visual inspection of the exterior of the fuel assembly would not view significant portions of the surface of the interior fuel rods in an assembly. One estimate is that a four-sided exterior visual inspection only views approximately 18 percent of the fuel assembly cladding area and would not by itself ensure that a defect no greater than a pinhole leak or hairline crack exists in an interior fuel pin. An example that provides additional criteria to meet the intact fuel requirement is the revised Catawba fuel selection procedure XSFM-009 Enclosure 5.3. Methods specified in Enclosure 5.3 included:

1) chemistry records for the operating cycle associated with when the fuel was discharged indicate that there were leaking fuel rods for that cycle,
2) Ultrasonic Testing (UT) inspection records or sipping data records of the fuel assembly indicate no damage or that the damage is not greater than pinhole leaks or hairline cracks, or
3) additional justification if core chemistry or operational inspections were unable to classify the assembly as intact.

Using this testing methodology, the staff believes that the storage of potentially damaged fuel in the NAC-UMS storage system at Catawba is acceptable for fuel storage under 10 CFR Part 72. Whatever additional justification is proposed by the licensee, the condition of the fuel assemblies must still demonstrate that there were no fuel rod cladding defects, or that any known or suspected fuel rod cladding defects were not greater than pinhole leaks or hairline cracks. The staff does not believe that spent fuel assemblies receiving only a four-sided visual inspection prior to loading into the NAC-UMS system, are in compliance with the NAC-UMS CoC Technical Specification B.2.1.1.

In addition, the staff has not yet determined if there is a safety issue associated with transporting potentially damaged fuel assemblies that are not enclosed in a damaged fuel container and whether licensees would be in compliance with the 10 CFR Part 71 transportation CoC (71-9270) for the UMS system if it were to use this CoC for offsite transportation.

Identification of potential damage that would hinder the ability to handle fuel assemblies

A potential problem with stress corrosion cracking has been identified with the fuel assemblies from the original cores for Catawba Units 1 and 2, which contain stainless steel in the top nozzle area. This is a known problem with this vintage of Westinghouse fuel that had been manufactured with a SS-304 guide sleeve. The guide sleeve was attached to the top nozzle by a braising process that sensitized

the 304 stainless steel. This sensitization made the 304 material susceptible to stress corrosion cracking (SCC). Several events have occurred with the design where the stress corrosion cracking leads to failure of the guide sleeve and separation of the top nozzle from the fuel assembly.

Enclosure 5.3 of XSFM-009 discussed[1] how the fuel assemblies susceptible to this top nozzle corrosion failure mechanism could meet the definition of intact fuel. The attachment also discusses four potential methods to evaluate the extent of the possible stress corrosion cracking or remediate the issue if necessary. A visual examination of the assembly to determine if this stress corrosion cracking issue is present in the subject assembly was determined as not acceptable since significant stress corrosion cracking can occur without any outwardly visible indications. Reactor chemistry records are lacking so they cannot be used to qualify the fuel assembly as SCC-free. Two methods were proposed to modify the assembly to by-pass the lift site either permanently or during the lift. The staff agreed with the licensee that the suspect fuel assemblies may meet the definition of intact fuel for the purposes of storage under 10 CFR Part 72 if the assemblies can be placed into the canister.

Any proposed stress test on the suspect assembly to verify the ability to handle it by normal or modified grapple would have to be approved by the NRC. Until such time as a stress test is performed, or the suspect assembly is modified to handle by by-passing the potential stress corrosion site, the assembly should be considered damaged for storage purposes. Loading of such an assembly without further testing or assembly modification would be considered a violation of T.S.B2-1 1.H, "*PWR INTACT FUEL ASSEMBLIES …inches. End fitting damage including damaged or missing hold-down springs is allowed, as long as the assembly can be handled safely by normal means"*

If the assembly is placed in a transportation system using a permanent modification of the assembly or a lifting system that does not permanently remain with the assembly, the utility must evaluate the ability of the assembly to meet all applicable normal and accident transportation regulations under 10 CFR Part 71. Until such an analysis is conducted and reviewed by the NRC, the loaded system is not qualified for transport since an unanswered safety issue, i.e. potential for criticality due to an undefined fuel configuration not in a damaged fuel can exists.

[1] Procedure XSFM-009, "Workplace Procedure for Selecting Spent Fuel Assemblies to be Stored in the NAC-UMS Storage System at the Catawba General License Independent Spent Fuel Storage Installation," Revision 0