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U. S. Nuclear Regulatory Commission
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Subject: Duke Power Company LLC d/b/a
Duke Energy Carolinas, LLC (Duke)
McGuire Nuclear Station, Unit 1
Docket No. 50-369
Request for Exemption from 10 CFR 74.19(c)

Pursuant to 10 CFR 74.7, McGuire Nuclear Station (MNS) herein requests an exemption from the requirements of 10 CFR 74.19(c) to address the physical inventory of loose fuel pellets stored in a container (pellet can) located in the Unit 1 Spent Fuel Pool (SFP) storage racks. 10 CFR 74.19(c) requires that each licensee conduct a physical inventory of all Special Nuclear Material (SNM) in its possession at intervals not to exceed 12 months.

Fuel Assembly D03 was discharged in 1986 and found to have baffle jetting induced damage. As a result, fuel pellets were released from the damaged fuel rods. Loose fuel pellets and fuel fragments retrieved from the reactor core plate and the refueling cavity areas were placed inside a pellet can (PCAN01). The pellet can was transported to the Unit 1 SFP for storage.

Specifically, this exemption seeks relief from the requirement to conduct a physical inventory for the loose fuel pellets that were recovered and placed within the pellet can. McGuire respectfully requests that this exemption request be reviewed and approved prior to February 1, 2008 in support of the required 2008 physical inventory.

Questions regarding this exemption request should be directed to Kay L. Crane, McGuire Regulatory Compliance at (704) 875-4306.

Gary R. Peterson

Attachment

A001

NRR

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Technical Evaluation and Justification for an Exemption to 10 CFR 74.19(c)

Applicable Regulatory Requirement

NRC regulations in 10 CFR 74.19 specify record keeping requirements applicable to Special Nuclear Material (SNM). 10 CFR 74.19(c) requires licensees to conduct a physical inventory of all SNM in their possession under license at intervals not to exceed 12 months.

Background

On June 26, 1986 following core reload, debris was discovered on the Unit 1 reactor core baffle plate near core location P-3. Upon further investigation, the debris was determined to be fuel pellets from Fuel Assembly D03. The damage to this assembly was the result of baffle jet impingement, a phenomenon that had already occurred at several other U.S. nuclear power plants, including Farley, Trojan, and Point Beach.

Licensee Event Report (LER) 369/86-13 was written to document this occurrence. NRC Inspection Report 50-369/86-19 and 50-370/86-19 also provided a discussion on the loose pellets and fuel assembly damage.

A video inspection of the reactor vessel, reactor internals, transfer canal, Spent Fuel Pool (SFP), and up-ender areas was performed. The loose fuel pellets on the baffle, refueling canal and in the up-ender area were vacuumed and the vacuum filters were placed into a pellet can (PCAN01) that was fabricated on-site for this purpose. In addition, a metal plate was placed on top of the filters. The pellet can was placed into a storage cell (PP-45) in the Unit 1 SFP.

Justification for Exemption

10 CFR 74.19(c) requires that each licensee conduct a physical inventory of all SNM in its possession at intervals not to exceed 12 months. The requirement for a physical inventory of all SNM mandates that a visual accounting of all assemblies, rods, rod segments, rod pieces, and other structurally discrete parts that contain SNM be performed. This would require the loose fuel pellets and fuel fragments from Fuel Assembly D03 within the pellet can to be visually verified during a physical inventory.

Past inventory practices were limited to a visual verification that the pellet can was in the location specified by the SNM inventory record database. The loose pellets and fuel fragments within the pellet can were not visually verified. A physical inventory in accordance with 10 CFR 74.19(c) of Fuel Assembly D03 loose pellets and fuel fragments requires an effort to recover, separate and secure each loose pellet and fuel fragment from within the pellet can. This would impose a significant hardship and regulatory burden. The effort to visually verify SNM requires the development of specialized tools and processes. This effort may result in the potential spread of

contamination within the SFP water. The filters have degraded over time and any recovery attempts may result in the possible discharge of fuel pellets or fuel fragments into the SFP. Further, removal of the loose pellets and fuel fragments from the container would be difficult as a result of this material (fuel pellets) being entangled within the filter medium.

Since the initial placement into the SFP in 1986, the pellet can had not been moved or lifted, until the 2007 physical inventory. A video inspection of the interior of the canister indicated that the contents of the pellet can had not been disturbed. A plate can be observed and small segments of the filter medium can also be seen around the edges of the plate. This configuration appears consistent with the description of the pellet can contents as provided by involved personnel and station records of this incident.

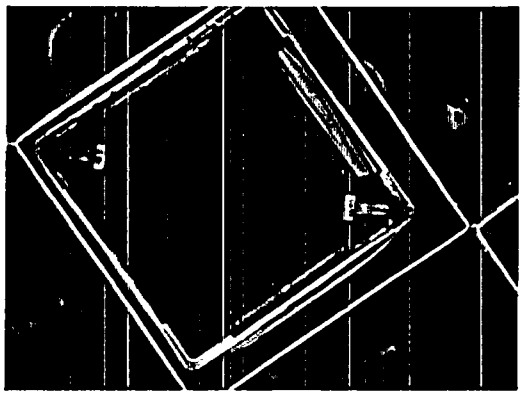
The loose pellets and fuel fragments within the canister have always been treated as SNM. The programs, processes, and procedures for Duke Energy's Material, Control and Accounting system ensures appropriate control and proper accounting over all SNM. Additional protection of the loose pellets is provided by the NRC approved Physical Security Plan and the radiation monitoring system at McGuire. This limits the possibility that SNM would be inadvertently diverted or lost.

Since the loose pellets in the container are not visible, an underwater radiation detector was used to acquire dose rate measurements as part of the 2007 physical inventory. The results of this verification provided an indirect means of determining the presence of fuel pellet material within the pellet can. Dose rate measurements of 11 R/hr provided confirmation of fuel pellet material within the pellet can. Although this method is not capable of precisely determining the exact number of pellets, the results indicate multiple pellets within the canister. Depending on the exact location and orientation, there are potentially as many as five or six fuel pellets stored within the pellet can.

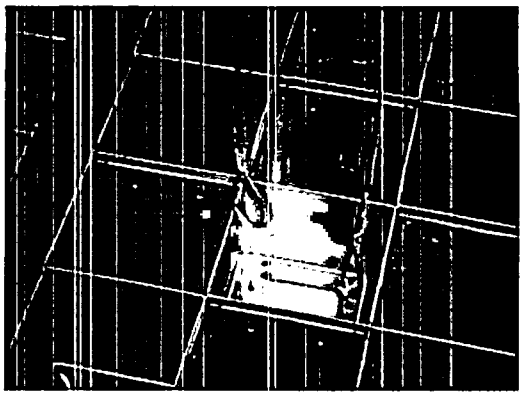
Duke believes the technique utilized during the 2007 physical inventory provides an acceptable alternative means of complying with 10 CFR 74.19(c). The underlying intent of 10 CFR 74.19 (ensuring SNMs are properly accounted for, appropriately secured and authorities informed of any theft, diversion, or loss) would continue to be met.

This alternate technique of using a radiation detector to comply with the regulatory requirements of 10 CFR 74.19(c) also presents concerns. At the time of the event, commercial containers were not available to store the recovered material. As such, a container was constructed onsite with readily available material. The container is approximately 12 feet in length. The bottom portion is constructed of metal plates welded together in the form of a rectangular can. The top portion consists of four right angled metal bars welded to the bottom portion of the container. These four right angled metal bars extend the entire length of the canister. To close off the open area of the top portion of the container, a steel mesh screen was tack welded to the metal bars. At the top of the container, two bolt studs were welded in opposite corners. To move the pellet can, two wire ropes are used to snag the bolt studs.

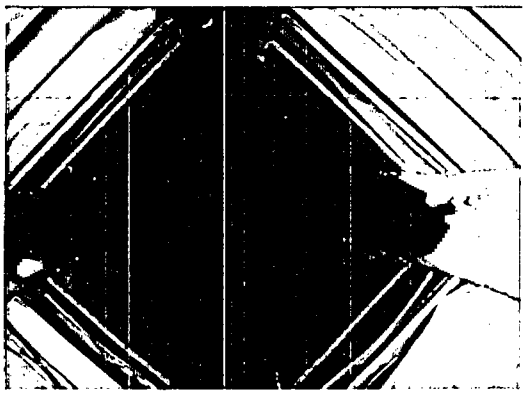
When moved during the 2007 physical inventory, degradation of the pellet can was observed. During handling, removal of the steel mesh screen was necessary, since it was partially unattached, leaving the top portion of the container open. The following are pictures of the pellet can:



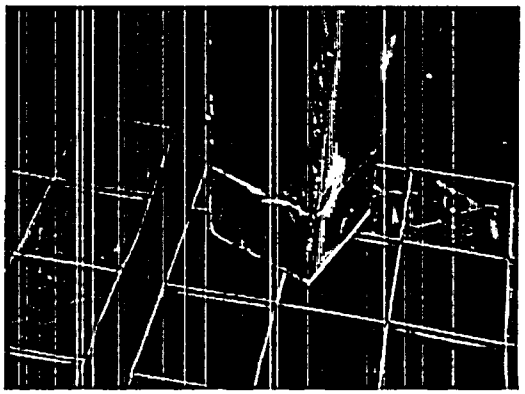
Pellet can stored in SFP storage cell



Attaching wire ropes to move pellet can



Inside bottom of pellet can



Outside bottom portion of pellet can

To take radiation readings of the pellet can, the container must be moved to a low dose area in the SFP. Due to the method used to handle the pellet can and degradation of the container, there is a possible risk of dropping fuel pellets. Instead of utilizing a radiation monitor, a video inspection of the interior of the container will be performed during the physical inventory to verify the contents have not been disturbed since the previous inspection.

Conclusion

McGuire requests an exemption from the requirement of 10 CFR 74.19(c) to address the physical inventory of the loose fuel pellets within the pellet can. McGuire requests the physical inventory of the pellet can be limited to a video inspection of the interior without disturbing the contents or requiring canister movement. McGuire requests this exemption until such time that the pellet can is placed into an appropriate container, planned no later than December 31, 2010. McGuire requests approval of this exemption request prior to February 1, 2008 in support of the required 2008 physical inventory.