NUCLEAR REGULATORY COMMISSION TRIP REPORT

SUBJECT 1

Visit to Fort (Ft.) Calhoun Nuclear Power Plant to observe spent fuel (SF) testing and discuss equipment failure

DATE AND PLACE OF MEETING/TRIP

September 12 - 13, 2005 Omaha, NE

AUTHOR, TITLE, AND AGENCY AFFILIATION

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Office of Nuclear Material Safety and Safeguards (NMSS)

MEETING PARTICIPANTS

Observers: Tae Ahn (HLWRS) and Scott Atwater (Region IV)
U.S. Nuclear Regulatory Commission (NRC) Resident Inspectors: Leonard Willoughby and John Hanna
Ft. Calhoun Main Contacts: Ken Erdman (Project Manager), Joe Willett (Fuel Reactor Engineer), Steve Anderson (Structural Engineer), Tim Salentino (Project Manager, Westinghouse), and George Pushnik (engineer conducting sipping test)

BACKGROUND AND PURPOSE OF MEETING/TRIP

(i) observe tests conducted by the utility to identify SF assemblies with cladding defects (e.g., sipping test); and (ii) discuss equipment failure experience at the Plant (e.g., trolley). The site visit is part of staff's preparation to review a potential U.S. Department of Energy's (DOE's) License Application for the Yucca Mountain (YM) Geologic Repository. The condition of the fuel cladding upon receipt at the proposed repository may impact the repository performance; therefore, staff needs to understand the sensitivity of the methods used to identify SF assemblies with cladding defects. The equipment failure experience may help staff assess the reliability of equipments to be used for the construction and operation of the repository.

SUMMARY OF PERTINENT POINTS AND ACTIVITIES

(1) Sipping Tests:

- A SF assembly is transferred in the pool to be loaded in a test cask for vacuum sipping tests. After loading and leak tight, the cask is vacuumed while the cask is mostly filled with water. The SF assembly temperature is about 80E F. During this period,

radioactivity counting is recorded as shown in Figure 1. Detailed radionuclides released are not identified.

- The vacuum sipping allows the release of residual radionuclides from cladding defects. However, most U.S. reactor plants use in-mass sipping which may not allow the release of residual radionuclides from existing defects. Therefore, it is important to calibrate the in-mass sipping with the vacuum sipping.

- The vacuum sipping only identifies whether a SF assembly had cladding defects. To identify a defected rod, ultrasonic test (UT) or eddy current (EC) test is used. UT basically detects water trapped in the defected cladding and EC is more sensitive to small perforations. A defect identified by EC was confirmed to have a 2 mil (about 50 micrometer) crack under high magnification visual camera.

- Currently, the minimum perforation size to be detected is not known. Typically the perforation size from corrosion could be smaller than 2 mil. Therefore, the staff needs to visit Westinghouse in PA to learn about this detection limit with various test methods.

- Ft. Calhoun first conducts visual examination and identifies suspected assemblies based on the observation of surface conditions (e.g., cruds). Suspected assemblies will be subject to the sipping tests. For example, among 300 assemblies, 159 were identified as suspected assemblies and subject to the sipping test. Among them, 5 were identified as defected.

- The defected assemblies are put aside for future canistering. However, it has been suspected that these may be kept at the site for an extended period.

- Other discussion was also made on observed secondary hydride cracking, no observation of oxidation/hydration, and SF types recorded.

- There will be vacuum drying/welding demonstration in November/December at Birmingham site

(2) Equipment Reliability

- Staff observed crane system.

- Historical data on assembly drops are being reviewed with the help of AREVA. SF drop and collision to wall occurred. However, no consequence of radionuclide release or fire was reported. To prevent the drop, the grapple was changed from L to U shape.

- Trolley: single failure proof is required and this leads to no failure with double backups of break and cable.

- Grapple: hook does not fail and, therefore, backup is not needed.

- Crane: it has standard and sound structure. Failure is not credible - hoist overload control eliminates human error of lifting more weight than the limit. NUREG 0612, 0554, and Part 50 are adequate to protect crane. Region IV crane inspection is planned later this year.

- Wet SF transfer: criticality is not an issue given Technical Specification.

Additionally, at the request of Scott Atwater, we had a short tour of the Horizontal Storage Margin facility. About (2 - 3) ft of concrete wall was used to take 10 casks in each setup. Seismic or aircraft hazards were excluded because of regional specifics. The horizontal set was said to be less susceptible to fire compared with the vertical set.

IMPRESSION

The visit was very informative in getting information on sipping test and equipment reliability. The sipping test method used currently does not seem to be sensitive enough to detect smaller perforations which may be of concerns to us. The equipments discussed seem to be sufficiently reliable based on the past experience and supporting technical evaluations.

PENDING ACTIONS/PLANNED NEXT STEPS FOR NRC

Visit to Westinghouse, Fuel Service, Madison, PA, to learn about research on detecting cladding defects

POINTS FOR COMMISSION CONSIDERATIONS/ITEM OF INTEREST

There are no policy matters that need to be brought to the Commission's attention.

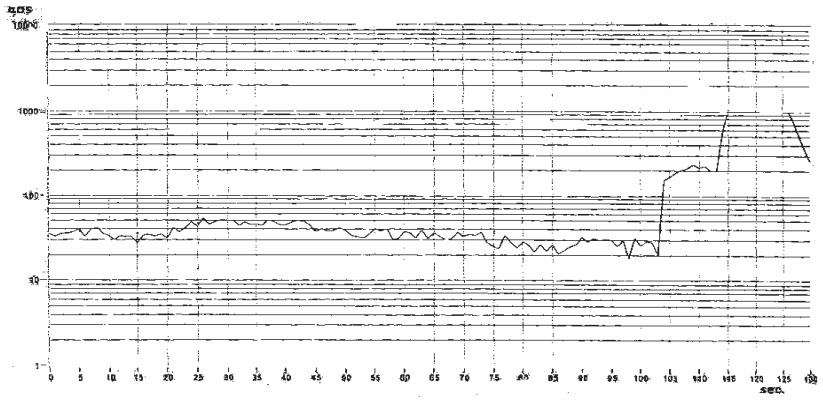
ATTACHMENTS

Figure 1. Radioactivity Counting as a Function of Time in Vacuum Sipping Test

"ON THE MARGINS"

None

Known Leaker



Suspect Leaker

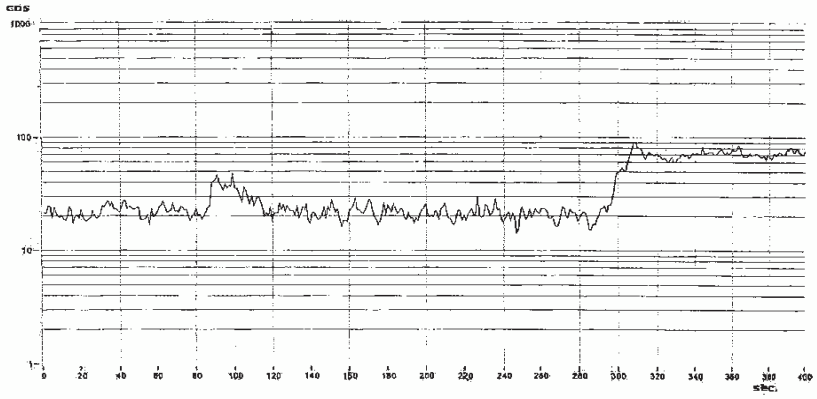


Figure 1. Sipping Test Results for Known Leaker and Suspect Leaker (count per second versus time of testing in second)

SUBJECT 2

Visit to the Idaho National Laboratory (INL) Hot Fuel Examination Facility (HFEF) to understand the environmental inerting system and the SF handling operation

DATE AND PLACE OF MEETING/TRIP

August 29, 2005; Idaho Falls, ID

AUTHOR, TITLE, AND AGENCY AFFILIATION

George Adams, Research Engineer, Center for Nuclear Waste Regulatory Analyses (Center for Nuclear Waste Regulatory Analysis (CNWRA))

Tae Ahn, Senior Materials Engineer, and R. Johnson, System Performance Analyst, HLWRS, NMSS

MEETING PARTICIPANTS

G. Adams (CNWRA), T. Ahn and R. Johnson (NRC)
A. Gil, J. Price and T. Hill of the Department of Energy (DOE)
H. Houser (INL)

BACKGROUND AND PURPOSE OF MEETING/TRIP

The purpose of the HFEF site visit was to understand the design and operations of the environmental control (i.e., Argon inerting system) within the Main Cell and to understand SF handling operations at this facility. This visit was in preparation of our review of a potential License Application for a nuclear waste repository at YM.

SUMMARY OF PERTINENT POINTS AND ACTIVITIES

The first part of the meeting consisted of discussions concerning the inerting system within the HFEF as well as SF handling operations. The second part of the meeting involved touring the HFEF facilities.

The discussions during the first part of the meeting focused on understanding what equipment is relied upon to maintain the environment within the Argon Main Cell (Figure 2) as well as what equipment is relied upon to conduct SF handling operations. The following areas were discussed:

- Reliability and potential failure of inerting system equipment (e.g., over pressurization scenarios) and SF handling equipment (e.g., potential for crane failure)

- Equipment that is relied upon to ensure a negative differential pressure (no loss of negative pressure) between the Main Argon Cell and the surrounding area, maintenance requirements (passive tight cell, seal, etc.)

- Event sequences (e.g., the potential for mishandling SF) of assembly drop

- The routing of ventilation ducts from the Argon Main Cell through areas where personnel may be present

- HFEF laboratory scale in operation, a bigger scale facility is being built; major modification is required for YM scale up.

- Observations of SF oxidation - at 650 EC liquid metal may go to pyrophoricity; oxidation observed in small quantity from SF exposure to air

- The hoisting mechanism and control system of the Cask Cart, which is used to transfer casks through the Cask Tunnel. A question was raised concerning how codes and standards were applied to the design and construction of the Cask Cart.

During the plant tour, the HFEF process areas were viewed. Specifically, the Main Cell and an adjacent Decon Cell were observed. The Cask Cart, Cask Tunnel, and the diesel generator room were also observed. The following topics were discussed:

- The various types of grappling devices used to transfer medium to high burnup SF with no consequence of radionilcide release

- Operations involved with the SF transfer

- Containers that waste material is placed in for onsite storage

- Loss of offsite power scenarios to include identifying those loads supplied by the diesel generators, 30 minute restore time

- Latent mechanical problems associated with a bridge crane

- Reliability of viewing windows

- Maintaining an inert environment during operations where the cask is mated to the cask port of the Argon Main Cell

- Filtering: dural, HEPA and C

- Seismicity of 7.2 within 50 miles - loss of offsite power, several hour of power restore time for several hours

IMPRESSION

The visit was an excellent opportunity to understand the SF handling operations and the

operation of the inerting system at the HFEF. This experience provided us with the opportunity to understand how the environment is maintained in the Argon Main Cell, what equipment is important to maintain this environment, and what scenarios may affect the environment. An added benefit was our opportunity to discuss operations and design of the Cask Cart.

The HFEF facility is a laboratory scale operation with a lower throughput volume than that expected for the surface facilities of a potential nuclear waste repository at YM. We were able to interact with the INL staff and understand the operations of the HFEF facility, potential event scenarios, and identify equipment relied upon for operation of this facility. These areas are important for our understanding of SF handling operations in an inert environment, and we believe this information will be useful in our review of a potential licence application.

PENDING ACTIONS/PLANNED NEXT STEPS FOR NRC

Requested information on the Codes and Standards used in the design and construction of the Cask Cart

POINTS FOR COMMISSION CONSIDERATIONS/ITEM OF INTEREST

There are no policy matters that need to be brought to the Commission's attention.

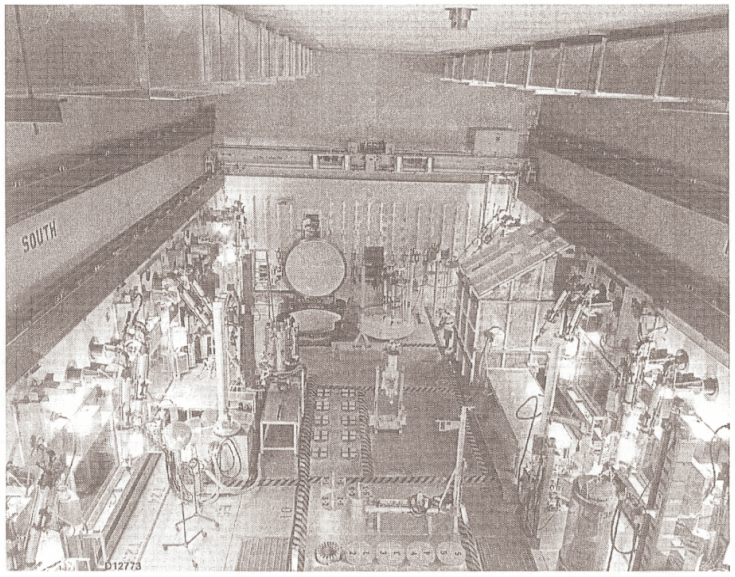
ATTACHMENTS

Figure 2. Main Cell View

"ON THE MARGINS"

None

Figure 2. Main Cell View West (70’ long, 30’ wide, and 25’ high)



Main Cell View West