

70-1308
72-0001
DCD/DCB

MAY 27 1992

MEMORANDUM FOR: Charles J. Haughney, Chief, Source Containment
and Devices Branch

FROM: John A. Grobe, Chief, Nuclear Materials Safety
Branch

SUBJECT: REQUEST FOR ASSISTANCE IN THE REVIEW OF THE
G. E. MORRIS METALLURGICAL STUDY OF THE
CLADDING VAULT LINER

This refers to the telephone conversation on May 19, 1992, between Fritz Sturz of your staff and George M. France III, of my staff, in which it was agreed that NMSS would assist Region III in the review of the metallurgical evaluation report of the Cladding Vault liner at the G. E. Morris Facility. A copy of that report is enclosed for your use along with a copy of our inspection report dated May 6-7, 1991, which describes the circumstances surrounding the leak in the liner. Due to the specific discipline required to review this report, it is our understanding that NMSS will forward the report to a metallurgist for review.

As you will note, the licensee has classified the entire metallurgical report, as proprietary. After further discussion, the licensee acknowledged that this proprietary classification is in error and can be disregarded. Consequently, a formal letter from the licensee retracting that classification is forthcoming.

We would appreciate comments on the metallurgical report within 60 days of receipt of this memorandum. Comments should be forwarded to Roy J. Caniano of my staff. If any additional information is needed concerning this matter, please contact Roy J. Caniano or George M. France III at 708-790-5500.

John A. Grobe, Chief, Nuclear
Materials Safety Branch

Enclosures: As stated

cc: w/enclosures
DCD/DCB (RIDS) w/o GE Morris Cladding Rpt
License File: 72-0001 w/o GE Morris Cladding Rpt
Fritz Sturz, NMSS w/o GE Morris Cladding Rpt

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France/nt
5/26/92

RIII
Caniano
5/26/92

RIII
Grobe
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JUN 11 1991

Docket No. 72-1

License No. SNM-2500

General Electric Company
ATTN: Mr. J. Z. Sherk, Manager
Nuclear Services
Central Territory
2311 West 22nd Street, Suite 201
Oak Brook, IL 60521

Gentlemen:

This refers to the announced special inspection conducted by Mr. G. M. France, III, of this office, accompanied by Messrs. D. J. Sreniawski, of this office, and J. F. Schneider of NRC HQ (NMSS) on May 6 and 7, 1991, of events related to a leak in the underground Cladding Vault, which occurred at your facility on April 19, 1991, and to the discussion of our findings with members of your staff at the conclusion of the inspection.

The enclosed copy of our inspection report identifies areas examined during the inspection. The special inspection consisted of a review of the circumstances surrounding the release of contaminated liquid from the Cladding Vault, the root cause of that release, your response and corrective actions following the release and an evaluation of the safety significance of the event.

No violations of NRC requirements were identified during the course of this inspection.

During the exit meeting, which was held on May 7, 1991, Messrs. L. L. Denio, Acting Plant Manager, J. D. Kesman, Manager, Plant Operations, and A. Shorkey, Operations Engineer of your staff agreed to: (1) inform Region III as to the results of corrective actions to mitigate the leak and determine the failure mode of the liner via biweekly telecommunications; (2) provide the region with a written summary of your followup to this event prior to June 30, 1991; and (3) meet with the Region III staff and present your findings after your written report.

In accordance with 10 CFR 2.790 of the Commission's regulations, a copy of this letter and enclosed inspection report will be placed in the NRC Public Document Room.

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General Electric Company

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JUN 11

We will gladly discuss any questions you have concerning this inspection.

Sincerely,

John A. Grobe, Chief
Nuclear Materials Safety Branch

Enclosure: Inspection Report
No. 072-00001/91001(DRSS)

cc w/enclosure:

T. E. Ingels, Manager

Morris Operation

DCD/DCB (RIDS)

David Rosenblatt, Governor's

Office of Consumer Services

Gary N. Wright, Manager

Nuclear Facility Safety

bcc w/enclosure:

R. Pankratz, RIII

yge
RIII
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RIII
Grobe
6/11/91

U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 72-001/91001(DRSS)

Docket No. 72-001

License No. SNM-2500

Licensee: General Electric Company
175 Curtner Avenue
San Jose, CA 95125

Facility Name: Morris Operation

Inspection At: Morris, Illinois

Inspection Conducted: May 6 and 7, 1991

Inspector:

G. M. France, III

5/27/91
Date

Reviewed By:

D. J. Sreniawski
D. J. Sreniawski, Project
Manager, Fuels Facilities
and Contaminated Sites

5/23/91
Date

Approved By:

John A. Grube
John A. Grube, Chief, Nuclear
Material Safety Branch

6/11/91
Date

Inspection Summary

Inspection on May 6 and 7, 1991 (Report No. 72-001/91001(DRSS))

Areas Inspected: This was an announced special safety inspection conducted to review the circumstances surrounding the leak in the Cladding Vault and the licensee's procedures and/or course of action taken to stop the leak and return the vessel to service.

Results: As of May 7, 1991, about 14,000 gallons of liquid had been transferred from the Cladding Vault to the Low Activity Waste Vault. This action slowed the rate that liquid is leaking from the Cladding Vault. The licensee agreed to a status report via biweekly telecommunications.

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DETAILS

1. Persons Contacted

- *L. L. Denio, Manager, Plant Services (Acting Plant Manager)
- *J. D. Kesman, Manager, Plant Operations and Maintenance
- *A. Shorkey, Operations Manager

*Denotes those present at the exit meeting on May 7, 1991. The inspector also interviewed the Safety and Security Engineer.

2. Licensee Program

The General Electric Morris Operation (GE:MO) provides a storage and service facility for nuclear reactor spent fuel. The GE:MO fuel storage facility includes three interconnected water-filled basins with cranes, water treatment systems, and other facilities required to receive irradiated fuel and store it underwater for an indefinite period. The storage facility reached capacity in January 1989. Consequently, the shipping casks were sold and the facility no longer receives shipments of spent fuel. Currently, the licensee's major activity is to maintain the basin and basin water quality to prolong the storage of reactor spent fuel.

The basins were constructed below ground with stainless steel lined, reinforced concrete walls about 2-ft thick poured in contact with the sides of a bedrock excavation. A leak detection system and pump-out facilities are provided for the space between the concrete walls and floor and the stainless steel liner.

3. Waste Storage Facilities

Waste storage facilities consist of two underground storage vaults, the Low Activity Waste Vault (LAW Vault) and the Cladding Vault. The underground LAW Vault is constructed of steel-lined, reinforced concrete about 2-ft thick, poured directly against the rock walls of the excavation. It is about 46-ft in diameter and 77-ft deep. The vault cover is also constructed out of reinforced concrete. The actual waste receptacle within the vault is an inner steel tank 38.5-ft in diameter and 69-ft deep. Basin water is circulated through a system that reduces radioactive contamination by ion exchange and filtration. Floating debris is removed by skimmer intakes. Radioactive material collected by these systems is discharged to the LAW Vault by a steam eductor via a connection from the basin water filter system sludge tank. Hence, the LAW Vault is the primary vessel for onsite storage of radioactive waste from aqueous process operations.

The Cladding Vault, a below-grade cylindrical vault 42-ft in diameter and 72-ft deep, was provided for underwater storage of leached cladding hulls and other irradiated metal scrap. The cylindrical vault structure is reinforced concrete lined with stainless steel. The reinforced floor is 4-ft thick with 2-ft thick walls. The structure extends 82-ft into the underlying bedrock to a total depth of 82 feet.

According to the licensee, there is no indication that irradiated fuel cladding (zirconium) or metallic scrap is stored in the vault. It is believed that the sheared fuel rod hulls and/or metallic scrap currently stored in the Cladding Vault was the result of test runs with non-irradiated sheared rods containing natural uranium. The vault is located adjacent to the LAW Vault on the south side of the main building. The vault is designed to receive contaminated water from the cask receiving area. However, the only routine use of the Cladding Vault to date is the receipt of condensate from the 300-ft effluent air stack. A stainless steel drain line is provided to route condensate from the main stack to the Cladding Vault.

The Spent Fuel Storage Basin, the LAW Vault and the Cladding Vault are equipped with leak collection, monitoring and pump-out provisions. In the Cladding Vault, the drain slots are provided in the concrete walls and floor, between the liner and concrete. A leak collection sump is located near the floor-to-wall junction. The sump consists of a 6-inch-diameter vertical stainless steel pipe embedded in the vault wall which extends from the top of the vault to 1 foot below the vault floor level. The sump is also equipped with a liquid level detector line and piping for a 5-gallon per minute jet-out system. Water from the jet-out system is routed back to the Cladding Vault. A level indicator and leak detection indicator and alarm are located in the control room. Operation of this system provides for detection of water between the vault liner and the concrete structure, with subsequent pump-out action. Operability tests are performed quarterly on this system.

4. Description of Event

On Friday April 19, 1991, the Operations Engineer (A. Shorkey) notified the Manager, Plant Services (L. Denio) that quarterly test results pursuant to Standard Operating Procedure (SOP 16-14), indicated that the Cladding Vault was leaking. The SOP provides that the accumulation of liquids in the underground sump must be tested quarterly for a possible leak in the Cladding Vault liner. The test is designed to differentiate between groundwater intrusion and a leak in the liner. Results that indicate a leak of more than one liter per day exceed the SOP threshold and must be investigated. The total indicated leak rate equals the sum of the intrusion from groundwater plus the leak from the Cladding Vault. This value was adjusted for historical groundwater intrusion rates resulting in an estimated leak from the Cladding Vault of 10 to 20 liters per day.

The licensee contacted Region III NRC on April 19 and 20 regarding the status of the apparent leak in the Cladding Vault. An evaluation of the sample collected on April 22 confirmed that the vault is leaking. Routinely, the cesium-137 concentration in the vault water is about 4.4 E-04 microcuries per milliliter (uCi/ml). On April 22 the leak detection analysis indicated that radiocesium concentration had reached 1.1 E-04 uCi/ml in the sump sample. An additional analysis disclosed that the ratio of cesium-137 to cesium-134 (137/134) as measured for the liquid in the vault is within 3.5% of the ratio measured for the liquid in the sump. This comparison seemed to confirm the GE:MO staff consensus that the vault was leaking.

Other than the condensate return from the main air stack to the Cladding Vault, the vault is essentially inactive. Prior to the incident the vault contained about 80,000 gallons of liquid.

5. Corrective Actions

After deliberating during the course of two safety meetings, the licensee proposed a course of action to recover from the incident. During the onsite inspection of May 6 and 7, the Region III inspector and the Project Manager from HQ NMSS reviewed the licensee's proposed course of action. Depending upon the timeliness of the following actions, a contractor will make a "tank entry" and attempt to locate and repair the leak in the Cladding Vault.

- a. A transfer line was erected to pump solution from the Cladding Vault to the LAW Vault. If the leak is located near the top of the liquid level, the pumping arrangement will lower the liquid level below the leak. As a minimum, lowering the volume will reduce the pressure and subsequently reduce the rate that the tank is leaking. On May 7 the licensee indicated that the leak had subsided, possibly from lowering the volume in the Cladding Vault. Nearly 14-inches or about 10,000 gallons was transferred to the LAW Vault.

The inspector observed the transfer line and noted that the piping and connections were plastic sleeved to guard against leaks; visual inspection of the transfer piping for leaks will be performed at two hour intervals. The low radioactivity level of the solution (E-04 uCi/ml gross beta) should not increase personnel exposure. Although the leak seemed to subside, a 24-hour waiting period was recommended for further evaluation. The sump will be monitored for intrusion water collection over the 24-hour period. The transfer was made in accordance with the written procedure SPOP No. 38, Revision 1, "CLADDING VAULT SOLUTION TRANSFER TO LAW VAULT."

- b. Ideally, the licensee prefers to clean the water in the Cladding Vault by ion exchange/demineralization. This will be performed by a contractor. This will reduce the nitrate level (800 ppm) and chloride level (7 ppm) to less than 1 ppm, thus meeting basin water quality. In turn, the demineralized water could be used as make up water to replace the losses in the Spent Fuel Basin that occur from evaporation. The water replenishing rate is about 100,000 gallons per year in the Spent Fuel Basin. Consequently, the cleanup of the Cladding Vault (about 70,000 gallons of water) may be ongoing until November 1991.
- c. Meanwhile, the Cask Service Facility floor drain, the Cask Receiving area floor drain and the Stack condensate return line to the Cladding Vault will either be rerouted or disabled. This project should be completed by October 1991.

- d. Once the water is removed from the Cladding Vault, the cladding hulls and other metallic scrap can be removed. This project should commence during the first quarter of 1992.
- e. During the course of conducting operations according to the above schedule, the licensee should be able to determine the failure mode of the Cladding Vault liner (2nd quarter 1992).

After deliberating with the licensee about the proposed course of action, the inspector concurred that the licensee's plan should not present any radiological impact on the individual worker.

6. Environmental Protection

The licensee is monitoring the cluster of deep wells located in the vicinity of the Cladding Vault and the LAW Vault to verify the lack of transport of vault contents to the groundwater. Gross beta results in each of the four monitor wells indicated less than $4.4 \text{ E-04 } \mu\text{Ci/ml}$. The inspector will monitor the licensee's results of groundwater monitoring via biweekly telecommunications and/or future inspections until the vault is repaired.

7. Low Activity Waste Vault (LAW)

Based on the radiochemical analysis of the water collected in the leak detection system, there is no indication that the LAW Vault is leaking. This was also confirmed by analyzing for four chemical components and their concentrations (pH, chloride, nitrate, and fluoride).

The inspector noted that liquid samples from the Spent Fuel Basin and the two vaults were analyzed for radiochemical and chemical components. The comparison indicated that the leak was from the Cladding Vault.

8. Spent Fuel Basin

The inspector reviewed data concerning the basin operation and determined that the integrity of the basin liner was examined for possible deterioration during 1989. A pulse-echo ultra sound device was used to measure liner thickness to the nearest 0.05-inches. During a tour of the basin, the licensee located the calibration plates used to verify the thickness of the liner. The plates are located above the water line, at the interface of the water line, just below the water line, and at approximately 20 feet below the water surface. Now that a base line has been established, periodic measurements can be made from each plate to determine the possibility of deterioration in the liner.

The inspector concluded that the licensee has initiated a program for maintaining liner integrity. This program will be monitored during future inspections.

9. Exit Meeting

The scope and findings of the inspection were discussed with licensee representatives (Section 1) at the close of the onsite inspection on May 7, 1991. The following matters were discussed:

- a. The licensee agreed to provide biweekly progress on the status of recovery via telecommunications.
- b. The licensee agreed to prepare a report to cover the first 6 weeks of the recovery operation and/or prepare data for a meeting with the Region III staff.

During the course of the inspection and the exit meeting the inspector agreed to safeguard the proprietary information disclosed in the minutes of the safety meeting.