

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

REGION I

Report No. 50-213/80-20
50-219/80-38
Docket No. 50-213
50-219
License No. DPR-61 Priority -- Category C
DPR-16
Licensee: Connecticut Yankee Atomic Power Company Jersey Central Power and Light Company
P.O. Box 270 Madison Avenue at Punch Bowl Road
Hartford, Connecticut 06101 Morristown, New Jersey 07960

Facility Name: Haddam Neck Plant
Oyster Creek Nuclear Generating Station

Investigation at: Haddam Connecticut; Forked River, New Jersey; and Atlanta, Georgia

Investigation conducted: From October 6, 1980, to January 14, 1981

Investigators: Raymond H. Smith 10/7/81
Raymond H. Smith, Investigator date signed
Jerome Roch 10/7/81
Jerome Roch, Fuel Facility Inspector date signed

date signed

Approved by: Robert T. Carlson 11/6/81
Robert T. Carlson, Director date signed
Enforcement and Investigation Staff

Investigation Summary:
Investigation from October 6, 1980 to January 14, 1981 (Report No. 50-213/80-20 and 50-219/80-38)
Investigation of circumstances surrounding the transportation and use of the Model No. NFS-4, Serial No. NAC-1E cask shipped from Haddam, Connecticut on May 1, 1980 until it arrived at Camp Pendleton, California on August 20, 1980.

SUMMARY

By memorandum dated October 7, 1980, IE:HQ requested Region I to investigate the circumstances surrounding the transportation and use of the Model No. NFS-4, Serial No. NAC-1E shipping container. Inspections had been conducted by NRC Regions I, III, and V which related to radiation and contamination associated with the transport and use of the container.

The container was loaded on April 26, 1980, at the Haddam Neck Plant, Haddam, Connecticut, which is operated by the Connecticut Yankee Atomic Power Company (CYAPCO). The shipment contained a fuel bundle having known fuel cladding failures. Because of problems with contamination continuing to be emitted from the container walls following decontamination, and radiation levels which necessitated placing external shielding on the container transport vehicle, departure of the shipment from the site was delayed until May 1, 1980. An NRC Inspector observed portions of the cask decontamination activity and was present when the cask departed the site.

On May 2, 1980, the shipment arrived at the Battelle, Columbus Laboratories (Battelle) facility located at West Jefferson, Ohio. A release of radioactivity occurred when the container was opened which caused abnormal radiation and contamination levels in the facility. The container was decontaminated after it was unloaded and departed the facility on July 22, 1980. The radioactive release was reported to the NRC Region III office and an inspection was performed September 22-26, 1980. Inspection Report 70-008/80-02 was issued.

On July 23, 1980 the container arrived at the Oyster Creek Nuclear Generating Station located at Forked River, New Jersey and operated by the Jersey Central Power and Light Company (JCP&L). The container was scheduled to be used for transporting a fuel bundle to Battelle for examination and study. JCP&L surveyed the container and reported to the NRC that contamination levels exceeded the DOT and NRC reporting levels. The radiation survey of the cask trailer revealed that in one area under the trailer the radiation level exceeded the DOT limit. This was confirmed by an NRC Inspector on site. The container was unloaded and subsequently the container and transport trailer were decontaminated externally by Battelle representatives. Representatives of the Nuclear Assurance Corporation (NAC), the owners of the cask, were also at the site. NAC made arrangements to have the container transported to San Onofre and the cask departed Oyster Creek on August 15, 1980.

On August 16, 1980, the shipment stopped at Battelle in West Jefferson, Ohio and the cask lifting yoke was off loaded for storage.

On August 20, 1980, the container arrived at San Onofre Unit 1 located at Camp Pendleton, California and operated by the Southern California Edison Company. Receiving surveys determined that the truck cab sleeper radiation level was 4.4 mrem/hr which exceeded the DOT limit. The cask was unloaded for decontamination. The cask handling and use were examined during an inspection performed September 22-26, 1980, by Region V. Inspection Report No. 50-206/80-26 was issued.

The transportation of the Model No. NFS-4, Serial No. NAC-1E cask described supra involved the transport of an irradiated fuel bundle only between the Haddam Neck Plant and the Battelle facility at West Jefferson, Ohio. The radiation levels at the external surfaces of the cask during the other transfers of the cask indicated that radioactive material remained in the cask after it was decontaminated at the Battelle facility and appeared to change positions within the cask during transport.

The film badge dosimetry results of the drivers involved with the cask transport indicated that the drivers did not exceed the allowable quarterly exposure for radiation workers.

PURPOSE OF INVESTIGATION

The purpose of this investigation was to determine the circumstances surrounding the transportation and use of the Model No. NFS-4, Serial No. NAC-1E cask shipped from the Haddam Neck Plant, Haddam, Connecticut on May 1, 1980, until it arrived at San Onofre Unit 1, Camp Pendleton, California on August 20, 1980.

BACKGROUND

The Connecticut Yankee Atomic Power Company (CYAPCO) forwarded a letter to the Director, Office of Nuclear Materials Safety and Safeguards (NMSS) dated February 22, 1980 (See Exhibit 1), requesting a route approval for shipments of irradiated fuel assemblies. The shipments were to be delivered to Battelle Columbus Laboratories (BCL) for examination to determine the cause of fuel failures.

On March 27, 1980, a conference telephone call was held between representatives of CYAPCO and NRC, Office of Nuclear Reactor Regulation regarding the movement of a spent fuel cask into the spent fuel pool. (See Exhibit 2)

By letter dated March 25, 1980, the Nuclear Assurance Corporation (NAC) provided CYAPCO with information relative to some of the items discussed during the March 27, 1980 telephone conference. (See Exhibit 3)

By letter dated March 31, 1980, CYAPCO received the route approval for shipments which had been requested previously. (See Exhibit 4)

A letter dated April 15, 1980, to the NRC, Region I, office from CYAPCO informed the NRC of the intent to make three shipments of irradiated fuel assemblies. (See Exhibit 5)

CYAPCO forwarded a letter dated April 18, 1980, to the NRC-NRR containing information relative to the items discussed during the March 27, 1980 telephone conference. This information was provided to support a proposed change to technical specifications to permit spent fuel cask movement over the spent fuel pool in order to complete the planned shipments. (See Exhibit 6)

The NRC issued license amendment No. 35 to License No. DPR-61 dated April 24, 1980, which permitted CYAPCO to move the casks involved in the planned loading and shipping of irradiated fuel assemblies.

During April 28, 29 and 30, 1980 there were telephone discussions between representatives of CYAPCO, NRC Inspector at site, NRC Region I, NRC-IE:HQ, and NRC-NRR regarding the problems encountered after the cask, Serial No. NAC-1E, was loaded with irradiated fuel for shipment. The problems encountered were with "leaching," or "weeping" of contamination from the cask. This problem was requiring the licensee to decontaminate the cask several times and was a concern that the cask contamination levels could possibly exceed the Department of Transportation (DOT) limits during shipment. There was also a problem of radiation levels exceeding DOT limits. The cask contamination was reduced

below DOT limits after several decontaminations and the radiation levels were reduced below DOT limits by the addition of external lead shielding around portions of the shipping cask.

The shipment (Licensee No. 0-80-10) departed from the Haddam Neck site at about 1:30 p.m. on May 1, 1980, enroute to Battelle Columbus Laboratories, West Jefferson, Ohio. (Ref: Inspection Report No. 50-213/80-07)

On May 16, 1980, NRC-Region I was notified by NRC-NMSS that CYAPCO had reported that the decay heat content limits for the shipment of May 1, 1980, had been exceeded. Telephone discussions followed between CYAPCO, NRC-Region I, NMSS and NRC-IE:HQ. The licensee informed Region I that the calculations indicated a decay heat content of 2.09 Kw prior to the shipment and that subsequent calculations had determined a decay heat content of 3.5 Kw. This information was confirmed by letter dated May 21, 1980 (See Exhibit 7). The licensee also informed Region I that the shipment had arrived at Battelle on May 2, 1980.

Also on May 16, 1980, Region I contacted Battelle Columbus Laboratories by telephone and was informed that the contamination and radiation levels of the CYAPCO shipment received on May 2, 1980 were within DOT limits. The Battelle representative also indicated that no problems were encountered in handling the cask other than what was expected. Since the shipment contained failed fuel rods the contamination level inside the cask was expected to be high. The representative also stated that the pool water became contaminated when the cask was opened.

The Battelle Columbus Laboratories submitted a report, pursuant to 10 CFR 21, Reporting of Defects and Noncompliance, on June 27, 1980, to the NRC-Region III Office. This report described the release of radioactive material when the shipping cask containing the failed fuel assembly was opened in the fuel pool (Ref: Inspection Report No. 70-008/80-02).

On July 23, 1980, the NAC-1E shipping container arrived at the Jersey Central Power and Light Company, (JCP&L) Oyster Creek Nuclear Generating Station located at Forked River, New Jersey. The container had been shipped empty from Battelle Columbus Laboratories, West Jefferson, Ohio. JCP&L refused to accept the shipment due to the radiation and contamination levels on the container. A radiation specialist from NRC-Region I was present at the Oyster Creek facility. The container was released from the Oyster Creek facility on August 15, 1980 (See Exhibit 8).

On July 24, 1980, the NRC-Region I issued Preliminary Notification No. 80-109, "Contaminated Empty Spent Fuel Shipping Cask" (See Exhibit 9).

On August 20, 1980, the empty container shipped from Oyster Creek arrived at San Onofre Unit 1 located at Camp Pendleton, California. Radiation surveys conducted by the licensee (Southern California Edison Company) determined that the dose rate measured in the tractor sleeper was 4.4 mrem/hr which exceeded the DOT limit of 2.0 mrem/hr. The contamination levels of the shipment were within DOT limits (Ref: Inspection Report No. 50-206/80-26).

DETAILSSpent Fuel Shipping Cask-Model No. NFS-4

A Certificate of Compliance No. 6698 was issued by the NRC for the above cask based on an application submitted by Nuclear Fuel Services, Inc., dated October 6, 1972. The certificate has been revised several times and the Safety Analysis Report has also been updated. The revised certificates also reference submittals to the NRC from the Nuclear Assurance Corporation (NAC). Revision 9 of Certificate No. 6698, dated December 13, 1979 was in effect when CYAPCO made the shipment on May 1, 1980, with the Model No. NFS-4, Serial No. NAC-1E cask. (See Exhibit 10)

Shipments Made of Cask Model No. NFS-4, Serial No. NAC-1E

Departed CYAPCO	-	May 1, 1980
Arrived Battelle	-	May 2, 1980
Departed Battelle	-	July 22, 1980
Arrived Oyster Creek	-	July 23, 1980
*Departed Oyster Creek	-	August 15, 1980
Arrived San Onofre	-	August 20, 1980

*with a stop off at Battelle.

All cask movements were transported by Tri-State Motor Transit Company.

Activities Involving Cask Model No. NFS-4, Serial No. NAC-1E, at CYAPCO

As stated previously in the "Background" portion of this report, the NRC was aware of CYAPCO planning to use the NAC-1E container and the contamination/radiation problems which they encountered after it was loaded.

On October 15, 16, and 17, 1980, R. Smith, NRC Investigator was at the Haddam Neck Plant to review the circumstances surrounding the use of the container. The following individuals were contacted:

- *R. Begenski, Reactor Engineer
- H. Clow, Health Physics Supervisor
- R. Graves, Station Superintendent
- **M. Hills, Supervisor, Reactor Performance Section
- W. Nevelos, Radioactive Waste Foreman
- A. Niriccio, Nuclear Information Supervisor
- **M. Pitek, Staff Engineer, Reactor Engineering Branch
- D. Vement, Nuclear Records Supervisor

*By subsequent telephone discussions.

**Northeast Utilities Service Company (NUSCO)

The investigator examined the following documents related to the use of the NAC-1E container which was shipment No. 0-80-10 (licensee number):

- Certificate of Compliance
- Safety Analysis Report
- Radiation Work Permits
- Radiation and Contamination Surveys
- Shipment Records
- Procedures for Unloading and Loading the NAC-1 Series Containers

Based on an examination of documents and discussions with licensee representatives, the following information was developed:

Certificate of Compliance No. 6698, Revision 9 was amended by an NRC order dated December 12, 1979. A list of registered users was attached to the order and CYAPCO was not named as a registered user. CYAPCO submitted a letter to the Director, Office of Nuclear Materials Safety and Safeguards dated February 22, 1980 (See Exhibit 1) which contained the information required by 10 CFR 71.12(b). This letter and documentation examined at the site showed CYAPCO to be a general licensee user of the container.

CYAPCO had contracted with NAC to provide the NAC-1 shipping container and services. NAC had provided surveillance testing on the container at the site. NAC had also provided oversight for the container loading and had two representatives at the site. During the surveillance testing, one of the drain ball valves would not provide a seal. The ball valve was removed and replaced with a pipe plug. (See Condition 9 of Exhibit 10, Certificate of Compliance). After completion of the surveillance testing, the container was loaded on April 26, 1980.

The NAC-1E container was loaded without adding or removing any spacers in the container. The temperature was obtained on the final gallon of water drained from the loaded container to compare with the temperature of the water in the spent fuel pit. The check sheet record had no entry recorded for the temperature of the final gallon; a temperature of 85°F was recorded for the spent fuel pit; and, 76°F was recorded as the temperature rise. R. Begenski, who performed the temperature measurements, stated that the 76°F figure was improperly recorded and was the temperature of the final gallon drained from the container. He also stated that in this shipment and two later shipments of spent fuel, the temperature of the final gallon drained from each loaded container was lower than the temperature of the water in the spent fuel pit. He also recalled that a NAC representative was present during draining of the container and obtaining the temperature of the drain water. The pipe plug that had been installed during the surveillance tests conducted by NAC was not removed after the cask was loaded or prior to departure from the Haddam Neck Plant.

The difficulty in decontaminating the container was indicated by the Radiation Work Permits and the radiation survey data. CYAPCO had contacted representatives of NAC and Battelle regarding the "weeping" problem of the container and was informed that the problem had previously been encountered during other shipments. The final contamination and radiation surveys prior to departure indicated that the levels were within DOT limits. Two representatives from CYAPCO accompanied the shipment until its arrival at Battelle. (See Exhibit 11, Bill of Lading) No problems were encountered with the shipment and the surveys upon arrival were within DOT limits.

Battelle contacted CYAPCO/NUSCO (Northeast Utilities Service Company) regarding the contamination problems experienced when the container was opened in their fuel pool.

The calculations for the decay heat content reported to the NRC on May 19, 1980, by CYAPCO (See Exhibit 7) were discussed with M. Hills and M. Pitek, NUSCO representatives. The investigator was provided a data sheet (See Exhibit 12) showing the calculations for the shipment on May 1, 1980 of bundle number H07 and also two later shipments. The decay heat content values are shown using the 1971 and 1979 ANSI 5.1 data. The revised 1971 data are similar to the revised 1973 data as stated in the letter dated May 21, 1980. M. Pitek stated that the calculations were performed after Battelle notified them of their calculations after receiving the shipment. Mr. Pitek also stated that he recalled contacting L. Danese, NAC representative, after Danese had left the Haddam Neck Plant site regarding his concerns related to the temperatures of the fuel and the cask. The concerns were due to the cask being dry on the inside and the decontamination of the cask having to be repeated. Since it was opined that the temperatures could affect the planned studies of the fuel, NAC was requested to perform calculations for the fuel and cask temperatures. Pitek also recalled discussions with Danese regarding the radiation levels on the container and discussions regarding the possibility of having a bundle other than number H07. There may also have been discussions regarding the decay heat content but Pitek could not specifically recall all matters that were discussed.

The limit for decay heat generation specified by the Certificate of Compliance is 2.5 Kw. (See Exhibit 10).

Activities Involving Cask Model No. NFS-4 (NAC-1E) at Battelle Columbus Laboratories, West Jefferson, Ohio

The shipment of the NAC-1E container arrived at Battelle on May 2, 1980 and was placed in the fuel pool shortly after its arrival. There was a release of radioactive material when the container was opened in the pool which was reported to the NRC, Region III office located in Glen Ellyn, Illinois on June 27, 1980.

The reported incident including the decontamination of the NAC-1E container was examined by Region III and is described in Inspection Report No. 70-008/80-02.

Activities Involving Cask Model No. NFS-4, Serial No. NAC-1E at Oyster Creek

The NAC-1E container, described as empty on the bill of lading (See Attachment 1, Exhibit 8), arrived at the Oyster Creek Nuclear Generating Station operated by Jersey Central Power and Light Company (JCP&L) on July 23, 1980. A survey by the licensee found that one smear of the container was 23,000 dpm/100 cm² which exceeded the 22,000 dpm/100 cm² NRC reporting level and DOT transportation limit (DOT 49 CFR 173.397(b)) for an exclusive use shipment. The survey results were reported to the NRC (See Exhibit 9).

A radiation specialist from NRC, Region I, was onsite at Oyster Creek when the container arrived. The inspector surveyed the container shipment and found a dose rate measurement of 240 mR/hr in one small area underneath the trailer. The limit specified in DOT 49 CFR 173.393(J)(2) is 200 mR/hr. The handling of the container by the licensee was examined and information was also obtained on the container departure from Oyster Creek. The information obtained by the radiation specialist was provided to the investigator in a memorandum (See Exhibit 8).

As noted in Exhibit 8, the radiation specialist also contacted representatives of NAC and Battelle during the Oyster Creek Inspection. The radiation specialist also discussed the container survey results with IE:HQ while at the site. The radiation specialist also informed T. Emswiler of Battelle that the Battelle survey prior to shipment showed the maximum radiation level at the opposite end of the container than that found during the survey at Oyster Creek, which indicated that the source had moved during transport.

A copy of the information contained in Exhibit 8 was provided to Region III by memorandum dated October 28, 1980, to confirm previous telephone discussions which began on July 24, 1980, with notification regarding the container arriving at Oyster Creek in excess of DOT and NRC reporting levels of radiation and contamination.

On October 9, 1980, R. Smith, NRC Investigator was at the Oyster Creek Plant to review the circumstances surrounding the use of the container. The following individuals were contacted:

*J. Molnar, Core Manager
R. Panciera, Acting Supervisor, Radiological Operations
D. Turner, Manager, Radiation Control

*During subsequent telephone discussions.

D. Turner provided the following information in substance:

Battelle had shipped the NAC-1E container to the Oyster Creek Plant in order for JCP&L to ship a bundle of irradiated fuel to Battelle for study. This was a study being conducted by the fuel fabricator regarding cladding failure.

When the shipment arrived on July 23, 1980, it was parked in an owner controlled area which is outside the plant protected area. Shipments are surveyed at this location prior to entering the plant. When the shipment surveys on July 23 and 24, 1980 revealed reportable levels of radiation and contamination, the shipper (Battelle) was notified. JCP&L refused delivery of the shipment, primarily because of the radiation and contamination levels, but agreed with Battelle and NAC to provide facilities for external decontamination of the cask. The container was brought inside the plant area about July 25, 1980.

On July 29, 1980, JCP&L issued Radiation Work Permit No. 126480 (RWP) to, "Decontaminate spent fuel cask and load on trailer." The delay in beginning cask decontamination was due to: the discussions between JCP&L, Battelle, and NAC relative to the cask decontamination; a lock-pin missing from the cask lifting yoke; and material located on the refueling floor had to be moved from the cask travel path.

The cask was removed from the transport trailer and moved to the refueling floor of the reactor building for decontamination. The trailer remained in the railroad airlock while the cask decontamination was in progress. Survey No. 9003-80 (See Exhibit 8 - Attachment IV) shows one location on the cask with a radiation level of 2 R/hr. Decontamination was performed by Battelle representatives.

The investigator examined the RWP and surveys related to the cask, yoke, and truck trailer. Radiation surveys of the truck trailer and lifting yoke are shown in Exhibit 13. The transport trailer was decontaminated to 1000 dpm/100 cm² or less and the lifting yoke was placed in a sealed container to be transported with the cask. Contamination levels on the outside of the sealed container were less than 1000 dpm/100 cm² on the departure survey. Lead shielding was placed on one area of the trailer to reduce radiation levels underneath the trailer to 60 mR/hr.

The Bill of Lading for the NAC-1E container departing Oyster Creek on August 15, 1980 (See Exhibit 14) was described. The notation on the Bill

of Lading regarding the original shipment being refused was confirmed by Turner. As agreed between NAC and Battelle a stop off at West Jefferson, Ohio is also noted. This was for the purpose of removing the lifting yoke for storage at the Battelle facility.

The Radiation Protection Manager at San Onofre had contacted Turner after receiving the NAC-1E container. Turner informed him that JCP&L had refused to accept the container and that it had been brought onsite for decontamination by Battelle. He also discussed the departure surveys being observed by an NRC Inspector (See Exhibit 8, Attachment V). The Manager from San Onofre informed Turner that arrival surveys differed from departure surveys as follows:

	<u>JCP&L</u>	<u>San Onofre</u>
Cab of truck	1 mR/hr	4 mR/hr
Front of cask cage	50 mR/hr	180 mR/hr
Cask Smears	<1000 dpm	7000 dpm

J. Molnar discussed the NAC-1E container handling at Oyster Creek with the investigator. Molnar recalled that one other consideration by JCP&L in deciding not to use the container was the required dimensional inspection being due in a few days after they would have scheduled cask loading. Molnar also stated that NAC and Battelle representatives arrived at Oyster Creek following JCP&L's refusal to accept the NAC-1E container. During discussions between Battelle and NAC at the site, NAC decided to have the container transported to San Onofre.

Activities Involving Cask Model No. NFS-4, Serial No. NAC-1E at San Onofre

On August 20, 1980, the NAC-1E container arrived at the San Onofre Unit 1 site located at Camp Pendleton, California and operated by the Southern California Edison Company. Radiation surveys conducted by the licensee revealed a radiation level of 4.4 mrem/hr in the tractor sleeper. The DOT limit is 2.0 mrem/hr. (49 CFR 173.393(j)(4)). The contamination levels did not exceed the NRC reporting limits or the DOT limits.

The handling and decontamination of the NAC-1E container at San Onofre was examined by Region V and is described in Inspection Report No. 50-206/80-26.

Activities Involving Representatives of Nuclear Assurance Corporation (NAC)

During the period from October 16 to 31, 1980, two investigators from the NRC, Region II Office contacted the following individuals at the NAC office location in Atlanta, Georgia.

R. Bonnett, Cask Technician
F. Danese, Supervisor, Cask Operations
C. Hoffman, Supervisor, Cask Operations
J. Viebrock, Manager, Operations and Engineering

The investigators were provided the following information in substance.

The NAC-1E cask had been provided to CYAPCO by NAC and was delivered to the Haddam Neck site on April 18, 1980, by Tri-State Motor Transit. The cask had previously been used to transport a fuel bundle from San Onofre to Morris, Illinois.

Danese and Bonnett confirmed that they performed the quarterly inspection at Haddam Neck on the NAC-1E cask on April 25, 1980. Detailed inspection disclosed that leakage of one drain ball valve was caused by a bent valve flange. Repair could not be made with the equipment and parts immediately available. Since the other drain and vent valves functioned properly the faulty ball valve was removed and replaced with a pipe plug.

Danese was present during the cask loading on April 26, 1980. The cask cavity contained a basket and spacers in the arrangement used for the shipment from San Onofre and did not require changing. Danese and Bonnett departed from the site after the final button-up of the cask and could not recall any mention by monitoring personnel of radiation levels exceeding 10 mR/hr.

Danese was contacted by CYAPCO on April 27, 1980, regarding the radiation levels on the cask and opined that they were not consistent with previous experience with similar fuel shipments. Discussions continued regarding the levels, cask location, and corrective action. Two options were discussed. One involved placing additional shielding external to the cask and the other involved returning the cask to the pool and rearranging the spacers in the cask cavity. The option of supplemental shielding was utilized.

Danese attended a meeting at Battelle on May 28, 1980, regarding the cask contamination and returned to Battelle the first part of July 1980, while the cask was being decontaminated. Danese also recalled being at Oyster Creek and was present during an NRC survey of the cask on July 24, 1980. Following decontamination of the cask and trailer at Oyster Creek the cask departed the site for San Onofre. A stop was scheduled at Battelle to unload a yoke and special spacer basket, but only the yoke was unloaded at Battelle.

The pipe plug that was installed at CYAPCO to replace the faulty ball valve was not removed until the cask arrived at San Onofre.

Exposure of Transport Drivers

The investigator contacted the Tri-State Motor Transit Company, Joplin, Missouri, to determine the radiation exposure of the drivers involved with transporting the NAC-1E cask. All transporting of the cask from CYAPCO until delivered at San Onofre was performed by Tri-State.

The drivers assigned for the transport of radioactive material are issued film badge dosimeters for a 30 day period. The driver that transported the empty cask from Battelle to Oyster Creek was not badged; however, the surveys at departure and arrival indicated less than 2 mrem/hr in the truck cab. The film badge dosimeter results indicated that the other drivers did not exceed the allowable quarterly exposure for radiation workers.

Status of Investigation

This investigation is being submitted in a CLOSED status.

EXHIBITS

1. Letter from CYAPCO to NRC dated February 22, 1980 (Attachment contains 10 CFR 2.790(d) information and is not included).
- *2. Memorandum of Telephone Discussion between CYAPCO and NRC dated April 11, 1980.
- *3. Letter from NAC to CYAPCO dated March 25, 1980.
- *4. Letter from NRC to CYAPCO dated March 31, 1980.
5. Letter from CYAPCO to NRC dated April 15, 1980.
6. Letter from CYAPCO to NRC dated April 18, 1980.
7. Letter from CYAPCO to NRC dated May 21, 1980.
8. Memorandum from K. Plumlee to R. Smith dated September 17, 1981, of Container Inspection at Oyster Creek.
9. Preliminary Notification No. 1-80-109 dated July 24, 1980.
10. Certificate of Compliance No. 6698, Revision 9.
11. Bill of Lading for Shipment from CYAPCO to Battelle.
- *12. CYAPCO decay heat calculations data sheet dated May 30, 1980.
13. Radiation surveys of spent fuel cask truck and cask yoke dated August 5 and 6, 1980.
14. Bill of Lading for Shipment from Oyster Creek to San Onofre.

*Copies of these Exhibits were provided by the Connecticut Yankee Atomic Power Company.



CONNECTICUT YANKEE ATOMIC POWER COMPANY

BERLIN, CONNECTICUT

P O BOX 270 HARTFORD CONNECTICUT 06101

TELEPHONE
203-666-2911

February 22, 1980

Docket No. 50-213

Director
Office of Nuclear Materials Safety and Safeguards
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Gentlemen:

Haddam Neck Plant
Advance Route Approval - 10CFR73, Section 73.37(a)(1)
Applicant Licensee: Connecticut Yankee Atomic Power Company,
FTOL DPR-61

Northeast Utilities Service Company (NUSCO), on behalf of Connecticut Yankee Atomic Power Company (CYAPCO), is presently negotiating a contract with the Electric Power Research Institute (EPRI) and Battelle Columbus Laboratories (BCL) under which BCL will perform both destructive and non-destructive examinations on two spent fuel assemblies from the Haddam Neck Plant. These examinations are in support of an effort to determine the cause of fuel failures that occurred during Haddam Neck's eighth cycle of operation.

Successful completion of this examination program will provide further bases for the achievement of high levels of fuel rod cladding integrity at the Haddam Neck Plant. This will minimize fission product release to the primary system, thereby preventing large man-rem exposures during refueling and maintenance operations. Examination of the fuel will provide additional data in support of the use of similarly processed fuel pellets to other reactor fuel types, including those clad with zircaloy.

The Department of Energy (DOE), through Battelle's Pacific Northwest Laboratories, has an interest in a third assembly from the Haddam Neck Plant discharged after an earlier cycle of operation. They are investigating the effects of long-term storage of irradiated fuel, probably in anticipation of the design, construction, and operation of an away-from-reactor (AFR) spent fuel storage facility. This assembly would not be returned to the Haddam Neck Plant.

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POR/LPOR

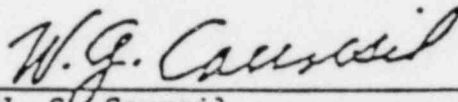
To support the above mentioned efforts, CYAPCO is hereby applying for route approval for the round-trip shipment of up to three irradiated fuel assemblies between the Haddam Neck Plant and BCL in Columbus, Ohio. The proposed routing, enclosed as Attachment 1, was prepared for NUSCO by Mr. T. R. Emswiler of HCL, in accordance with NUREG-0561, Appendix 2-A to comply with the requirements of 10CFR73. It should be noted that DOE may assume ownership of one or more of the assemblies in which case it (they) would not be returned to Haddam Neck.

Confirming conversations with the Staff, CYAPCO respectfully requests that this application be given expedited review in order that these assemblies can be shipped to BCL before the planned May 2, 1980 shutdown for Haddam Neck's next refueling. The coordination of cask lease, transportation, support equipment fabrication, and manpower cannot be finalized without this NRC approval. To facilitate this effort, approval is requested no later than March 17, 1980. Any improvement on this date would be sincerely appreciated.

If you have any questions or comments on this application, please contact us.

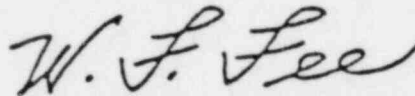
Very truly yours,

CONNECTICUT YANKEE ATOMIC POWER COMPANY



W. G. Council
Vice President

Attachment



By: W. F. Fee
Vice President



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

April 11, 1980

Docket No. 50-213

RECEIVED.

APR 28 1980

VICE PRESIDENT
Nuclear Engineering & Operations

LICENSEE: Connecticut Yankee Atomic Power Company (CYAPCO)

FACILITY: Haddam Neck Plant

SUBJECT: SUMMARY OF MARCH 27, 1980 PHONE CONVERSATION REGARDING THE MOVEMENT OF A SPENT FUEL CASK INTO THE SPENT FUEL POOL

A conference telephone call was held on March 27, 1980, between members of the NRC headquarters staff and the licensee's staff to discuss movement of a spent fuel cask into the Haddam Neck spent fuel pool. A list of the participants is included as Attachment 1.

On March 21, 1978, the licensee submitted a proposal to delete (from the Haddam Neck Technical Specifications) the prohibition of spent fuel cask movement over his spent fuel pool. This prohibition was added by Amendment No. 7 on June 8, 1976, in conjunction with a change which authorized an increase in the fuel storage capability of the spent fuel pool. The staff had not acted on this request pending completion of generic task A-36, "Control of Heavy Loads". However, the licensee recently informed us that he would like to ship several failed fuel elements from Haddam Neck to Battelle Laboratory for analysis in April 1980 before his next refueling outage, and therefore, requires evaluation of their March 1978 proposal in order to bring a spent fuel cask into the spent fuel handling building and lower it into the pool.

The task group which is considering the control of heavy loads as a generic issue was given this request to review for technical acceptability. This group studied the licensee request and identified several areas in which they needed further information to complete the evaluation. The licensee was supplied with a list of the NRC staff's questions (Attachment 2) prior to the conference call.

All items in Attachment 2 were discussed, and the licensee agreed to provide additional details as listed below.

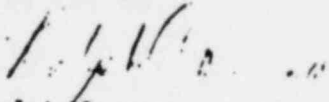
1. The licensee will provide copies of analyses done to verify the structural integrity of the fuel pool in the event of a cask drop. The licensee stated that analyses done for plants with fuel pools of similar design showed that the pool would not be significantly damaged by the dropping of a 100 ton cask. The NRC staff would like to know the basis and assumptions made by these other analyses and a comparison to the features at Haddam Neck.

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PDR/LPOR

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2. The licensee will use an NAC-1 cask. He will determine if the yoke is redundant and single failure proof and will investigate the availability of a single failure proof yoke.
3. The licensee gave a value of 2800 lbs. as the rating of the fuel cask cover lifting spider. He will verify that this rating is the design rating and not the ultimate rating.
4. The licensee will send the NRC a detailed drawing of the fuel pool area, including the locations of all spent fuel assemblies and seismic restraints. The drawing will also diagram the load path of the cask, and the orientation of the cask trunion as it traverses the load path.
5. The licensee will verify and document to the NRC staff that procedures satisfying staff criteria will be used for the movement of the cask and will verify and document the training of the crane operators in accordance with ANSI B30.2-1976.
6. The licensee will verify that the cask handling yoke complies with ANSI N14.6-1978 and will send us a copy of the detailed analysis for the yoke.
7. The licensee will verify and confirm that the crane used for handling of the cask has been maintained and inspected IAW ANSI B30.2-1976, and that positive motion stops or interlocks are installed to prevent improper movement of the crane used for handling the floor hatch cover.
8. The licensee has not completed his evaluation of the design of the crane in comparison with ANSI B30.2-1976. When this is complete, he will forward it to us for review.
9. The licensee will verify and document that there will be no fuel elements in the pool with U^{235} concentrations greater than 4 w/o. This is to ensure that an inadvertant criticality will not occur due to crushing and a change in fuel geometry if the cask were to drop.

The licensee indicated that he would provide the requested information quickly in order to allow the staff to complete its review.


Ralph Caruso
Operating Reactors Branch #2
Division of Operating Reactors

Attachments:
As stated

cc w/attachments:
See next page

cc w/attachments:

Day, Berry & Howard
Counselors at Law
One Constitution Plaza
Hartford, Connecticut 06103

Superintendent
Haddam Neck Plant
RFD #1
Post Office Box 127E
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Mr. James R. Himmelwright
Northeast Utilities Service Company
P. O. Box 270
Hartford, Connecticut 06101

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Board of Selectmen
Town Hall
Haddam, Connecticut 06103

Connecticut Energy Agency
ATTN: Assistant Director
Research and Policy
Development
Department of Planning and
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20 Grand Street
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Director, Technical Assessment
Division
Office of Radiation Programs
(AW-459)
U. S. Environmental Protection
Agency
Crystal Mall #2
Arlington, Virginia 20460

U. S. Environmental Protection
Agency
Region I Office
ATTN: EIS COORDINATOR
JFK Federal Building
Boston, Massachusetts 02203

ATTACHMENT 1

LIST OF ATTENDEES

NRC

R. Caruso
H. George
H. Shaw
F. Clemenson

CYAPCO

T. Murray
R. Eppinger
J. Radder
A. Puri
M. Pitek

ATTACHMENT 2

HADDAM NECKCASK HANDLING OPERATIONS

1. Indicate whether a failed-fuel container will be used for movement of the damaged fuel. If it will be, describe the path to be followed and extent to which staff positions 1 through 5 of Enclosure 2 will be satisfied for movement of this container.
2. Identify the model cask that will be used for shipment of the fuel.
3. a) Identify the weight of the hatch cover that is moved to the roof to allow handling of the cask.
b) Identify where this load is stored on the roof.
4. a) Identify the weight of the spent fuel cask cover.
b) Identify the crane used for handling this cover, and the defined safe load path for its movement.
5. Identify what safety-related equipment (including cabling) is located in the area below the location where the spent fuel cask is loaded onto the transfer buggy.
6. The response to Question 1 contained in the May 14, 1974 letter from Connecticut Yankee makes reference to analyses docketed for other plants. Describe the assumptions and approach used for the reference analysis and by whom that analysis was made. Describe the similarity of the assumptions made for that analysis and the working conditions in the Haddam Neck plant.
7. Verify that procedures are developed and followed for the proper handling of the spent fuel cask and related heavy loads (such as the hatch cover or the spent fuel cask cover), and that these procedures include: identification of proper equipment and components for performing these operations; required inspections before movement of the load and related acceptance criteria; the steps and proper sequence to be followed in handling the load; definition of the safe load path; and special precautions.
8. Verify that operators that will handle the cask and related heavy loads are trained and qualified, prior to handling these loads, and conduct themselves in accordance with Chapter 2-3 of ANSI B30.2-1976, "Overhead and Gantry Cranes".
9. Verify that the yoke used to handle the cask satisfied the guidelines of ANSI N14.6-1978; however, the stress design factor stated in Section 3.2.1.1 of ANSI N14.6 should be based on the combined maximum static and dynamic loads that could be imparted on the handling device based on the characteristics of the crane which will be used.
10. Verify that the slings or handling devices used for movement of the hatch cover and spent fuel cask cover (if different from the cask yoke) are installed and used in accordance with ANSI B30.9-1971, "Slings".

- 2 -

11. Verify that the crane(s) used for handling of the spent fuel shipping cask and related heavy loads are inspected, tested, and maintained in accordance with Chapter 2-2 of ANSI B30.2-1976, with the exception that tests and inspections should be performed prior to use where frequency of crane use for these loads is less than the specified inspection and test frequency.
12. Verify that the crane design satisfies the guidance of ANSI B30.2-1976, Chapter 2-1. Provide justification for those provisions that are not met.

Nuclear Assurance Corporation
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Telex: 549567, 542703

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Weinbergstrasse 9
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(01) 470844
Telex: 57275
March 25, 1980
FLD/80/15/ETS

Mr. Pitek
Northeast Utilities Services Company
P. O. Box 270
Hartford, Connecticut 06101

Dear Mr. Pitek:

As indicated below, we have provided a suggested response to certain of the questions posed by the NRC with regard to cask handling operations. The numbering system used corresponds to the numbers used in the telecopied request.

HADDEM NECK

NRC Questions - Cask Handling Operations

Requests for additional information:

1. A failed-fuel container will not be used for movement of the damaged fuel. The NFS-4 (NAC-1) model shipping cask is a zero release cask in its shipping configuration. Failed fuel shall be loaded into the cask underwater in the fuel pool. All movements after loading are performed with the cask. Consequently, no failed-fuel container is required.
2. The cask model number is NFS-4 (NAC-1), licensed under Certificate of Compliance Number 6698, Revision 9, dated December 12, 1979.
4. (a) The estimated weight of the spent fuel cask cover is 750 pounds.
(b) Typically, the auxiliary (5-ton) crane is used for handling the cask cover.

Staff Positions

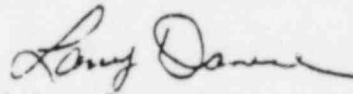
1. Cask Handling and Loading Procedures have been provided to plant personnel. These procedures identify necessary equipment to adequately handle the cask. Selected aspects of the procedures can and should be incorporated into plant operations procedures and be reviewed by the Facility Review Group.

2. Nuclear Assurance Corporation can provide qualified cask handling assistance to the plant.
3. The yoke used to handle the cask satisfies the guidelines of ANSI H14.6-1978 and specifically meets the (static load) requirements of Section 3.2.1.1. However, we note that the referenced Section (Section 3.2.1.1.) has no requirement that stress design factors include static and dynamic loads. Dynamic loads are a function of crane characteristics.
4. A lid lifting spider is used to handle the cask lid. The lifting spider is attached by four 1" bolts, is load-tested to 2000 lbs. and is constructed of C 1020 steel.

Please let us know if additional information is required.

Sincerely,

NUCLEAR ASSURANCE CORPORATION



Larry Danese
Supervisor, Cask Operations

FLD:cnr

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

MAR 31 1980

RECEIVED

SGPL:CRH
50-213

APR 7 1980

Connecticut Yankee Atomic Power Company
ATTN: W. G. Council
Vice President
P.O. Box 270
Hartford, Connecticut 06101

Nuclear Engineering & Operations

Gentlemen:

This is in regard to your request for approval of a route to be used for transport of spent reactor fuel as contained in your letter of February 22, 1980, Subject: Haddam Neck Plant - Advanced Route Approval - 10 CFR 73, Section 73.37(a)(1) - Applicant Licensee: Connecticut Yankee Atomic Power Company, FTOL DPR-61.

The "Proposed Routing - Routing Plan" submitted in the attachment to your February 22, 1980 letter is judged to meet the regulatory requirements in accordance with 10 CFR Part 73.37 and accordingly is approved.

Please note that assuring highway safety is the responsibility of the licensee and carrier and an approval is not intended to provide relief in this regard. Furthermore, the approval does not guarantee that there will be no local or state legislation applicable to the route that restricts or prohibits the movement of radioactive material.

During the spring months when inclement weather with accompanying hazardous road conditions can occur with short notice, the appropriate state police should be contacted with regard to road conditions before a shipment commences.

The initial arrangements with law enforcement agencies along the route, as required by 10 CFR Part 73.37(a)(2), have been completed by the NRC staff. Data relating to these arrangements and a copy of the approved route are enclosed. This information is to be incorporated into your shipment plan and provided to your carrier along with instructions regarding its use.

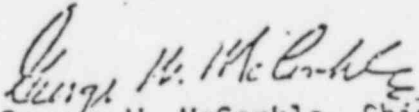
Please note that the notification requirements of 10 CFR Part 73.72 for each individual shipment still apply.

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-2-

Since the attachment to your letter of February 22, 1980 contains information of a type specified in 10 CFR Part 2.790(d), it is deemed to be commercial or financial information within the meaning of 10 CFR Part 9.5(a)(4) and shall be subject to disclosure only in accordance with the provisions of 10 CFR Part 9.12. For the same reason, the enclosure to this letter is being withheld.

Sincerely,


George W. McCorkle, Chief
Physical Security Licensing Branch
Division of Safeguards, NMSS

Enclosure:
As stated