UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 16, 1998



Mr. Jonathan M. Block, Esq.
Attorney for Citizens Awareness Network
P.O. Box 566
Putney, VT 05346-0566

Dear Mr. Block:

This is in response to your petition dated March 13, 1998, addressed to the Chairman, the Commissioners, and the Executive Director for Operations of the U.S. Nuclear Regulatory Commission (NRC). The petition requests that NRC (1) take immediate action to suspend Connecticut Yankee Atomic Power Company's (CYAPCO's) license to operate the Haddam Neck reactor and (2) investigate CYAPCO's intention to use an air cooling method as a backup cooling method for spent fuel.

In order to complete our response to your petition, certain information was requested from the licensee. That information is enclosed.

For the reasons stated in the enclosed Director's Decision (DD-98-12), your petition is denied in part and granted in part. The request to suspend the operating license has been denied. The request to investigate the licensee's proposal to air cool the spent fuel pool (SFP) has been granted. The results of staff's review of the licensee's proposal are presented in Section IV of the enclosed Director's Decision. In accordance with 10 CFR 2.206(c), a copy of this decision will be filed with the Secretary of the Commission for the Commission's review. As provided for by this regulation, the decision will constitute the final action of the Commission 25 days after issuance, unless the Commission, on its own motion, institutes a review of the decision within that time. The decision and the documents cited in the decision are available for public inspection and copying in the Commission's Public Document Room, the Gelman Building, 2210 L Street NW., Washington, D.C.

Sincerely,

Samuel J. Collins, Director
Office of Nuclear Reactor Regulation

Docket No. 50-213

Enclosures:
1. Director's Decision 98-12
2. Federal Register Notice
3. Licensee response to request for information dated June 29, 1998
4. Supplemental licensee response dated October 14, 1998

cc w/enclosures: See next page

19722

Connecticut Yankee Atomic Power Co.

Haddam Neck Plant
Docket No. 50-213

cc:

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7590-01-P
DD-98- 12



UNITED STATES OF AMERICA



NUCLEAR REGULATORY COMMISSION

OFFICE OF NUCLEAR REACTOR REGULATION

Samuel J. Collins, Director

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| In the Matter of | ) | |
| | ) | |
| CONNECTICUT YANKEE ATOMIC POWER COMPANY | ) | Docket No. 50-213 (10 CFR 2.206) |
| | ) | |
| Haddam Neck | ) | |

DIRECTOR'S DECISION UNDER 10 CFR 2.206

## I. INTRODUCTION

On March 13, 1998, Mr. Jonathan M. Block submitted a petition pursuant to Title 10 of the Code of Federal Regulations Section 2.206 (10 CFR 2.206) on behalf of the Citizens Awareness Network (Petitioner) requesting that NRC (1) take immediate action to suspend Connecticut Yankee Atomic Power Company's (CYAPCO's) license to operate the Haddam Neck reactor and (2) investigate CYAPCO's intention to use an air cooling method as a backup cooling method for spent fuel.

In support of his request, the Petitioner offers the following five bases: (1) CYAPCO has not resolved longstanding failures to exercise adequate radiological controls, (2) the nitrogen intrusion event of August 1996 demonstrates that CYAPCO is unable to maintain operations in a shutdown condition, (3) CYAPCO's plan to use air cooling of the spent fuel pool (SFP) as a backup cooling method would constitute an unmonitored, unplanned release

into the environment, (4) the proposal to use the air cooling method is a violation of CYAPCO's license, and (5) the proposal to use the air cooling method reveals CYAPCO's lack of comprehension of the defense-in-depth approach to safety systems.

## II. BACKGROUND

Connecticut Yankee Atomic Power Company is the holder of Facility Operating License No. DPR-61, which authorizes the licensee to possess the Haddam Neck Plant (HNP). The license states, among other things, that the facility is subject to all the rules, regulations, and orders of the U.S. Nuclear Regulatory Commission (the Commission or NRC) now or hereafter in effect. The facility consists of a pressurized-water reactor located at the licensee's site in Middlesex County, Connecticut. On December 5, 1996, CYAPCO submitted written certifications of permanent cessation of operation and that all nuclear fuel had been permanently removed from the reactor vessel. The certifications were docketed on December 11, 1996, and therefore, in accordance with §50.82(a)(2), the facility is permanently shut down and defueled and is no longer authorized to operate or place fuel in the reactor.

Additional background relevant to the five bases offered by the Petitioner to support its requests is outlined below.

The Petitioner's first basis regarding the adequacy of the Haddam Neck Plant's (HNP's) radiological controls program has been evaluated by the NRC. The Petitioner notes that (1) in November 1996, the licensee allowed two workers to become contaminated during an entry into the fuel transfer canal, (2) in February 1997, the licensee released contaminated equipment to an unlicensed facility, and (3) on numerous occasions during

the operating phase of the HNP, the licensee released contaminated materials to unrestricted areas. The first two items noted were included in the basis for issuing a confirmatory action letter (CAL) to the licensee on March 4, 1997, which documented the licensee's commitments to improve its radiation controls program. Subsequently, on May 5, 1998, the NRC issued the results of an inspection of the changes to the licensee's radiation controls program and concluded that the licensee had met the commitments listed in the CAL. The third item noted was addressed by the NRC in the Haddam Neck Historical Review Team Report, dated March 1998. The report concluded, that based on dose assessments completed thus far, radiation exposure to members of the public from the release of contaminated materials to offsite locations did not exceed the regulatory limits of 10 CFR Part 20.

The Petitioner's second basis, that CYAPCO is unable to maintain operations in the shutdown condition, is based on an August 1996 event. At that time, the reactor was shut down with the head in place and contained a full core of fuel. However, operators allowed nitrogen to collect in the reactor vessel, displacing water contained in the top of the reactor vessel head. The NRC conducted an augmented inspection team (AIT) review of the event and concluded that the event, in combination with other events that took place at the same time, was safety significant. However, there were no actual public health and safety consequences. The AIT issued its report on October 30, 1996. A "Notice of Violation and Proposed Imposition of Civil Penalties—$650,000" was issued to the licensee by NRC on May 5, 1997, due, in part, to the nitrogen intrusion event.

The Petitioner's third, fourth, and fifth bases pertain to modifications to the HNP spent fuel cooling system. CYAPCO submitted its Post Shutdown Decommissioning

Activities Report (PSDAR) on August 22, 1997. The licensee plans to keep its spent fuel in wet storage in the spent fuel pool (SFP) until it can be transferred to the Department of Energy (DOE). In the interim period, the spent fuel building and systems necessary to accomplish fuel cooling will remain on site, separate from the rest of the site's mechanical and electrical systems. This arrangement is referred to as the "spent fuel pool island." On March 11, 1998, at a public meeting at the Haddam Neck site, the licensee reported on the status of establishing the SFP island, among other items. The licensee stated that two trains of water cooling will be installed to cool the SFP. Heat rejection will be changed from the existing service water system to two new spray coolers to be mounted on the roof of the spent fuel building. During the discussion, the licensee stated that a backup cooling method, created by opening the building's doors and roof hatch to establish natural circulation air flow through the building, could be used to cool the spent fuel in the event that all other cooling systems became unavailable. The licensee did not present an evaluation of the dose consequences of radiological releases through the roof hatch, if the air cooling method was actually used. However, the licensee had not used the air cooling method and considered it highly unlikely that conditions would arise that would require its use.

In order to respond to the petition, the NRC requested information from the licensee with respect to its plans to air cool the SFP if other cooling methods were unavailable. The licensee responded by letters dated June 29 and October 14, 1998.

## III. DISCUSSION OF PETITIONERS' REQUESTS

Each of the Petitioner's requests is discussed below. The five bases presented by the Petitioner are considered for each request, and determinations are made as to whether the bases support the request.

The Petitioner's first request is to immediately suspend CYAPCO's operating license.

The first basis presented by the Petitioner, that the licensee has not resolved failures to exercise adequate radiological controls, no longer pertains to the first request, since the licensee has implemented improvements, and the NRC has found them acceptable.

The second basis presented was the nitrogen intrusion event of August 1996. Although the NRC took enforcement action in response to the event, the basis no longer pertains to the first request since the reactor vessel has been permanently defueled and no reactor accident is, or ever will be, possible at HNP.

The third basis presented to support the request to suspend HNP's operating license is that air cooling the spent fuel through the spent fuel building roof hatch would constitute an unplanned, unmonitored release of radioactivity to the environment. The Commission's regulations require a licensee to monitor and control radioactive releases. The Commission places a licensee under the authority of the regulations by issuing a license with appropriate conditions. For example, the HNP operating license imposes the requirements of 10 CFR Part 20, "Standards for Protection Against Radiation," and 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," among others, on the licensee. 10 CFR Part 20 limits the radiation exposure a licensee may allow a person to receive and requires the licensee to demonstrate that it has controlled exposures to levels less than the limits. 10 CFR Part 50 governs the operation and decommissioning of a

reactor facility, and, perhaps most significantly in view of the third basis presented, requires a licensee to limit the release of radioactive materials in effluents to "as low as reasonably achievable" (ALARA). Suspending the HNP license would not relieve the licensee of its responsibility to adequately control the use of radioactive materials in its possession, but could impede the NRC's ability to enforce regulatory requirements. Since the license is a mechanism through which the NRC holds the licensee to its responsibility, the third basis presented does not support suspension of the license.

The fourth basis presented to support the request to suspend the license is that the licensee's proposal to air cool the SFP using a flow path through the spent fuel building doors and roof hatch constitutes a violation of the license conditions. However, the license does not prohibit making proposals for alternate methods of operation of a reactor facility. Since making a proposal to air cool the SFP does not violate the license, the fourth basis does not support suspension of the license.

The fifth basis presented to support the request to suspend the license is that the air cooling proposal reveals that CYAPCO does not understand the defense-in-depth approach to backing up safety systems. Defense-in-depth, as applied at the system level, can be achieved by providing redundant and diverse methods to accomplish a function. The licensee described the normal and alternate SFP cooling systems. The normal system consists of redundant components for the SFP cooling system, the intermediate cooling loop, and the roof-mounted spray coolers. These are closed loops and do not require outside water to remain in operation, except for makeup water to the sprayers in hot weather. The redundancy provided in the normal cooling system allows several configurations to remove SFP heat. In addition, the SFP cooling pumps are backed up by

alternate pumps that can be used to circulate river water through the normal system heat exchangers, which provides a diverse heat sink for the normal system. The pumps may be powered from offsite or onsite electrical power sources, and there is an engine-powered pump available that does not require electrical power. Thus, there are redundant and diverse sources of power for pumping. In the event no heat exchange systems are available, makeup water could be added to the SFP, and the cooling could be accomplished through evaporation. The heat would then be removed by the building exhaust fan, which is the normal release path. As evidenced by the components and alternates listed above, redundant and diverse methods are available to provide defense-in-depth for the SFP cooling function. The air cooling method is not required. Thus, the fifth basis does not support the request to suspend the license.

For the reasons stated above, the Petitioner's request to suspend the licensee's operating license is denied.

The Petitioner's second request is to investigate CYAPCO's proposal to air cool the SFP by opening the spent fuel building's doors and roof hatch.

The first basis presented by the Petitioner, that the licensee has not resolved failures to exercise adequate radiological controls, no longer pertains to the second request, since the licensee has implemented improvements, and the NRC has found them acceptable.

The second basis presented was the nitrogen intrusion event of August 1996. Although the NRC took enforcement action in response to the event, the basis does not pertain to the second request since the reactor vessel has been permanently defueled and no reactor accident is, or ever will be, possible at HNP.

The third basis presented by the Petitioner to support the request to investigate the licensee's air cooling proposal is that the licensee's plan to air cool the SFP by opening the spent fuel building's doors and roof hatch would constitute an unplanned, unmonitored release into the environment. The third basis concerns actions that have not occurred, and that the licensee does not expect to take. However, because the licensee plans to use the air cooling method under certain circumstances, the NRC considers the Petitioner's basis to be sufficient to grant the second request. A review of the licensee's regulatory responsibilities is presented in Section IV below.

The fourth basis presented to support the request for an investigation is that the licensee's proposal to air cool the SFP using a flow path through the spent fuel building doors and roof hatch constitutes a violation of the license conditions. However, the license does not prohibit making proposals for alternate methods of operation of a reactor facility. Since making a proposal to air cool the SFP does not violate the license, the fourth basis does not support the request.

The fifth basis presented to support the request to investigate the licensee's proposal is that the air cooling proposal reveals that CYAPCO does not understand the defense-in-depth approach to backing up safety systems. As noted above, the system proposed by the licensee achieves defense-in-depth by installing redundant and diverse components, power supplies, and heat sinks. The air cooling method is not required for defense-in-depth. Thus, the fifth basis does not support the request.

The NRC has determined that the third basis presented by the Petitioner is sufficient to grant the Petitioner's request to investigate the licensee's proposal to air cool the SFP. The staff's evaluation of the licensee's proposal is presented in Section IV below.

## IV. REVIEW OF THE LICENSEE'S PROPOSAL

The NRC requested information from the licensee with respect to its plans to air cool the SFP if other cooling methods become unavailable. The licensee responded by letters dated June 29 and October 14, 1998. The NRC also reviewed the licensee's operating license, Updated Final Safety Analysis Report (UFSAR), and Offsite Dose Calculation Manual (ODCM).

By letter dated October 14, 1998, the licensee stated that the dose consequence to an offsite member of the public from an airborne release from the SFP if the doors and roof hatch were opened to cool the spent fuel would be 0.254 mrem. The dose was calculated assuming that the air cooling method would be in use for 2 weeks before returning to a water cooling method and closing the doors and roof hatch. The dose is within regulatory limits. The licensee stated that procedures are in place to monitor a radioactive release from the roof hatch.

The licensee's October 14 letter contained a commitment to develop procedural guidance regarding when to open and subsequently close the spent fuel building (SFB) doors and roof hatch, in the event air cooling becomes necessary. The procedure will also direct operators to request airborne radioactivity surveys when the SFB doors and roof hatch are opened.

The Facility Operating License limits gaseous effluents in accordance with Technical Specification (TS) 3/4.11.2. That TS also requires that if a dose rate exceeds the limit, the licensee must decrease the release rate within 15 minutes to comply with the limits.

The UFSAR, Section 9.1.3, describes the SFP cooling system. Under the provisions of 10 CFR 50.59, a change to a system described in the UFSAR requires the licensee to perform a safety evaluation and, if necessary, obtain NRC approval before implementing the change. Using the air cooling method would fall within the scope of 10 CFR 50.59. Therefore, when the licensee revises its procedure to permit use of the air cooling method, it must perform a safety evaluation.

The ODCM provides the parameters and methodology to be used to calculate offsite doses and effluent monitor setpoints. Each effluent pathway used by the licensee must be accounted for in the ODCM. The licensee has procedures to monitor and quantify airborne releases, although, at the time of this review, the ODCM did not contain parameters or a methodology for a release path from the SFB roof hatch. However, there is no requirement to develop that information until the release path is used.

In summary, a release from the SFB doors and roof hatch from air cooling the SFP is required to be within regulatory limits. Before the air cooling method could be used, the licensee would have to perform a safety evaluation in accordance with 10 CFR 50.59 and revise its ODCM. In the event that the SFB doors and roof hatch are actually used for cooling the SFP, the release path must be monitored and actions taken to meet regulatory limits. However, there is no requirement to revise the ODCM unless the licensee, in fact, uses the air cooling method.

## V. DECISION

For the reasons stated above, the petition is denied in part and granted in part. The request to suspend the operating license is denied. The request to investigate the licensee's proposal to air cool the SFP is granted. The investigation is presented as the review in Section IV above. The decision and the documents cited in the decision are available for public inspection in the Commission's Public Document Room, the Gelman Building, 2210 L Street NW., Washington, D.C., and at the Local Public Document Room for the Haddam Neck Plant at the Russell Library, 123 Broad Street, Middletown, Connecticut.

In accordance with 10 CFR 2.206(c), a copy of this decision will be filed with the Secretary of the Commission for the Commission's review. As provided for by this regulation, the decision will constitute the final action of the Commission 25 days after issuance, unless the Commission, on its own motion, institutes a review of the Decision within that time.

Dated at Rockville, Maryland, this 16th day of November 1998.

FOR THE NUCLEAR REGULATORY COMMISSION

Samuel J. Collins, Director
Office of Nuclear Reactor Regulation

7590-01-P



UNITED STATES NUCLEAR REGULATORY COMMISSION

CONNECTICUT YANKEE ATOMIC POWER COMPANY

DOCKET NO. 50-213

HADDAM NECK PLANT

ISSUANCE OF DIRECTOR'S DECISION UNDER 10 CFR 2.206

Notice is hereby given that the Director, Office of Nuclear Reactor Regulation, has issued a Director's Decision concerning a petition dated March 13, 1998, filed by Mr. Jonathan M. Block, Esq., pursuant to Title 10 of the Code of Federal Regulations, Section 2.206 (10 CFR 2.206) on behalf of the Citizens Awareness Network (Petitioner). The petition requests that NRC (1) take immediate action to suspend Connecticut Yankee Atomic Power Company's (CYAPCO's) license to operate the Haddam Neck reactor and (2) investigate CYAPCO's intention to use an air cooling method as a backup cooling method for spent fuel.

The Director, Office of Nuclear Reactor Regulation, has determined that the Petition should be denied in part and granted in part for the reasons stated in the "Director's Decision Under 10 CFR 2.206" (DD - 98 -12); the complete text that follows this notice is available for public inspection and copying in the Commission's Public Document Room, the Gelman Building, 2210 L Street NW., Washington, D.C., and at the Local Public Document Room for the Haddam Neck Plant at the Russell Library, 123 Broad Street, Middletown, Connecticut.

A copy of this decision has been filed with the Secretary of the Commission for the Commission's review. As provided for by 10 CFR 2.206(c), the decision will constitute the

final action of the Commission 25 days after issuance, unless the Commission, on its own motion, institutes a review of the decision within that time.

Dated at Rockville, Maryland, this 16th day of November 1998.

FOR THE NUCLEAR REGULATORY COMMISSION

Samuel J. Collins, Director
Office of Nuclear Reactor Regulation

ENCLOSURE 3

CONNECTICUT YANKEE ATOMIC POWER COMPANY

HADDAM NECK PLANT
362 INJUN HOLLOW ROAD • EAST HAMPTON, CT 06424-3099

June 29, 1998

Docket No. 50-213
CY-98-103

Re: 10 CFR 2.206

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D. C 20555

Haddam Neck Plant
Response to 2.206 Petition Questions
Spent Fuel Pool Cooling Methods

The purpose of this letter is for Connecticut Yankee Atomic Power Company (CYAPCO) to reply, on behalf of the Haddam Neck Plant, to a request for additional information contained in an NRC letter dated May 28, 1998[1]. Additional information was requested on the spent fuel pool cooling methods that will be used at the Haddam Neck Plant.

Attachment 1 to this letter restates the NRC question and provides CYAPCO's response.

The following is CYAPCO's commitment made within this letter. Other statements made within this letter are provided for information only.

CY-98-103-01 - CYAPCO will monitor the noise levels of the fans during the startup of the new cooling system.

(1) Thomas L. Fredrichs letter to Russell Mellor, "Request for Information - 2.206 Petition Regarding Spent Fuel Pool Cooling Methods", dated May 28, 1998.

If there are any question regarding this submittal, please contact Mr. G. P. Van Noordennen at (860) 267-3938.

Very truly yours,

CONNECTICUT YANKEE ATOMIC POWER COMPANY

Russell A. Mellor
Vice President - Operations and Decommissioning

Attachment

cc: H. J. Miller, NRC Administrator, Region I
T. L. Fredrichs, NRC Project Manager, Haddam Neck Plant
W. J. Raymond, NRC Senior Resident Inspector, Haddam Neck Plant
K. T. A. McCarthy, Director, CT DEP Monitoring and Radiation Division

Docket Number 50-213
CY-98-103

Attachment 1

Haddam Neck Plant

Response to 2.206 Petition Questions

Spent Fuel Pool Cooling Methods

June 1998

**Question 1**

Do you intend to use ventilation through open doors and roof hatches of the spent fuel building (SFB) to cool the spent fuel pool (SFP) in the event forced cooling is unavailable? If yes, answer questions 2 through 6. If no, answer question 6.

**Response 1**

The heat energy in the stored spent fuel is released to the SFP water continuously. Part of this energy is released to the air above the SFP by evaporation of pool water. This occurs regardless of whether or not forced cooling is operating. The amount of water that evaporates is a function of pool water temperature, air flow over the pool and the relative humidity of the air flowing over the pool. Vapor generated by evaporation of pool water is removed from the SFB by an exhaust fan that discharges to the plant stack, which is monitored for radiation.

The normal cooling systems for the SFP Island are the SFP cooling system, intermediate cooling system and spray cooling system. Each of these systems are comprised of redundant trains. In addition, the redundant trains of the SFP cooling system and the intermediate cooling system are interchangeable. The SFP cooling system, intermediate cooling system and spray cooling system provide forced cooling for the pool. All of the cooling equipment, as well as the SFB exhaust fan, can be powered from an on-site diesel powered generator, which is independent from any offsite power supply. Multiple failures of these components would have to occur to result in the normal method of forced cooling not being available.

Backup cooling to the SFP heat exchangers is available from pumps that can be used to circulate river water through a heat exchanger. One of the pumps has its own diesel engine (independent of the diesel generator and independent of the offsite power supply). An additional gasoline powered pump is also available on-site. This backup cooling can be implemented utilizing temporary hoses and fittings available on site. The capability to use the alternative cooling methods has been proceduralized at the plant for many years. During the time to implement backup cooling the pool temperature is expected to rise only a few degrees, with a negligible increase in SFP water evaporation rate.

Should all the above permanent and temporary backup forced cooling equipment become unavailable, or all available power is lost to the SFP cooling pumps, the heat energy from the fuel will cause the SFP temperature to rise until the heat removed from the SFP from evaporation is equal to the heat addition. This is calculated to occur prior to the SFP reaching 170° F and results in a maximum evaporation rate of approximately four gallons per minute. It is estimated to take approximately 55 hours to reach the existing Technical Specification pool temperature limit of 150° F, given an initial temperature in the SFP of 110° F. During this time, normal ventilation, which will continue to direct the released vapor to a monitored stack, would continue to be used, if available.

Only during an event that results in an extended loss of forced cooling, which threatens to cause fuel pool temperatures to exceed the technical specification limit of 150° F would the plant operators initiate procedures that would open the doors and the roof hatches and allow the vapor to flow directly to the atmosphere outside the building.

CYAPCO, throughout its years of operation, has never had a loss of forced cooling which threatened our capability to maintain temperatures below 150° F.

Make-up water to replenish the evaporated water is discussed in the response to question 2. Monitoring of the vapor pathway is discussed in the response to question 4.

**Question 2**

As the SFP water level drops, particulate material may deposit on the SFP walls. How has your dose consequence evaluation accounted for the potential release of particulate material?

**Response 2**

The postulation of a continuous drop in water level within the spent fuel pool is not part of the Haddam Neck Plant's design basis. CYAPCO's normal operating procedure 2.10-1 requires that the spent fuel pool level be maintained at a level of 20 feet 6.5 inches above the top of the stored fuel. Alarms are present which will notify the operators if the water level above the top of the fuel would go above 20.9 feet or below 20.4 feet. In addition, the Haddam Neck technical specifications require the SFP water level to be maintained at least 20 feet above the stored fuel. With water level so maintained, there will be no potential for the particulate matter to deposit on the spent fuel pool walls and thus, no new source of particulate activity would be released from the SFB.

There are multiple sources of makeup water available ranging from demineralized water stored in multiple tanks on-site to river water. These makeup sources are available without the use of offsite electric power supply. As discussed above, the maximum evaporation rate is calculated to be approximately four gallons per minute. A minimum of

three days supply of demineralized water is maintained on site in a seismically qualified tank. A gasoline driven pump is also available on site to deliver water to the SFP. Experience has demonstrated that portable equipment can be brought to the site within three days to replenish the demineralized water supply.

**Questions 3**

What are the dose consequences of cooling the SFP by ventilating the SFB through open doors and the roof hatch under normal conditions and postulated design basis events?

**Response 3**

Under normal conditions, with the ventilation system operating, evaporative cooling of the SFP is minimal. Cooling the SFP by opening the doors and the roof hatch is only performed if forced cooling were to be lost for an extended period of time, and only until repairs can be made.

If this unlikely event occurred, the calculated total dose at the site boundary for a fourteen day event is approximately 0.25 mrem. It is reasonable to assume that restoration of forced cooling to the SFP can be accomplished within no more than a few days, but certainly within two weeks.

**Question 4**

What is your procedure for monitoring and quantifying a release of radioactive materials via pathways through the open doors and roof hatch?

**Response 4**

CYAPCO personnel would obtain samples using RPM 2.5-12, Airborne Radioactivity Surveys. The samples would be analyzed using plant procedures CHDP 2.3-14, Operation of the Canberra Genie Gamma Spectroscopy System and CHDP 2.4-6, Tritum Analysis, to determine the specific activity of the released vapor. Total released activity would be determined using CHDP 6.4-2, Gaseous Discharge Data handling (Hand Calculation) and CHDP 6.4-4, Particulate Discharge Data Handling (Hand Calculation). Portable radiation monitors are also available for use during the unlikely event of forced cooling restoration activities.

**Question 5**

What action will be taken in the event that high radiation levels are detected emanating from the SFB, while the SFB is being ventilated through open doors and the roof hatch?

**Response 5**

High levels of radiation will not be released during this ventilation evolution since there is no mechanism for causing this type of release. Spent fuel will remain covered and cooled. The only activity that could create a significant radiation release would be a fuel handling accident (refer to the response to question number 3). No fuel handling will be conducted during this evolution since AOP 3.2-59, "Loss of Spent Fuel Cooling", requires that fuel handling be terminated until forced cooling is restored. In addition, technical specifications related to fuel handling require the fuel building ventilation to be in service. In any event, accident analyses for the fuel handling accident do not assume the ventilation system is operating during a fuel handling accident and even without credit for ventilation the offsite doses during this accident are well below the EPA Protective Action Guidelines(2) as committed to in CYAPCO's letter dated May 30, 1997(3).

**Question 6**

How will local noise levels be affected by the modified SFP cooling system?

**Response 6**

Excessive noise levels are not expected to be produced by the new cooling system. CYAPCO procured fans with reduced noise emission specifically to address this potential issue. Noise levels from the coolers located at the HNP are anticipated to be much less than others found in the industry since CYAPCO has only 4 fans. In addition, CYAPCO has procured fans that operate at a slower speed of 900 rpm versus the 1,800 rpm units that are used at other utilities. Operation at the slower speed will reduce the potential noise. CYAPCO will monitor the noise levels during startup of the new cooling system.

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(2) EPA 400-R-92-001, "Manual of Protective Actions Guides and Protective Actions for Nuclear Incidents," US EPA, 1991.

(3) CYAPCO letter CY-97-047 from T. C. Feigenbaum to U. S. Nuclear Regulatory Commission, "Defueled Emergency Plan And Request For Exemption From 10CFR50.54(q) For Offsite Response," dated May 30, 1997.

ENCLOSURE 4

CONNECTICUT YANKEE ATOMIC POWER COMPANY

HADDAM NECK PLANT
362 INJUN HOLLOW ROAD • EAST HAMPTON, CT 06424-3099

October 14, 1998

Docket No. 50-213
CY-98-129

Re: 10 CFR 2.206

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D. C 20555

Haddam Neck Plant
Supplemental Response to 2.206 Petition Questions
Spent Fuel Pool Cooling Methods

The purpose of this letter is for Connecticut Yankee Atomic Power Company (CYAPCO) to provide supplemental information to its response to 2.206 petition questions originally provided by letter dated June 29, 1998[1], on behalf of the Haddam Neck Plant. The initial request for additional information was contained in an NRC letter dated May 28, 1998[2]. Additional information, subsequently requested verbally by the NRC, is provided in this letter on the spent fuel pool cooling methods and cooling fan noise test results.

Attachment 1 to this letter restates the NRC questions and provides CYAPCO's supplemental response.

The following is CYAPCO's pending commitment made within this letter:

CY-98-129-01 Procedure AOP 3.2-59, "Loss of Spent Fuel Cooling" will be revised to provide the operators guidance on when to open and when to subsequently close the SFB doors and roof hatch. The procedure will also direct the operators to request that airborne radioactivity surveys be performed when the SFB doors and roof hatch are opened.

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(1) CYAPCO Letter CY-98-103, from R. A. Mellor, to the U.S. Nuclear Regulatory Commission, "Response to 2.206 Petition Questions Spent Fuel Pool Cooling Methods", dated June 29, 1998.

(2) NRC Letter from Thomas L. Fredrichs, to Russell Mellor, "Request for Information - 2.206 Petition Regarding Spent Fuel Cooling Methods", dated May 28, 1998.

If there are any question regarding this submittal, please contact Mr. G. P. van Noordennen at (860) 267-3938.

Very truly yours,

CONNECTICUT YANKEE ATOMIC POWER COMPANY

For: Russell A. Mellor
Vice President - Operations and Decommissioning

By: Kenneth J. Heider
Decommissioning Director

Attachment

cc: H. J. Miller, NRC Administrator, Region I
T. L. Fredrichs, NRC Project Manager, Haddam Neck Plant
W. J. Raymond, NRC Senior Resident Inspector, Haddam Neck Plant
E. Wilds, Director, CT DEP Monitoring and Radiation Division

Docket Number 50-213
CY-98-129

Attachment 1

Haddam Neck Plant

Supplemental Response to
2.206 Petition Questions

Spent Fuel Pool Cooling Methods

October 1998

**Question 1**

Do you intend to use ventilation through open doors and roof hatches of the spent fuel building (SFB) to cool the spent fuel pool (SFP) in the event forced cooling is unavailable? If yes, answer questions 2 through 6. If no, answer question 6.

**Response 1**

Yes. However, as discussed below, the need to open the SFB doors and roof hatch is extremely unlikely.

The heat energy in the stored spent fuel is released to the SFP water continuously. Part of this energy is released to the air above the SFP by evaporation of pool water. This occurs regardless of whether or not forced cooling is operating. The amount of water that evaporates is a function of pool water temperature, air flow over the pool and the relative humidity of the air flowing over the pool. Vapor generated by evaporation of pool water is normally removed from the SFB by an exhaust fan into the discharge line of the Primary Auxiliary Building (PAB) purge fans. The PAB purge fan discharge line leads to the plant stack, which is monitored for radiation.

The SFP Island at the Haddam Neck Plant (HNP) will be comprised of two redundant SFP cooling subsystems. Each SFP cooling subsystem will provide forced cooling for the SFP. Each subsystem of the SFP cooling system will include a SFP cooling loop, an intermediate cooling loop and a spray cooling loop. The redundant subsystems of the SFP cooling loop and the intermediate cooling loop will have the capability to be crosstied, at the component level, to the other train to provide additional flexibility. Currently, all of the SFP cooling system equipment, as well as the SFB exhaust fan, can be powered from the EG-2B emergency diesel generator, which is independent from any off-site power supply. However, during phase II of the SFP Island project, a new diesel and switchgear will be installed to power SFP cooling loads in the event of loss of offsite power. Multiple failures of components would have to occur to result in the normal SFP Island method of forced cooling not being available.

The intermediate loops have hose connections so that other sources of water can be used to cool the SFP heat exchangers. Temporary hoses and fittings are available on-site to make the backup cooling connection. Backup sources of water available include the fire system which has a diesel engine driven pump that is not dependent on off-site power.

Should all the above permanent and temporary backup forced cooling equipment become unavailable, or all available power be lost to the SFP cooling pumps for an extended period of time, the heat energy from the fuel will cause the SFP temperature to rise until the heat removed from the SFP from evaporation is equal to the heat addition. This is calculated to occur prior to the SFP reaching 170° F and would result in a maximum evaporation rate of approximately four gallons per minute. It is estimated to take approximately 50 hours to reach the existing Technical Specification pool temperature limit of 150° F, given an initial

temperature in the SFP of 110° F. During this time, normal SFB ventilation, which will continue to direct the released vapor to a monitored stack, would continue to be used, if available.

The need to open the SFB doors and roof hatch, is extremely unlikely. It would take the long term loss of a number of normal and alternate spent fuel pool cooling methods to reach this point. Only during an event that would result in an extended loss of forced cooling, which would cause the fuel pool temperature to exceed the technical specification limit of 150° F, would the plant operators take action to open the SFB doors and roof hatch and allow the vapor to flow directly to the atmosphere outside the building. The Haddam Neck Plant has never experienced a loss of SFP cooling event that challenged the 150 degree SFP temperature limit in all its years of operation and it is not likely that this will occur in the future. A review of past losses to spent fuel cooling either from a loss of off-site power or component malfunction confirm that cooling would be restored well within the estimated 50 hour time frame.

The Defueled Emergency Plan will require the declaration of an "Unusual Event" if an uncontrolled heatup of the SFP occurs such that the bulk pool temperature exceeds 150°F. As such, the NRC will be notified and communications established under the Defueled Emergency Plan process. All action taken from that point on would be provided under associated supporting plant procedures with the NRC cognizant of the situation.

Make-up water to replenish the evaporated water is discussed in the response to question 2. Monitoring of the vapor pathway is discussed in the response to question 4.

**Question 2**

As the SFP water level drops, particulate material may deposit on the SFP walls. How has your dose consequence evaluation accounted for the potential release of particulate material?

**Response 2**

With the SFP isolated from the Reactor Cavity, the postulation of a continuous drop in water level within the SFP is not part of the Haddam Neck Plant's design basis. The Haddam Neck technical specifications require the SFP water level to be maintained at least 20 feet above the stored fuel. Alarms are present which will notify the operators if the water level above the top of the fuel would go above 20' 9" or below 20' 4". With the water level maintained above 20 feet, there will be no significant buildup of additional particulate matter to deposit on the spent fuel pool walls and thus, no new source of particulate activity would be released from the SFB.

There are multiple sources of makeup water available ranging from demineralized water stored in multiple on-site tanks to river water. The tanks are the Demineralized Water Storage Tank (DWST), Primary Water Storage Tank (PWST), and the Recycled Primary Water Storage Tank (RPWST). However, the DWST is the designated seismically qualified make-up source. Two makeup sources (DWST and River Water) are available without the use of the off-site electric power supply. Assuming the maximum evaporation rate is approximately four gallons per minute, a minimum of three days supply of demineralized water is maintained on-site in a seismically qualified tank. If offsite power is available, the demineralized water supply can be replenished within 3 days. If offsite power is not available, alternate means of obtaining demineralized water would be evaluated. However, river water will also be available as a makeup supply, as necessary.

The committed effective dose equivalent to an offsite member of the public due to potential release of particulate radioactivity from the walls of the SFP, in the unlikely event of an uncontrolled loss of pool level to 13 feet above the top of the fuel assemblies, is approximately 1.1 E-3 mrem. The analysis which supports this dose equivalent includes many conservative assumptions regarding the transport of radioactive material from the contamination on the walls of the SFP to the environment. For example, the analysis assumes a release of material to the environment through an unfiltered pathway via an open roof vent. Additionally, the analysis assumes that an individual is present at the site boundary for the entire 2 week period during this postulated release condition. Two weeks is chosen as a conservative maximum amount of time it would take to restore the system or component which is postulated to fail. This analysis clearly indicates that the offsite dose to members of the public from this postulated release is bounded by the design basis accidents described in the HNP Final Safety Analysis Report.

In the highly unlikely event that an uncontrolled decrease in fuel pool level was experienced with an inability for any of the makeup sources to replenish it, an Unusual Event would be declared. As such, the NRC would be notified and communications established under the Defueled Emergency Plan process. All action taken from that point on would be in accordance with associated supporting plant procedures with the NRC cognizant of the situation. Consideration would be given to close the SFB doors and roof hatch if the fuel would no longer be adequately shielded by water. It is estimated that 10 feet of water above the fuel would be needed to provide adequate shielding to plant emergency personnel. The 10 foot water depth exceeds the minimum water depth of 8 feet for shielding one year old fuel as specified by ANSI/ANS-57.7-1988, "American National Standard Design Criteria for an Independent Spent Fuel Storage Installation (Water Pool Type)".

**Question 3**

What are the dose consequences of cooling the SFP by ventilating the SFB through open doors and the roof hatch under normal conditions and postulated design basis events?

**Response 3**

There is no normal condition under which the SFP is cooled by ventilating the SFB through open doors and the roof hatch.

In the highly unlikely event of only evaporative cooling of the pool, the calculated total dose at the site boundary from the evaporation of the pool water for a fourteen day event is approximately 0.253 mrem. The analysis supporting this dose assumes a 5 gallon per minute evaporation rate. Tritium is the only radionuclide considered and the evaporated water is discharged through the building roof vent unfiltered.

Dose from particulate radioactivity discussed in answer to question 2 is not expected since the makeup water quantities are minimal and there are multiple methods of makeup. However, if the particulate dose (1.1 E-3 mrem) was added to the evaporation dose (0.253 mrem), the total dose would be only slightly increased to approximately 0.2541 mrem for a fourteen day event.

**Question 4**

What is your procedure for monitoring and quantifying a release of radioactive materials via pathways through the open doors and roof hatch?

**Response 4**

CYAPCO personnel would obtain samples using procedure RPM 2.5-12, "Airborne Radioactivity Surveys." The samples would be analyzed using plant procedures CHDP 2.3-14, "Operation of the Canberra Genie Gamma Spectroscopy System" and CHDP 2.4-6, "Tritium Analysis", to determine the specific activity of the released vapor. Total released activity would be determined using CHDP 6.4-2, "Gaseous Discharge Data Handling (Hand Calculation)" and CHDP 6.4-4, "Particulate Discharge Data Handling (Hand Calculation)." As decommissioning progresses, these procedures will evolve and may be revised to support changing plant needs.

**Question 5**

What action will be taken in the event that high radiation levels are detected emanating from the SFB, while the SFB is being ventilated through open doors and the roof hatch?

**Response 5**

In the event high radiation levels are detected emanating from the SFB, while the SFB is being ventilated through open doors and the roof hatch, and consistent with our response to question 2, consideration would be given to close the SFB doors and roof hatch. The SFB ventilation system effluent would be manually diverted to a filter if the ventilation system is operable.

High levels of radiation will not be released during this ventilation evolution since there is no mechanism for causing this type of release. Spent fuel will remain covered and cooled through established makeup sources and evaporative cooling. The only activity that could create a noticeable radiation release would be a fuel handling accident. However, AOP 3.2-59, "Loss of Spent Fuel Cooling", requires that work in progress in the spent fuel pool (including fuel handling) be stopped until loss of cooling is resolved. Procedure NOP 2.15-3, "Spent Fuel Building Ventilation System Operation" contains a precaution that the SFB Exhaust Ventilation System shall be in service, with the exhaust fan suction aligned through the charcoal filter, when initiating fuel movement operations or crane movement above the spent fuel pool. In addition, technical specifications related to fuel handling require the fuel building ventilation to be in service. In any event, the accident analysis for the fuel handling accident in the SFB does not assume the ventilation system is operating during the event. Even without taking credit for ventilation, the off-site doses during this accident are well below the EPA Protective Action Guidelines[1] as discussed in CYAPCO's letter dated May 30, 1997[2]

**Question 6**

How will local noise levels be affected by the modified SFP cooling system?

**Response 6**

Noise levels have been monitored during testing for the new cooling system and were found to be well within Department of Environmental Protection (DEP) regulations. CYAPCO procured fans with reduced noise emission specifically to address this potential issue. Noise levels from the coolers located at the HNP are low because CYAPCO has only 4 fans which operate at a slow speed of 900 rpm. Operation at this slow speed reduces the noise.

CYAPCO has had an extensive sound level survey performed to verify that the noise level of the modified SFP cooling system will be in compliance with the DEP regulations. The contractor performing the survey not only confirmed that the noise levels were well within the DEP regulations, but stated that they believed the acoustic impact on the community would be negligible.

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(1) EPA 400-R-92-001, "Manual of Protective Actions Guides and Protective Actions for Nuclear Incidents," US EPA, 1991.

(2) CYAPCO letter CY-97-047 from T. C. Feigenbaum to U. S. Nuclear Regulatory Commission, "Defueled Emergency Plan and Request For Exemption From 10CFR50.54(q) For Offstie Response," dated May 30, 1997.

5D4

# ACTION

TAC #MA132

EDO Principal Correspondence Control

FROM: DUE: ~~04/20/98~~ 11/16/98

EDO CONTROL: G980168
DOC DT: 03/13/98
FINAL REPLY:

Jonathan M. Block, Attorney
Citizens Awarenss Network, Inc.

TO:

Julian, SECY

FOR SIGNATURE OF : ** GRN ** CRC NO: 98-0234

Callan, EDO

DESC:

2.206 -- REQUEST FOR SUSPENSION OF OPERATING LICENSE FOR CONNECTICUT YANKEE NUCLEAR POWER STATION

DATE: 03/20/98

ROUTING:

Callan
Thadani
Thompson
Norry
Blaha
Burns
Cyr, OGC
Miller, RI
JGoldberg, OGC
BGleaves, NRR

A. NED TO: CONTACT:

NRR Collins

SPECIAL INSTRUCTIONS OR REMARKS:

DRPE.Lee
~~SPO.TRAVERS~~

NRR ACTION: ~~DRPE.Zwolinski~~
NRR RECEIVED: March 20, 1998

NRR ROUTING: Collins/Miraglia
Boger
Sheron
Travers
Roe
NRR Mailroom

~~4/15/98~~

TC NRR 11/9/98

OFFICE OF THE SECRETARY
CORRESPONDENCE CONTROL TICKET

PAPER # NUMBER: CRC-98-0234 LOGGING DATE: Mar 16 98

ACTION OFFICE: EDO

AUTHOR: JONATHAN BLOCK
AFFILIATION: UTAH

ADDRESSEE: JULIAN, RAS/DSB

LETTER DATE: Mar 13 98 FILE CODE: IDRF 5 CONN YANK

SUBJECT: REQ FOR SUSPENSION OF OPER LIC FOR CONNECTICUT YANKEE NUC POWER STATION

ACTION: Appropriate

DISTRIBUTION: CHAIRMAN

SPECIAL HANDLING: 2.206 PETITION

CONSTITUENT:

NOTES:

DATE DUE:

SIGNATURE: . DATE SIGNED:
AFFILIATION:

**Jonathan M. Block**
**ATTORNEY** **LAW**
Main Street
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-2667 (fax)
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March 13, 1998

Mr. E. Julian, Esq., Docketing & Service Branch
United States Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738
BY OVERNIGHT MAIL

RE: Enclosed request for suspension of operating license for Connecticut Yankee Nuclear Power Station, Haddam, Connecticut, pursuant to 10 C.F.R. 2.206

Dear Mr. Julian:

Enclosed herewith for filing and service upon the Secretary, Commissioners, and EDO, please find an original and six copies of the above referenced document.

Thank you for your assistance.

Sincerely,

Jonathan M. Block

Jonathan M. Block
Attorney for Citizens Awareness Network, Inc.

**Jonathan M. Block**
ATTORNEY AT LAW
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(802) 387-2646 (vox)
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March 13, 1998

Chairman, Commissioners, Executive Director for Operations
United States Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738
BY OVERNIGHT MAIL

RE: Request for suspension of operating license for Connecticut Yankee Nuclear Power Station, Haddam, Connecticut, pursuant to 10 C.F.R. 2.206

Dear Chairman Jackson, Commissioners, EDO:

By this letter, we request, pursuant to 10 C.F.R. 2.206, that your agency take immediate action to suspend Connecticut Yankee Atomic Power Company's [CYAPCo] license to operate the Connecticut Yankee Nuclear Power Station in Haddam, Connecticut [CY]. The reason for this request is that CYAPCo does not practice or comprehend the basis for your agency's "defense in depth" approach to occupational and public health and safety regulations. This continuing failure jeopardizes the health and safety of workers at CY and persons who live in the surrounding communities.

As you are aware, CY is at present under a Confirmatory Action Letter [CAL] because they did not adequately resolve long-standing failures to exercise adequate radiological controls. These failures have meant that real people living in ~~my~~ the community, both those working at the facility and those merely living in the vicinity, received unnecessary and unplanned exposures to radiation. Over the years, on numerous occasions, CY's failures have gone

beyond the reactor site-boundary, including allowing workers to carry contaminated materials off-site, providing radioactive fill to a day-care center and radioactive rubble to a road-builder. Since its shut-down in December of 1996, CY also sent radioactively contaminated video equipment to a private company. In terms of on-site radiological failures, in the fall of 1996, CY allowed two workers to become contaminated by conducting a walk-down of the fuel chute without adequate radiological protection.

None of this presents a very reassuring picture for persons who live in the communities near CY. We are forced to rely upon your agency to police CY's on-going, systemic incompetence in the area of radiological controls. Moreover, even when in a shut-down condition, CY's inability to maintain operations also created a near disaster in the Fall of 1996, when a nitrogen bubble was allowed to form in the reactor vessel and begin displacing cooling water.

Given this history and your agency's failure to adequately sanction CY's operators for the mess they have made of the reactor site and surrounding community, and the danger in which they have unnecessarily placed us, discussions at the March 11, 1998 NRC conference at CY are particularly disturbing.

During the course of March 11th discussions between your agency and CY concerning issues remaining prior to lifting the CAL, Mr. John Haseltine, Engineering Director of CY, told your staff of the plans for establishing a Spent Fuel Pool island during decommissioning of the facility. In the course of that discussion, Mr. Haseltine, said that in the worst case scenario where loss of the forced air cooling system (which will be used to replace service water cooling) could not be restored, CY planned to open the hatch and doors of the fuel pool building to cool the pool by venting with ~~ambient~~ ambient air.

This suggestion amounts to designing in the unmonitored, unplanned release of radiation into the environment of the communities around CY as one of the back-up safety systems. Your staff listened to this without comment.

We believe that CY's proposal, particularly in the light of its history and its being under a CAL for failure to exercise adequate radiological controls, is a

violation of the most fundamental terms of its license and warrants immediate suspension of the license pending a full investigation of the matter. Despite your agency's efforts, CY still does not comprehend the notion of the "defense in depth" approach to back-up safety systems. If a licensee cannot manage to come up in advance with a set of back-up safety systems that avoid planning to vent radiation into the local community as one of the "back-up" safety systems, they should not be allowed to have a license.

Thank you for your consideration of this matter.

Sincerely,

Rosemary Bassilakis
Citizens Awareness Network, Inc. (CT)
54 Old Turnpike Road
Haddam, CT 06438

Jonathan M. Block
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Deborah B. Katz (CMO)
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President, Citizens Awareness Network
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