CONNECTICUT YANKEE ATOMIC POWER COMPANY

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

JUL 27 2005

Docket No. 50-213
CY-05-167

Re: 10 CFR 50.71(e)

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

Haddam Neck Plant
Decommissioning Updated Final Safety Analysis Report

The purpose of this letter is for Connecticut Yankee Atomic Power Company (CYAPCO) to submit a revision to the Haddam Neck Plant Decommissioning Updated Final Safety Analysis Report (UFSAR) as required by 10 CFR 50.71(e). This revision is provided in Attachment 1. This revision contains replacements pages, with insert instructions, for the Decommissioning UFSAR submitted on April 19, 2004[1].

Pursuant to 10 CFR 50.71(e)(2)(i), I certify that this revision accurately presents changes completed since our previous submittal that are necessary to reflect information and analyses associated with: (1) changing plant conditions during decommissioning, and (2) the transfer of spent fuel from the Spent Fuel Pool to an Independent Spent Fuel Storage Installation at the Haddam Neck Plant (HNP) site. As the plant continues to abandon and decommission structures, systems, and components, the UFSAR will be updated in accordance with 10 CFR 50.71(e)(4).

As stipulated in 10 CFR 50.71(e)(2)(ii): "This submittal shall include an identification of changes made under the provisions of Section 50.59, but not previously submitted to the Commission." Accordingly, the 50.59 evaluations for the FSAR changes in this submittal have been included with the 10 CFR 50.59 annual report for the HNP which was submitted on February 17, 2005[2] pursuant to 10 CFR 50.59(b).

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(1) W. Norton (CYAPCO) letter to the U. S. Nuclear Regulatory Commission, "Decommissioning Updated Final Safety Analysis Report," dated April 19, 2004.

(2) G. P. van Noordennen (CYAPCO) letter to the U. S. Nuclear Regulatory Commission, "10 CFR 50.59 Summary Report," dated February 17, 2005.

A053
NMSS01

If the NRC should have any questions, please contact Mr. G. P. van Noordennen at (860) 267-3938.

Sincerely,

Wayne Norton
President

7/27/05
Date

Subscribed and sworn before me

This 27th day of July, 2005

Gerard P. van Noordennen
Notary Public

My Commission Expires 12-31-2007

Attachment

cc: S. J. Collins, NRC Region I Administrator
T. B. Smith, NRC Project Manager, Haddam Neck Plant
Dr. E. L. Wilds, Jr., Director, CT DEP Monitoring and Radiation Division

# Attachment 1

**Haddam Neck Plant**

**Updated Final Safety Analysis Report**

**Replacement Pages Only with Insert Instructions**

July 2005

HADDAM NECK PLANT
FINAL SAFETY ANALYSIS REPORT
July 2005 Update
Insert Instructions – Page 1 of 4

Please revise your controlled copy per instruction below:

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| List of Effective Pages, Pages EP-1 through EP-6 | February 2005 | List of Effective Pages, Pages EP-1 through EP-4 | July 2005 | Admin. change |
| Chapter 1, Table of Contents, Page 1-i | February 2005 | Chapter 1, Table of Contents, Page 1-i | July 2005 | LBDCR #54 |
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| Chapter 1, Table 1.1-1 | February 2004 | None | N/A | LBDCR #54 |
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| Chapter 15, Tables 15.2-1 through 15.2-7 | various | None | N/A | LBDCR #54 |

Notes:

1. The following Chapter 2 Pages were updated in November 2004 and distributed to the controlled copy holders of the HNP UFSAR via Memo RACY-04-095 dated November 22, 2004 and these pages are included in Attachment 2.

   Chapter 2, Table of Contents Pages 2-i and 2-iv,
   Chapter 2, Pages 2.1-1 through 2.1-6,
   and Chapter 2, Figure 2.1-3.

2. The following Chapter 11 page was updated in February 2005 and distributed to the controlled copy holders of the HNP-UFSAR via Memo RACY-05-012 dated February 2, 2005 and this page is included in Attachment 2.

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HADDAM NECK PLANT UFSAR

CHAPTER 1

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# CHAPTER 1

## INTRODUCTION AND GENERAL DESCRIPTION OF PLANT

### 1.1 INTRODUCTION

In December of 1996, Connecticut Yankee Atomic Power Company (CYAPCO) certified to the NRC of the permanent cessation of operations of the Haddam Neck Plant (HNP) and that all of the fuel assemblies have been permanently removed from the reactor vessel and placed in the Spent Fuel Pool (Reference 1.1-1). Following the cessation of operations, CYAPCO has started to decommission the HNP. On March 30, 2005, all spent fuel and Greater than Class C (GTCC) waste have been removed from the Spent Fuel Pool and stored in an Independent Spent Fuel Storage Installation (ISFSI) at the HNP site.

This Updated Final Safety Analysis Report (UFSAR) for the Haddam Neck Plant was prepared using the guidance of Regulatory Guide 1.70, Revision 3, Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants, LWR Edition, dated November 1978, as applicable. The UFSAR is intended to be responsive to the guide, to existing regulations, and to NUREG-75/087, Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants, LWR Edition, to the extent possible. Since the cessation of operations at the HNP and removal of Spent Fuel from the Spent Fuel Pool, many of the Structures, Systems and Components (SSC) are no longer required to safely store spent fuel. Therefore, the UFSAR has been revised to describe the advance stage of decommissioning and the permanent removal of all Spent Fuel and GTCC waste from the Spent Fuel Pool to the ISFSI.

CYAPCO performed SSC evaluations to determine what function, if any, would be expected to be performed during the evolution to a decommissioned plant. Each major plant SSC was evaluated to determine if the SSC, in its entirety or portions thereof, was required to support maintaining the spent fuel in a safe condition, or not required to perform any function at all. Based on these evaluations the SSCs were grouped into one or more of the categories defined below.

Operable — A SSC which has a safety related function in the decommissioned mode (i.e., maintenance of the spent fuel in a safe condition) or is required to be Operable per the plant Technical Specifications, Technical Requirements Manual (TRM), or other regulatory requirements.

Available — A SSC which is required to be available to perform a non-safety related plant support function (i.e., radwaste processing, HVAC, etc.). The function may be modified or limited from its original design.

Abandoned — A SSC which is no longer required to support any plant activity throughout plant decommissioning efforts.

Modifications or changes in categorization will not have an impact on plant safety because, once a system, or portion, is determined to be in the Available or Abandoned category, it has no safety function in the plant. As a result of these evaluations, the applicable UFSAR sections have been revised to identify the applicable system categorization. A building which houses SSCs will assume the highest functional category of the SSCs inside or attached to the building. Therefore, when all the systems are abandoned in a building, the building is also abandoned.

Changes to the Available or Abandoned portions of UFSAR figures are not considered a change to the facility as described in the UFSAR since it has been documented in the applicable categorization safety evaluations, that any recategorization or modification of these systems/components will not result in a need for prior NRC approval of the change per 10CFR50.59.

## 1.2 GENERAL PLANT DESCRIPTION

This section includes a summary description of the principal characteristics of the site and a concise description of the Haddam Neck Plant.

### 1.2.1 General

Prior to the certification of the permanent cessation of operations, the Haddam Neck Plant incorporated a 4-loop closed-cycle pressurized water type nuclear steam supply system (NSSS); a turbine generator and electrical systems; engineered safety features; radioactive waste systems; fuel handling systems; structures and other on-site facilities; instrumentation and control systems; and the necessary auxiliaries required for a complete and operable nuclear power station. As of March 30, 2005, all of the Spent Fuel and GTCC waste has been transferred from the Spent Fuel Pool to the ISFSI at the Haddam Neck Plant site. The site plan (Figure 2.1-3) and the plot plan (Figure 2.1-4) show the general arrangement of the unit at the time the decision was made to decommission.

### 1.2.2 Site

The Haddam Neck Plant is located in the town of Haddam, on the east bank of the Connecticut River. The site consists of 525 acres. The minimum distance from the reactor containment to the site boundary is 1,740 ft, except for the near river bank where the distance is 600 ft. The distance to the nearest residence is over 2,000 ft. Except for several small towns and villages and a portion of Middletown, the area within a ten-mile radius is predominantly rural. The majority of this area is wooded, with the remaining open area devoted to general farming, resorts and some minor industry.

An extensive and carefully coordinated program of seismic exploration and borings was developed. Although it was the consensus of seismologists that Connecticut is a seismically stable area, structures and systems essential to the safe storage of spent fuel have been designed for a moderately strong earthquake having a maximum zero period ground [Bedrock] acceleration of 0.17 g.

### 1.2.3 Structures

With the removal of all Spent Fuel and GTCC from the Spent Fuel Pool and their transfer to the ISFSI, there are no major remaining structures of the Haddam Neck Plant that continue to serve a function in the decommissioning state. The only structure, systems and components remaining at the HNP site are those associated with radioactive effluent release control and monitoring.

1.2.4 Plant Systems

### 1.2.4.1 Normal and Emergency Power Systems

**DELETED**

1.2.4.2 Fuel Storage and Handling

### 1.2.4.2.1 Fuel Handling and Storage in the Spent Fuel Pool

**DELETED**

1.2.4.2.2 Dry Fuel Storage

To enable decommissioning of the Spent Fuel Building and provide for safe storage of the HNP spent fuel, an Independent Spent Fuel Storage Installation (ISFSI) was constructed for the dry storage of spent fuel under the General License provisions of 10 CFR 72 Appendix K (Reference 1.2-1).

1.2.4.3 Fire Protection

The fire protection system furnishes the capacity to extinguish and/or control any potential fires which might occur at the Haddam Neck Plant. The fire protection program consists of water suppression and detection systems. The overall objective of the fire protection program is to administratively control combustible loading due to the decommissioning of the HNP. As a result, the amount of equipment requiring fire protection has been reduced. Section 9.5.1 of this document provides a discussion of the revised scope of the fire protection systems and its categorization.

1.2.4.4 Radioactive Waste Systems

Radioactive wastes are collected, processed, and disposed of in a safe manner complying with appropriate regulations.

## REFERENCES

1.2-1 Connecticut Yankee Atomic Power Company – Haddam Neck Plant, Independent Spent Fuel Storage Installation (HNP ISFSI), 10 CFR 72.212 Evaluation Report.

## 1.4 MATERIAL INCORPORATED BY REFERENCE

### 1.4.1 License Termination Plan

The License Termination Plan (LTP) is incorporated by reference. Changes to the LTP must be assessed in accordance with the requirements of 10 CFR 50.59 and License Condition 2.(7). The LTP was approved by the NRC as Amendment 197 (Reference 1.4-1)

CHAPTER 3

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The GDC were not written specifically for a nuclear power plant that is permanently defueled or being decommissioned. When the HNP was an operating plant, CYAPCO made statements in this document of conformance to only GDC 3, 19, 60, 62, 63 and 64. The remaining GDCs are either not applicable to the HNP, or if they are, the respective sections of this document address the degree of conformance to the intent of the criteria. Although not committed to meet the listed GDCs, CYAPCO's conformance is summarized below.

#### 3.1.1.1 Criteria Conformance

##### 3.1.1.1.1 Fire Protection (Criterion 3)

Criterion

"Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions. Noncombustible and heat-resistant materials shall be used wherever practical throughout the unit, particularly in locations such as the containment and control room. Fire detection and fighting systems of appropriate capacity and capability shall be provided and designed to minimize the adverse effects of fires on structures, systems, and components important to safety. Fire fighting systems shall be designed to assure that their rupture or inadvertent operation does not significantly impair the safety capability of these structures, systems and components."

Design Conformance

The regulatory requirements for the Connecticut Yankee Decommissioning Fire Protection Program are set forth in 10 CFR 50.48(f). In accordance with 10 CFR 50.48(f), the Decommissioning Fire Protection Program shall establish the fire protection policy for the protection of structures, systems and components from fires which could cause the release or spread of radioactive materials from the time that the plant ceases operation until the plant is completely decommissioned. This includes the personnel, procedures and equipment required to implement the program. Subject to the requirements of 10 CFR 50.48(f), the licensee (Haddam Neck Plant) may make changes to the Decommissioning Fire Protection Program without prior NRC approval provided the changes do not reduce the effectiveness of fire protection for structures, systems and equipment that could result in a radiological hazard, taking into account the plant conditions and activities during decommissioning.

#### 3.1.1.1.2 Control of Releases of Radioactive Materials to the Environment (Criterion 60)

Criterion

"The nuclear power unit design shall include means to control suitably the release of radioactive materials in gaseous and liquid effluents and to handle radioactive solid wastes produced during normal reactor operation, including anticipated operational occurrences. Sufficient holdup capacity shall be provided for retention of gaseous and liquid effluents containing radioactive materials, particularly where unfavorable site environmental conditions can be expected to impose unusual operational limitations upon the release of such effluents to the environment."

Design Conformance

In all cases, the design for radioactivity control is based on:

1. The requirements of 10 CFR 20, 10 CFR 50, and Appendix I to 10 CFR 50 for normal operations and for any transient situation that might reasonably be anticipated to occur.

2. 10 CFR 100 dose level guidelines for potential accidents of extremely low probability of occurrence.

All release paths, including ventilation and process streams, are monitored and controlled as described in Section 11.5.

Due to cessation of power operation, radioactive gases are no longer being generated at the HNP. Solid wastes are prepared for offsite disposal as described in Section 11.4.

Control of liquid waste effluents (Sections 11.2 and 11.5) is maintained by batch processing of all liquids, sampling before discharge, and a controlled rate of release. Liquid effluents are monitored for radioactivity and rate of flow. Radioactive liquid waste is processed by a demineralizer system of sufficient capacity to handle any expected transient in the processing of liquid waste.

3.1.1.1.3 Prevention of Criticality in Fuel Storage and Handling (Criterion 62)

Criterion

"Criticality in the fuel storage and handling system shall be prevented by physical systems or processes, preferably by use of geometrically safe configurations."

Design Conformance

Criterion 6.2 is no longer applicable to the HNP since all the Spent Fuel and GTCC waste have been removed from the Spent Fuel Pool and transferred to the ISFSI.

3.1.1.1.4 Monitoring Fuel and Waste Storage (Criterion 63)

Criterion

"Appropriate systems shall be provided in fuel storage and radioactive waste systems and associated handling areas (1) to detect conditions that may result in loss of residual heat removal capability and excessive radiation levels and (2) to initiate appropriate safety actions."

Design Conformance

Criterion 63, with respect to monitoring fuel, is no longer applicable to the HNP since all the Spent Fuel have been removed from the Spent Fuel Pool and transferred to the ISFSI.

The minimum amount of radioactivity that remain do not require the installation and operation of permanent monitoring systems. Surveys are conducted as necessary for radioactive waste systems and handling area to detect excessive radiation levels initiate appropriate safety actions.

### 3.1.1.1.5 Monitoring Radioactivity Releases (Criterion 64)

Criterion

"Means shall be provided for monitoring the reactor containment atmosphere, spaces containing components for recirculation of loss-of-coolant accident fluids, effluent discharge paths, and the plant environs for radioactivity that may be released from normal operations, including anticipated operational occurrences, and from postulated accidents."

Design Conformance

The portion of Criterion 64 on reactor containment atmosphere and spaces containing components for recirculation of loss-of-coolant accident fluids is not applicable to the HNP.

Normal plant effluent discharge paths are monitored during normal plant operation by the ventilation particulate samplers. Radioactivity levels in the environs are controlled during normal and accident conditions by the various radiation monitoring systems (Sections 11.5 and 12.3.4) and monitored by the collection of samples as part of the offsite radiological monitoring program.

## 3.1.2 Systematic Evaluation Program and Three Mile Island Evaluations of General Design Criteria

During the Systematic Evaluation Program (SEP) initiated by the NRC in 1977, a large number of generic and plant specific safety concerns were addressed and resolved, Reference 3.1-4. Many of these SEP issues, and later, issues which arose from the Three Mile Island (TMI) accident involved a consideration of the NRC GDC affected by a specific issue and how the plant design compared to the criteria. Although compliance with GDCs was not required, the degree of compliance with the intent of the GDCs during power operations was maintained consistent with the July 1971 assessment and the SEP review. Following the permanent cessation of power operations, CYAPCO canceled the remaining SEP open issues listed in Reference 1.8-2 which were controlled under the Integrated Implementation Schedule (IIS) in the Integrated Safety Assessment Program (ISAP). The NRC removed the license condition concerning ISAP from the HNP operating license, Reference 3.1-7.

## 3.2 CLASSIFICATION OF STRUCTURES, COMPONENTS, AND SYSTEMS

The classification of structures, systems and components (SSCs) remaining at the Haddam Neck Plant (HNP) site, reflects the current advanced stage of decommissioning and the permanent removal of all spent fuel and GTCC waste from the Spent Fuel Pool to the Independent Spent Fuel Storage Installation (ISFSI), (Reference 3.2.1). The only safety significance SSCs remaining at the HNP site are those associated with radioactive effluent release control and monitoring.

REFERENCES

3.2-1 CY-DCR-00-001-05, "Declassification/Re-Classification of Systems, Structures and Components based on removal of all Spent Fuel and GTCC waste from the Spent Fuel Pool".

## 3.3 WIND AND TORNADO LOADINGS

The original licensing basis of the Haddam Neck Plant (HNP), established by the Facility Description and Safety Analysis Report, did not contain a requirement to design or analyze for the effects of tornado wind or tornado missiles, References 3.3-1 and 3.3-2. In the early 1980's the NRC implemented a program of reviews of older operating commercial nuclear power plants, i.e., Systematic Evaluation Program (SEP) Topics. This program was based on the concern that older plants, such as the HNP, were licensed under regulations that were less stringent than the criteria current at the time. In response to the SEP, a reevaluation of the plant design was initiated to assess the significance of differences between current design criteria and original plant design criteria, References 3.3-1, 3.3-2, 3.3-3 and 3.3-4.

A tornado wind speed, adopted for the SEP review, was as defined in Regulatory Guide 1.76 which showed that the HNP site is in tornado intensity Region I. This correlated with a tornado wind speed of 360 mph with an occurrence frequency of $10^{-7}$ per year, Reference 3.3-5. This wind speed is considered a conservative upper bound based on current practice and regulatory guidance. The SEP was an analytical review, and in the case of wind and tornado, did not change the original wind and tornado loading licensing and design basis of the HNP.

## REFERENCES


3.3-1 Letter from W.G. Counsil to D.L. Ziemann dated September 7, 1979, Subject "SEP Structural Topics." Docket No. 50-213.

3.3-2 Letter from W.G. Counsil to D.M. Crutchfield dated December 14, 1981, Subject: "SEP Topic III-2, Wind and Tornado Loadings, Haddam Neck Plant." Docket No. 50-213, B10273.

3.3-3 Letter from W.G. Counsil to D.M. Crutchfield dated April 6, 1982, Subject "SEP Topic III-2, Wind and Tornado Loading, Haddam Neck Plant." Docket No. 50-213 B10465 N.U. Uniqueness No. 91440033.

3.3-4 Letter from D.M. Crutchfield to W.G. Counsil dated September 2, 1982, Subject: "SEP Topic III-2, Wind and Tornado Loadings Haddam Neck Plant." Docket No. 50-213 LS05-82-09-013 N.U. Uniqueness No. 91740015.

3.3-5 Letter from the NRC to CYAPCO dated August 2, 1982, "SEP Topic III-4.A, Tornado Missiles - Haddam Neck".

## 3.4 WATER LEVEL DESIGN

DELETED

## 3.5 MISSILE PROTECTION

DELETED

## 3.7 SEISMIC DESIGN

DELETED

## 3.8 DESIGN OF CLASS I AND CLASS II STRUCTURES

DELETED

## 3.9 MECHANICAL SYSTEM AND COMPONENTS

DELETED

## 3.10 INSTRUMENTATION AND ELECTRIC EQUIPMENT

DELETED

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## 4.3 NUCLEAR DESIGN

DELETED

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## 6.2 CONTAINMENT SYSTEM

DELETED

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# CHAPTER 7

## INSTRUMENTATION AND CONTROLS

7.0 DELETED

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# CHAPTER 8

# ELECTRIC POWER

## 8.1 ISFSI and Monitoring Station 120/240V System

Power to the ISFSI Electrical Equipment Enclosure (EEE) Building, ISFSI Monitoring Station and Guard House is supplied from a 23 kV overhead utility line that feeds a 23 kV to 120/240V, single phase transformer located near the ISFSI Monitoring Station. The system provides power to emergency and non-emergency loads.

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# CHAPTER 9

## AUXILIARY SYSTEMS

## 9.1 FUEL STORAGE AND HANDLING

### 9.1.1 New Fuel Storage

Since the Haddam Neck Plant has permanently ceased operations there is no longer a need for new fuel on the site. In addition, all new fuel that was onsite has been removed. Since new fuel will never again be needed at the HNP, the new fuel storage area of the plant will not be used to store new fuel. The new fuel storage racks have been categorized as abandoned and have been removed.

### 9.1.2 Spent Fuel Storage

Approval to store spent fuel at the HNP Independent Spent Fuel Storage Installation (ISFSI) was granted by the NRC under Subpart K of 10 CFR 72. The ISFSI is a passive, dry cask storage system. A single dry storage cask consists of a transportable storage canister within a vertical concrete cask. The dry storage casks are arranged on a concrete storage pad (Reference 9.1-1).

REFERENCES

9.1-1 Connecticut Yankee Atomic Power Company – Haddam neck Plant – Independent Spent Fuel Storage Installation (HNP – ISFSI), 10 CFR 72.212 Evaluation Report.

## 9.4 AIR CONDITIONING, HEATING, COOLING AND VENTILATION SYSTEMS

DELETED

# 9.5 OTHER AUXILIARY SYSTEMS

## 9.5.1 Fire Protection Systems

A Fire Protection Program that addresses the decommissioned status of the plant, as required by 10 CFR 50.4(f), has been established and is procedurally controlled at the Haddam Neck Plant. The Connecticut Yankee Decommissioning Fire Protection Program Manual, Reference 9.5-1, has been developed to ensure that the risk of fire-induced radiological hazards to the public, environment, and plant personnel is minimized. The Connecticut Yankee Fire Hazard Analysis (FHA) (Reference 9.5-2) addresses the plant areas that are a concern in a fire. The FHA will evaluate the status of the fire protection systems and fire areas that where in accordance with 10 CFR 50.48(c), there is a potential for fires which could cause the release or spread of radioactive materials, that could result in a radiological hazard. As plant conditions change during decommissioning, the FHA may be revised as applicable to support plant conditions.

## 9.5.2 Communication Systems

### 9.5.2.1 Design Bases

Reliable communication systems are provided for in plant and plant-to-offsite communication. The systems are available for day-to-day communication and to support the emergency response activities related to the emergencies that may arise at the HNP during decommissioning activities and emergencies that may arise while spent fuel and GTCC waste are stored at the ISFSI.

## 9.5.3 Lighting Systems

DELETED

REFERENCES

9.5-1 CY Decommissioning Fire Protection Program Manual.

9.5-2 Connecticut Yankee Decommissioning Fire Hazards Analysis.

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## 11.2 LIQUID WASTE MANAGEMENT SYSTEMS

During decommissioning, the liquid waste system is used to collect, hold, process, and dispose of potentially radioactive water in the plant. All spent fuel has been removed from the Spent Fuel Pool for dry storage and this liquid waste system will be used to process the spent fuel pool water for discharge. The system also processes water from sources such as groundwater in-leakage, cleaning of components and buildings, and waste water from resin vessels.

### 11.2.1 Design Bases

The liquid waste system is designed to collect, hold, process and dispose of potentially radioactive liquids generated by the plant to meet the requirements of 10 CFR 20. It also removes non-radiological contaminants to meet state and Environmental Protection Agency standards prior to discharge. The design of systems to control and monitor liquid effluents meets the intent of Regulatory Guide 1.143.

Liquid effluents are controlled and monitored as described in Section 11.5, to meet the intent of General Design Criteria 60 and 64 of Appendix A to 10 CFR 50 and the NPDES permit.

### 11.2.2 System Description

The liquid waste system includes provisions to collect and hold water from plant systems. This water is processed to remove radioactive and chemical contaminants; and collected in test tank(s) prior to discharge. The system is shown in Figure 11.2-1.

Water for processing is collected in various plant sumps, tank and component dikes, and various intermediate tanks. It is also collected in various systems.

From the collection points, water is generally transferred to holdup tank(s). These tank(s) may be temporary tank(s). The holdup tank(s) serve to allow a batch of water to be collected. The collected water may be sampled and analyzed, as necessary, to determine the appropriate treatment prior to discharge. Water from other sources that can be sampled and analyzed may also be directly processed. If required, water in the holdup tank(s) may be treated to reduce biological growth prior to processing.

Water is processed to temporary test tank(s) prior to discharge. This processing consists of filtration and ion exchange to remove solids and chemical contaminants, as necessary to satisfy release criteria. Other processing, such as reverse osmosis to reduce boron concentration, may also be employed as required.

In the temporary test tank(s), the processed water is adjusted for pH, and the contents thoroughly mixed. Following mixing, the tank contents are sampled and analyzed for activity and chemical content to ensure they meet the required limits for discharge as specified in the REMODCM and the NPDES permit.

The tested water is released to the Connecticut River via the plant's discharge canal. Other suitable sources may provide flow for dilution of liquid waste, as necessary. During discharge, wastewater passes through a flow instrument which is used to control the discharge rate in accordance with state and federal discharge requirements. Wastewater also passes through a radiation monitor (R-22), as required per the REMODCM. This radiation monitor will terminate flow by closing the flow control valve, if excessive activity is detected. The wastewater is then released to the discharge canal. The discharge canal is flushed to the Connecticut River by means of tidal flow. Compensatory actions are provided should this radiation monitor be out of service.

If the wastewater in the test tank(s) does not meet the criteria for discharge, it may be reprocessed, or polished until the criteria for discharge is met.

### 11.2.3 Radioactive Releases

A current summation of all releases and current off-site dose estimates resulting from liquid effluents are provided in Reference 11.2-1, the Annual Radioactive Effluents Release Report. The methods and criteria for determining the contents of Reference 11.2-1 are contained in Reference 11.2-2, the Radiological Effluent Monitoring and Off-Site Dose Calculation Manual and Process Control Program. Reference 11.2-2 provides sampling and analysis programs and meets the intent of 10 CFR 10 and 10 CFR 50. In addition, it outlines the information to be submitted to the NRC in Reference 11.2-1 and in Reference 11.2-3, the Annual Radiological Environmental Operating Report.

### 11.2.4 Safety Evaluation

Reference 11.2-4 provides the safety evaluation for the categorization of the liquid waste system. A synopsis of the safety evaluation is provided in the following paragraphs.

The portions of the liquid waste system categorized as Operable are the waste test tank effluent monitor (R-22), the waste liquid effluent discharge flow recorder/controller (FRC-1003), and associated instrumentation loop, up to and including, air operated valve WD-FRCV-1003. This value, which is used to control the flow rate of the radioactive liquid being discharged, is modulated by FRC-1003 and fails closed on a loss of control air and on a loss of power. Channel R-22 monitors all waste liquid effluents to the discharge canal. In the event that radiation levels are above the acceptance level, R-22 will automatically stop the waste effluent release by closing FRCV-1003. Maintaining these portions of the liquid waste system in the Operable category will satisfy applicable regulatory requirements. Maintaining the waste test tank effluent monitor (R-22) and the waste liquid effluent discharge flow recorder/controller (FRC-1003) in the Operable category will allow the liquid waste system to continue to accomplish its function.

The liquid waste system serves as a collection point for plant generated liquid radwastes; consequently, it interfaces with those plant systems which generate liquid radwaste. Maintaining the identified portions of the system as Available will allow this system to continue to accomplish this function. Maintaining the identified portions of the liquid waste system as Available will satisfy applicable regulatory requirements and will support releases controlled by the REMODCM.

As decommissioning proceeds, changes to the liquid waste processing system may be required. These are reviewed under the criteria of IE Circular 80-18, "10 CFR 50.59, Safety

Evaluations for Changes to Radioactive Waste Treatment Systems". System modifications are evaluated against the seismic, quality group, and quality assurance criteria of Regulatory Guide 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants". Should any new release points be created, they are evaluated under Regulatory Guide 1.21, "Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents form Light-Water-Cooled Nuclear Power Plants". A radiological evaluation has been performed to ensure that the curie loading of components, such as filters and ion exchangers, will not exceed that assumed in the bounding events of Chapter 15.

### 11.2.5 Disposition of Discharge Canal Dredging Spoils On-Site

Reference 11.2-5 presents historical information concerning the disposition of discharge canal spoils on owner controlled property in 1987.

Reference 11.2-5 presented the dose analysis results (developed in Reference 11.2-6) that at no time has the total effective dose equivalent from the material exceeded 1 millirem in a year.

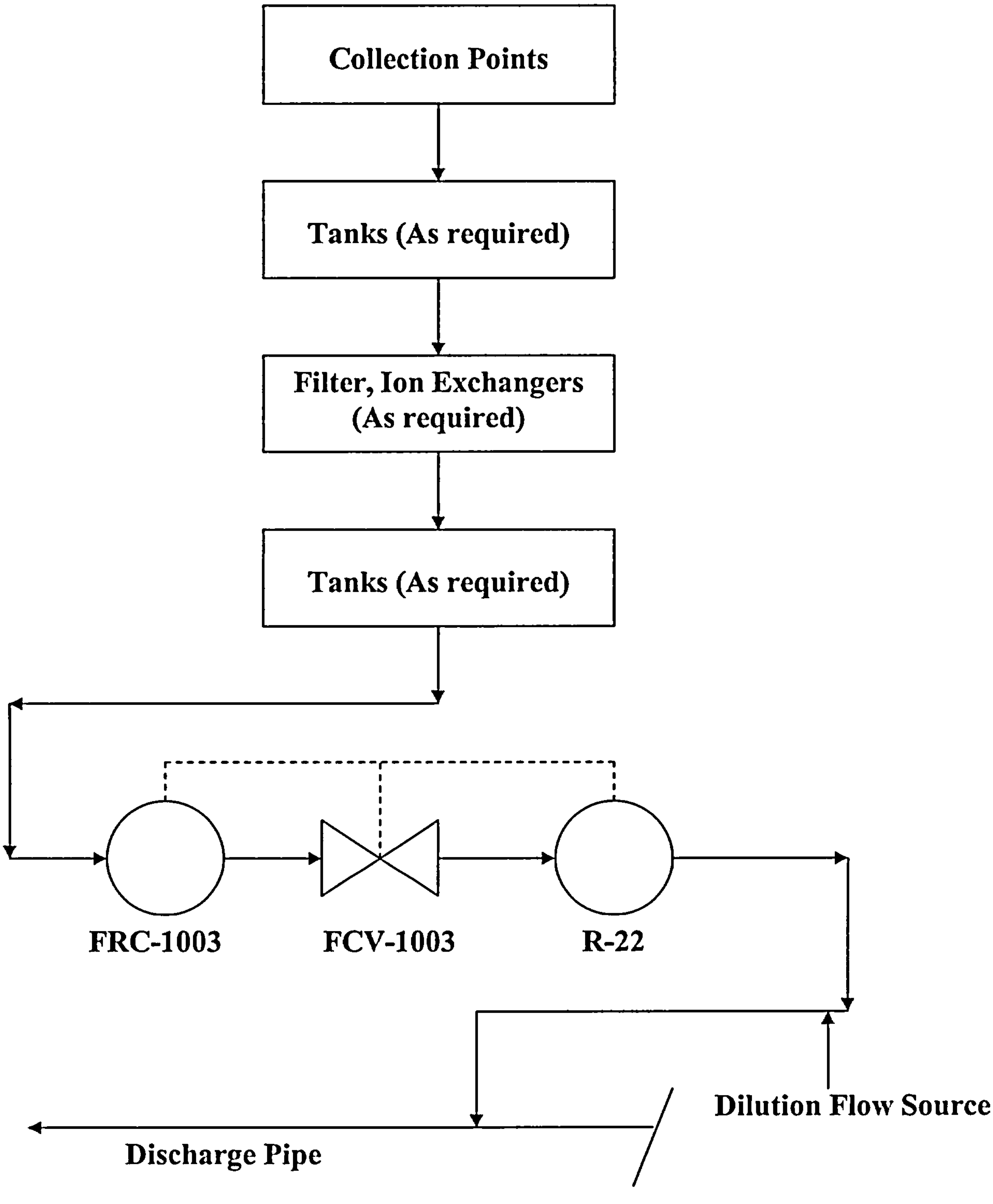


Figure 11.2-1 – Liquid Waste System

## 11.3 GASEOUS WASTE MANAGEMENT SYSTEM

Radioactive gases are no longer generated at the HNP since the cessation of power operations. At this time all spent fuel has been removed from the reactor and spent fuel pool and is maintained in storage at the Independent Spent Fuel Storage Installation (ISFSI). Therefore the Gaseous Waste Management System is no longer required. All gaseous radioactive waste systems have been classified as Abandoned and have been decommissioned. Their components have been removed and disposed. Therefore, no residual radioactive noble gas is available for release at the site.

## 11.4 SOLID WASTE MANAGEMENT SYSTEM

The function of the solid waste system is to receive, concentrate, solidify (as necessary) package, collect and store radioactive wastes that result from plant operation, maintenance and decommissioning activities.

### 11.4.1 Design Bases

The radioactive solid waste system is designed to:

(1) Package radioactive solid wastes for off-site shipment and disposal in accordance with the applicable Nuclear Regulatory Commission and Department of Transportation (DOT) regulations. DOT approved steel or high integrity liners and shipping containers are used for the packaging of dry solid wastes, solidified liquid waste, spent resins, and spent filter cartridges.

(2) Achieve system safety compliance requirements by the equipment layout, shielding, accurate radiation and process monitoring, and remotely operated and reliable equipment.

(3) Contain selected equipment and storage capacities which meet the station's solid waste processing requirements.

(4) DELETED

(5) Hold Dry Activated Waste (DAW) in the Radwaste Reduction Facility (RRF). The capacity of the RRF is dependent upon:

  a) the wastes generated, and

  b) waste volume reduction techniques employed.

(6) Collect and store dried spent filter cartridges and/or other similar dried radioactive waste in on-site storage containers.

(7) Collect and store DAW in Sea/Land type containers

(8) Store three canisters of Greater Than Class C radioactive waste in three concrete casks on the ISFSI pad.

### 11.4.2 System Description

The types of wastes handled and processed include the following:

(1) Demineralizer spent resins

(2) Expended cartridge filter elements

(3) Contaminated dry wastes consisting of air filters, miscellaneous paper, rags, etc., from contaminated areas; contaminated clothing; tools and equipment parts; and solid laboratory wastes.

The estimated volumes and the activities and isotopic contents of solid wastes are given in Reference 11.2-1, the Annual Radioactive Effluent and Waste Disposal Report.

#### 11.4.2.1 Handling of Spent Resins

Spent resins from radioactive demineralizers are handled/disposed of by using temporary equipment and plant procedures.

#### 11.4.2.2 Handling of Dry Solid Wastes

Contaminated DAW and metallic materials are placed into suitable transport packages, for storage and transport to a waste processor and/or disposal. Equipment too large to be handled in this way are first cut into small pieces before placement in the packages.

#### 11.4.2.3 GTCC Waste Storage

The GTCC waste is stored in three stainless steel canisters which have been evacuated of water, filled with helium and welded shut. Each canister is stored within a concrete cask on the ISFSI pad. The canister and casks are described in reference 11.4.1.

# 11.5 PROCESS AND EFFLUENT RADIOLOGICAL MONITORING

## 11.5.1 Process Radiological Monitoring

Since all spent fuel have been removed from the Spent Fuel Pool and stored at the ISFSI, process radiation monitoring is no longer required in the Spent Fuel Island. Any ventilation in the Spent Fuel Building will be sampled in accordance with REMODCM to ensure effluent control is maintained. Area monitoring for personnel protection during decommissioning is controlled by Health Physics Procedures.

## 11.5.2 Effluent Radiological Monitoring

Channel R-22: Test Tank Effluent Monitor

As described in Section 11.2, Channel R-22 may be used to sample the waste and recycle test tanks. A slipstream sample is taken from the process prior to entering the discharge line. The sample flow enters the monitor and passes through a lead shielded liquid sampler with check source. The sampler houses a scintillation detector. A high activity alarm results in the automatic closing of the Waste Discharge Flow Control Valve.

Channel R-22 supports corresponding requirements of the Radiological Effluent and Monitoring and Offsite Dose Calculation Manual (REMODCM) (Reference 11.5-1) radioactive effluent monitoring. The REMODCM also includes alternative action requirements corresponding to a status of Channel R-22 that does not support the same effluent monitoring instrument requirements. The REMODCM includes corresponding requirements for instrumentation to monitor the discharge flow rate from the Recycle Test Tank discharge line. Additionally, the REMODCM includes alternative action requirements corresponding to a status of the discharge line flow instrument that does not support the same effluent monitoring instrument requirements.

The sensitivity for liquid effluent monitor Channel R-22 is listed in Table 11.5-1. The operating range for the channel is listed in Table 11.5-2. The channel is provided with interim decommissioning electrical power.

## REFERENCES

11.5-1 Haddam Neck Plant, Docket No. 50-213, Radiological Effluent Monitoring and Offsite Dose Calculation Manual

TABLE 11.5-1

Liquid and Gaseous Process Radiation Monitor Channels

Channel Sensitivities

| Channel | Sensitivity (μCi/cc) Minimum | | Maximum | Isotope |
|---|---|---|---|---|
| R-22 | $1.0 \times 10^{-5}$ | to | $1.0 \times 10^{-2}$ | $Co^{60}$, $Cs^{137}$ |

# TABLE 11.5-2

## Liquid and Gaseous Process Radiation Monitor Channels

## Channel Operating Ranges

| Channel | Operating Range |
|---|---|
| R-22 | 10 to $10^6$ cpm |

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## 12.3 RADIATION PROTECTION DESIGN FEATURES

### 12.3.1 Facility Design Features

The radiation shielding was designed to ensure that the criteria specified in 10 CFR 20, "Standards for Protection Against Radiation," would be met with the plant at a power level of 1,825 Mwt. However, the Haddam Neck Plant has permanently ceased power operations and the fuel has been permanently moved from the spent fuel pool, and stored at the ISFSI. Since all fuel resides at the ISFSI, and will never be returned to the plant, radiation shielding is only required at the ISFSI as part of the NAC-MPC system design.

### 12.3.2 Shielding

Fuel Handling Shielding

The NAC-MPC canister has 5/8 inch cylinder walls with a 5 inch and 3 inch shield and structural lids. The canister is contained in a concrete cask with side walls constructed of 3.5 inches of steel and 21 inches of concrete as described in reference 12.3-1.

### 12.3.3 Area Radiation Monitoring Instrumentation

Since all spent fuel has been removed from the Spent Fuel Pool and stored at the ISFSI, area radiation monitoring is not required for safety of fuel in the Spent Fuel Building. Area monitoring for personnel protection during decommissioning is conducted on an as needed basis in accordance with Health Physics Procedures.

## 12.5 HEALTH PHYSICS PROGRAM

### 12.5.1 Organization

The health physics program is established to provide an effective means of radiation protection for employees and visitors at the station. To provide an effective means of radiation protection, the health physics program incorporates a philosophy from management (Section 12.1); employs qualified personnel to supervise and implement the program (Section 13.2); provides appropriate equipment and facilities; and utilizes written procedures designed to provide protection of station personnel against exposure to radiation and radioactive materials in a manner consistent with Federal and State regulations (Section 13.5). The health physics program was developed and is implemented based upon regulations, and regulatory and industry guidance.

Station procedures and policies provide the overall guidance for establishing the health physics program. Programmatic procedures and policies provide the requirements and philosophies from which station implementing procedures are derived.

The Health Physics Manager shall meet or exceed the qualifications for Radiation Protection Manager in Regulatory Guide 1.8, Revision 1. Health Physics technicians shall meet or exceed the qualifications specified in ANSI N18.1, 1971. Additional information on the qualifications and experience of the Health Physics personnel can be found in CYQAP.

The Health Physics Department provides health physics coverage for activities that involve radiation or radioactive material.

The Chemistry Section is responsible for measuring the radioactive content of gaseous and liquid effluents from the site in accordance with the requirements of the Technical Specifications and 10 CFR 20.

### 12.5.2 Equipment, Instrumentation, Facilities

The criteria for purchasing the various types of portable and laboratory equipment used in the Health Physics Department are based on several factors. Portable survey and laboratory radiation detection equipment is selected to provide the appropriate detection capabilities, ranges, accuracy and durability required for the expected types and levels of radiation anticipated during decommissioning or emergency conditions. Respiratory protection equipment such as respirators, self-contained breathing apparatus, and respirator filters is consistent with the guidance in 10 CFR 20 and/or National Institute for Occupational Safety and Health (NIOSH). Respiratory protection equipment is used and stored in accordance with station procedures.

Health physics equipment, such as portable survey meters, is maintained by the Health Physics Department. Survey equipment for use in emergency situations is stored in emergency kits which are located in an area local to and immediately available to personnel in the Spent Fuel Island Monitoring Station. Equipment, such as personnel air samplers, is available from the Health Physics Department and will be used at the discretion of the Health Physics Manager or designee.

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## 13.2 TRAINING PROGRAMS

Formal training programs have been established to train and qualify the personnel who operate and maintain the Haddam Neck Plant.

## 13.3 EMERGENCY PLANNING

The Connecticut Yankee Atomic Power Company, Haddam Neck Plant, Emergency Plan, describes CYAPCO's plan for responding to emergencies that may arise while spent nuclear fuel and GTCC waste are stored at the ISFSI and to emergencies that may arise at the HNP Power Plant site during on going decommissioning activities.

## 13.6 PHYSICAL SECURITY PLANS

The Haddam Neck Plant Physical Security Plan provides the security measures for the protection of the Haddam Neck Plant and complies with the requirements of 10 CFR 73.55 (with approved exemptions).

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# CHAPTER 15

## ACCIDENT ANALYSES

### 15.1 SUMMARY

In December of 1996, Connecticut Yankee Atomic Power Company (CYAPCO) certified to the NRC of the permanent cessation of operations of the Haddam Neck Plant (HNP) and that all of the fuel assemblies have been permanently removed from the Reactor Vessel and placed in the Spent Fuel Pool (Reference 15.1-1). Since the HNP will never again enter any operational mode, reactor related accidents are no longer a possibility. Therefore, this chapter of the Updated Final Safety Analysis Report (UFSAR) has been revised to delete the reactor and spent fuel pool storage related accidents. All of Spent Fuel and GTCC waste have been removed from the spent fuel pool and transferred to the ISFSI.

Conservatism in equipment design, conformance to high standards of material and construction, the control of mechanical and pressure loads, the control of the environment of material exposure, and strict administrative control over plant operations all serve to assure the integrity of the spent fuel assemblies in dry storage casks at the ISFSI. Similar designs and conformance controls mitigate the consequences of radioactive releases from postulated subsystems or components.

The layout of this chapter is as follows:

# 15.2 RADIOACTIVE RELEASE FROM A SUBSYSTEM OR COMPONENT

All spent fuel has been removed from the reactor and the spent fuel building and is maintained in dry storage at the ISFSI. The relocation of the spent fuel has eliminated fuel handling as a potential accident source as well as the potential for any storage cask transportation events. Events that may result in a radioactive release are limited to failures in the solid or liquid radioactive waste systems.

## 15.2.1 Radioactive Waste System Failure

### 15.2.1.1 Identification of Causes and Accident Description

Two accidents are considered. One accident is an uncontrolled release of airborne radioactivity from the solid waste disposal system. The other is a liquid radiological release from a Liquid Waste System Failure.

### 15.2.1.2 Solid Waste System Failure

The current accident considered is the release of airborne radioactivity due to a fire involving dry radioactive waste. During the initial years of decommissioning, a fire involving burning resin was considered bounding because class C resin was being produced and dewatered in plastic High Integrity Containers (HICs) where the potential for an exothermic reaction causing a fire existed. All resin used at the site for the remainder of the decommissioning will be contained in metal vessels and dewatering for disposal at an offsite radioactive waste processing facility. Resin waste will no longer be collected or stored in poly HICs for dewatering. Therefore the resin fire accident is no longer a credible accident.

The current bounding accident analysis (ref. 15.2-14) assumes an 1800 cubic foot pile of Dry Active Waste with a dose rate of 100 millrem per hour at 30 centimeters burns uncontrollably and releases 0.5% of the material to the atmosphere. The curie content of the waste is based on a conservative mixture of radionuclides that exist in HNP waste from actual samples. Administrative controls at the site ensure that a pile of DAW of this magnitude will not be exceeded and therefore the analysis is conservative. The release fraction of 0.5% as described in Reference 15.2-14 is considered bounding for a fire of this type.

The accident analysis takes no credit for filtration, confinement inside a building, or plateout of particulated on building surfaces.

The site boundary TEDE dose due to a DAW fire accident is bounded at 0.0014 Rem. This dose is much less than the EPA Protective Action Guidelines (Reference 15.2-3).

### 15.2.1.3 Liquid Waste System Failure

The bounding accident for this scenario considers a hypothetical release from the original plant Refueling Water Storage Tank (RWST) containing water accumulated during segmentation of the reactor vessel baffle. The analysis for this accident (Reference 15.2-11) results in a release that is within the limits of 10 CFR 20, Appendix B, Table II, Column 2, at the nearest potable water supply.

The original plant RWST, which held 250,000 gallons of water, has been abandoned, decommissioned, and disposed. The remaining liquid waste system components and tank, which hold much less volume, have been evaluated for potential accidents and are considered to be bounded by the RWST liquid release analysis. Therefore any event resulting from the current liquid Radioactive Waste System would be within the limits of 10 CR 20, Appendix B, Table II, Column 2.

#### 15.2.1.4 Other Decommissioning Activity Accidents

Other accidents involving the release of radioactive airborne particulate may possibly occur during decommissioning. Accidents that have been evaluated include:

- A radiological HEPA filter rupture
- A dropped component being removed from the site
- Segmentation of components or structures during loss of local engineering controls.
- An oxyacetylene explosion while performing cutting of radiologically contaminated components.
- An explosion of liquid propane gas leaked from a front-end loader while handling radiologically contaminated components.

The actual radioactivity available for release from the components involved in the types of accidents listed above will be estimated based on surface dose measurements and calculations. The decommissioning activity involving those components will be controlled by limiting the quantities of radioactivity, or by engineering or design controls, to ensure that the amount of radioactivity that can be released is within the bounds of the dry active waste fire accident.

Therefore, the dry active waste fire accident calculated in Section 15.2.1.2 bounds the dose effects of the other types of decommissioning activity accidents listed in this section.

## REFERENCES


15.2-1 Safety Guide 24, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Pressurized Water Reactor Radioactive Gas Storage Tank." U.S. Nuclear Regulatory Commission, March 23, 1972.

15.2-2 "Calculation of Annual Doses to Man From Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I", Regulatory Guide 1.109, Rev. 1, U.S. Nuclear Regulatory Commission, October 1977.

15.2-3 EPA 400-R-92-001, "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents," U.S. Environmental Protection Agency, October 1991.

15.2-4 NRC Regulatory Guide 1.145, "Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants", dated August, 1979.

15.2-5 Code of Federal Regulations, Title 10, Part 100, "Reactor Site Criteria."

15.2-6 Safety Guide 25, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors", U.S. Atomic Energy Commission, March 23, 1972.

15.2-7 Code of Federal Regulations, Title 10, Part 20, "Standards for Protection Against Radiation".

15.2-8 NUREG 0782, Environmental Impact Statement on 10 CFR 61, "Licensing Requirements for Land Disposal of Radioactive Waste", September, 1981.

15.2-9 10 CFR 61.55, Criteria for Disposal of Radioactive Material, 1/1/97 edition.

15.2-10 CY Calculation, CY RESIN 2-01666 RY, Rev. 0, Resin Source Terms and Accident Dose Analysis, July 7, 1999.

15.2-11 CY Calculation, CYC-020, Evaluation of a Release from the Refueling Water Storage Tank (RWST) Containing Water Accumulated During the Segmentation of the Baffle.

15.2-12 Health Physics Department Technical Support Document BCY-HP-007

15.2-13 NUREG-0586, Final Generic Environmental Impact Statement, August 1988

15.2-14 CY Health Physics Department Technical Support Document CY-HP-0199, Revised Analysis of Consequences of DAW Fire and other Radiologically related fires for Elimination of Insipient Fire Brigade and Fire Suppression System, March 22, 2005.

2.1.2.2 Control of Activities Unrelated to Plant Operation

No part of the site is leased and all structures located on the site are under the control the Connecticut Yankee Atomic Power Company.

The location and extent of the plant site was one of the considerations entering into the analysis of the overall safety of the plant. To ensure the safety of people within the exclusion area during an emergency, an emergency plan (see Section 13.3) for the site describes procedures for removal of visitors on-site.

2.1.2.3 Arrangements for Traffic Control

There are provisions in Reference 2.1-5 for the U.S. Coast Guard to control water traffic on the Connecticut River in the vicinity of the Haddam Neck Plant in the event of an emergency. A motor boat is also available for use by the State Police to keep river traffic away from the site.

2.1.2.4 Abandonment or Relocation of Roads

No abandonment or relocation of roads is necessary.

2.1.3 Population Distribution

The information provided in this section is "Historical Information." The total 1990 permanent population within 10 miles of the plant is estimated to be 78,141. This population is projected to increase to about 83,496 by the year 2000 and to a total of approximately 88,211 by the year 2030 [Connecticut Office of Policy and Management, 1991 (Reference 2.1-6); U.S. Department of Commerce, 1990 Census of Population (Reference 2.1-7)]. The 10-mile area includes most of Middlesex County and small portions of New London, Hartford, Tolland, and New Haven Counties.

Aside from a scattering of small towns and villages and a portion of the city of Middletown, the area within a ten-mile radius of the site is predominantly rural. About 80% of this area is wooded and much of it is state parks and forests. The remaining area is devoted primarily to general farming and some minor industry. Table 2.1-1 provides the 1990 tabulation of population distribution within 10 miles of the Haddam Neck Plant and is keyed to distances and directional sectors shown in Figure 2.1-6.

The total population and population density of all municipalities, either completely or partially within the 10-mile radius, is provided in Table 2.1-2.

The Town of Haddam, in which the Haddam Neck Plant is located, contained a total population of 6,769 in 1990, with an average population density of 154 people per square mile (1990 Census of Population and Housing) (Reference 2.1-8). Haddam has experienced a modest population growth, but has slowed considerably compared to previous decades. This growth is projected to continue through 2010 (the last year of projections), at which time the population of Haddam is expected to reach 7,470.

The population distribution within 10 miles of the plant is based on 1990 Census of Population by Census Block (Reference 2.1-7). The population within each Census Block was assumed to be distributed evenly over its land area, unless shown otherwise by USGS 7.5 minute quadrangle maps (Reference 2.1-9) of the area. The proportion of each Census Block area within each grid sector was estimated and applied to the total population within the Block. The population of all Blocks or portions of Blocks within a sector were added to calculate the total population within each sector. Population projections by municipality, generated by the Connecticut Office of Policy and Management (Reference 2.1-6), provided growth factors to calculate the population in each sector in the future.

## REFERENCES

2.1-1 R. A. Mellor letter to U.S. Nuclear Regulatory Commission Document Control Desk, transmitting the January - December 1998 Annual Radioactive Effluent Report for the Haddam Neck Plant, dated April 4, 1999 and subsequent revisions thereto submitted on an annual basis.

2.1-2 Correspondence Letter dated April 27, 1981, Docket No. 50-213, A01452 SEP Topic II-1.A, "Exclusion Area Authority and Control," TO: Dennis M. Crutchfield (NRC), FROM: W.G. Counsil (CYAPC), NUSCO File No. 8113310199.

2.1-3 R. A. Mellor letter to U.S. Nuclear Regulatory Commission, Document Control Desk, "Haddam Neck Plant Revision 3 to the Haddam Neck Plant Defueled Emergency Plan," dated April 2000 and subsequent revisions thereto.

2.1-4 Regulatory Guide 1.181, "Content of the Updated Final Safety Analysis Report in Accordance with 10 CFR 50.71(e)."

2.1-5 State of Connecticut Radiological Emergency Response Plan. Millstone Nuclear Power Station, Waterford, Connecticut Haddam Neck Plant, Haddam Neck Plant, Haddam, Connecticut.

2.1-6 Connecticut Office of Policy Management, Interim Population Projection Series 91.1, 1991.

2.1-7 U.S. Department of Commerce, Bureau of the Census, 1990 Census of Population, P.L. 94-171 Counts by Census Block, 1991.

2.1-8 U.S. Department of Commerce, Bureau of the Census, 1990 Census of Population and Housing, Connecticut, 1990 CPH-1-8, 1991.

2.1-9 U.S. Geological Survey, 7.5-Minute Quadrangle maps.

2.1.10 W. A. Norton (CYAPCO) letter to the US NRC, "Haddam Neck Plant, Letter of Intent Concerning the Release at the East Side Grounds from the Part 50 License", dated April 29, 2004.

2.1.11 T. Smith (NRC) to W. Norton (CYAPCO), "Haddam Neck Plant, Release of East Site Grounds from Part 50 License", dated September 1, 2004.

SUPPORTING REFERENCES

U.S. Department of Commerce, Bureau of the Census, State and Metropolitan Area Book 1991, a Statistical Abstract Supplement, 1991.

U.S. Department of Commerce, Bureau of the Census, Number of Inhabitants: Connecticut, PC(1)-A8, 1971; PC80-1-A8, 1981.

**Attachment 2**

**Haddam Neck Plant**

**Updated Final Safety Analysis Report**

**Previously revised Pages**

July 2005

CHAPTER 2

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# CHAPTER 2

## SITE CHARACTERISTICS

This chapter contains information on the geological, seismological, hydrological and meteorological characteristics of the site and vicinity, in conjunction with population distribution, land use and site activities and control. The purpose of this section was to indicate how these site characteristics influenced plant design, operation and decommissioning and show the adequacy of the site characteristics from a safety viewpoint. However, much of the information that was presented in this chapter is historical in nature and, as permitted by R.G. 1.181 (Reference 2.1-4), this information does not require updating. Therefore, in order to eliminate confusion between the historical information and information that needs to be maintained as part of the plant's "design basis", sections 2.1.3, 2.3, 2.4, and 2.5 have been annotated to indicate that the information contained in these sections is "Historical Information Only".

## 2.1 GEOGRAPHY AND DEMOGRAPHY

### 2.1.1 Site Location and Description

#### 2.1.1.1 Specification of Location

The site is located in the Town of Haddam, Middlesex County, Connecticut, on the east bank of the Connecticut River at a point 21 miles south-southeast of Hartford, Connecticut, and 25 miles northeast of New Haven, Connecticut. Figure 2.1-1 shows the site location.

The geographical coordinates of the centerline of the reactor were as follows:

| Latitude and Longitude | Northing and Easting |
|---|---|
| N41° 28'57" | N236, 589 |
| W72° 29'57" | E668, 745 |

The general plant area was filled and graded from an initial elevation of approximately 12 ft mean sea level (MSL) to a final elevation of 21 ft. This grade is 1.5 ft above the highest recorded river level near the site. At the back or east side of the plant, wooded hillsides rise steeply above the perpendicular rock cut, while the Connecticut River acts as a barrier on the west side as well as at the southern end of the peninsula, approximately one mile from the plant. Access to the site is gained over an improved access road from the north. The general topography is shown on Figure 2.1-2.

#### 2.1.1.2 Site Area Map

The site consists of approximately 525 acres, bounded by the property lines as shown on Figure 2.1-3. The minimum distance overland from the reactor containment to the exclusion area as defined in 10 CFR 100.3, shall be 1,740 ft and the distance to the nearest residence is over 2,000 ft. The largest nearby city, Middletown, is 8 air miles northwest of the plant.

The location and orientation of the plant structures within the site area at the time of permanent shutdown are shown on the Site Plot Plan, Figure 2.1-4.

Decommissioning changes to the plant involving structures other than the fuel building, Independent Spent Fuel Storage Installation (ISFSI) or auxiliary equipment building are not considered a change to the facility as described in the UFSAR. As such, Figure 2.1-4 may not reflect the up-to-date configuration of site structures as the plant progresses through decommissioning.

#### 2.1.1.3 Boundaries for Establishing Effluent Release Limits

Figure 2.1-3 depicts the property line and site boundary line. The property line is that line beyond which land is not owned, leased or otherwise controlled. The area within the site boundary is governed by the HNP Part 50 License (Reference 2.1-10 and 2.1-11).

The land outside the bounds of the site boundary is considered an unrestricted area for radiation protection purposes. The land areas between the site boundary and the security protected area is generally considered a controlled area, access to which can be limited by the licensee. Restricted areas are areas which are limited by the licensee for the purposes of protection of individuals from exposure to radiation and radioactive materials. The Haddam Neck Plant restricted area and industrial protected area generally correspond. Additional restricted areas may be designated by the licensee in the controlled area as necessary to protect individuals against exposure to radiation and radioactive materials. The ISFSI is a restricted area. The restricted areas, the controlled area, and the unrestricted area are shown on Figure 2.1-3.

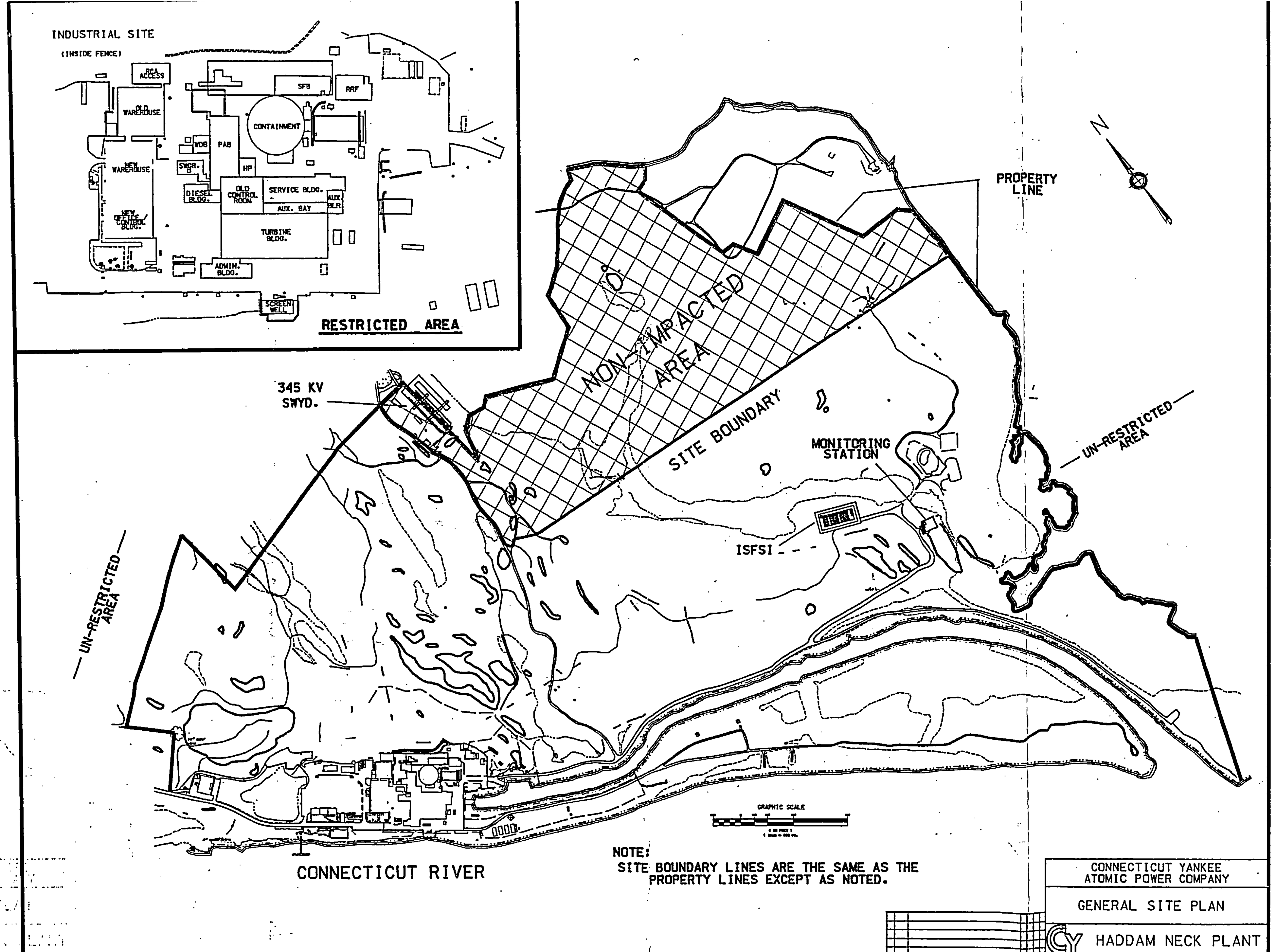
The Haddam Neck Plant prepares an Annual Radioactive Effluent and Release Report (Reference 2.1-1) that provides actual plant effluent release data.

### 2.1.2 Exclusion Area Authority and Control

#### 2.1.2.1 Authority

The Haddam Neck Plant is owned by the Connecticut Yankee Atomic Power Company (CYAPCO). Along the river bank, the exclusion area extends to the opposite shore (western side) of the Connecticut River. The minimum distance to the boundary of the exclusion area, as defined in 10 CFR 100.3, shall be 1740 feet from the reactor containment. Connecticut Yankee Atomic Power Company has the controlling authority to determine all activities within land portion of the exclusion area. In a letter dated April 29, 2004, a written request was submitted to the NRC of intent to release the East Side Grounds (Survey Area 9532) from the Part 50 license (Reference 2.1-10). The NRC approved that request on September 1, 2004 (Reference 2.1-11). The site area is reduced as a result of the release of the non-impacted area from the Part 50 License (i.e., some portion of the exclusion area will be outside the site boundary). Figure 2.1-3 shows the new site boundary. Since CYAPCO still owns the property covered by this release area (Survey area 9532) CYAPCO will continue to maintain authority, in accordance with 10 CFR 100.3, over the activities conducted beyond the site boundary (i.e., over the activities conducted within 1740 feet of the Reactor Containment until such time as the reanalysis shows the exclusion area can be reduced or eliminated).

Arrangements with the U.S. Coast Guard and the State of Connecticut allow for closure of river traffic, if necessary, during an emergency (Reference 2.1-2).




UFSAR FIGURE 2.1-3

CHAPTER 11

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