



CONNECTICUT YANKEE ATOMIC POWER COMPANY

HADDAM NECK PLANT

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

Docket No. 50-213

CY-07-127

Re: 10 CFR 50.71(e)

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

Haddam Neck Plant
Update of License Termination Plan

In a letter dated July 7, 2000, as revised in August 2002 (Revision 1) and in October 2002 (Revision 1A), Connecticut Yankee Atomic Power Company (CYAPCO) submitted the Haddam Neck Plant (HNP) License Termination Plan (LTP) to the NRC as a supplement to the HNP Updated Safety Analysis Report (USFSAR). The HNP LTP was approved by the NRC on November 25, 2002, via License Amendment No. 197. In a letter dated August 19, 2005, the NRC approved Revision 3 of the HNP LTP as part of License Amendment No 202. This revision added the Basement Fill Model. Revision 4 to the LTP, which contained updates due to decommissioning progress and other administrative changes, was submitted to the NRC in a letter dated November 16, 2006. Revision 5 to the LTP, which contained updates due to decommissioning progress and other administrative changes, was submitted to the NRC in a letter dated February 22, 2007. Revision 6 to the LTP was submitted on July 12, 2007 and reflected changes to survey units, current decommissioning status, and other administrative changes.

The purpose of this letter is to submit Revision 7 to the HNP LTP as required by 10 CFR 50.71(e). The detailed description and reasons for each change is provided in Attachment 1. Revision 7 of the LTP reflects completion of decommissioning and license termination of the industrial area, and other administrative changes. It also added text explaining that content of the HNP LTP will not be updated until preparations for decommissioning the ISFSI related survey areas have begun.

This revision replaces only the affected pages for Revision 6 which are provided in Attachment 2. A markup of the affected pages from Revision 6 are provided in Attachment 3.

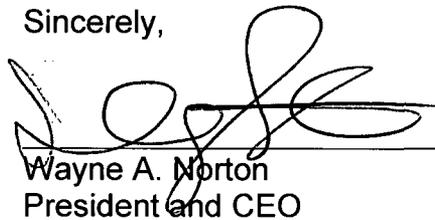
Pursuant to 10 CFR 50.71(e)(2)(i), I certify that this revision accurately presents changes completed since our previous submittal that are necessary to reflect information and analyses associated with the changes discussed above.

NMSS01
FSME

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". The changes to the HNP LTP included in this submittal were made using the provisions of 10 CFR 50.59. Specifically, the changes were screened to determine whether the changes require a 10 CFR 50.59 evaluation. There were no 50.59 evaluations required for the changes in this submittal.

If the NRC should have any questions, please contact me at (860) 267-6426.

Sincerely,



Wayne A. Norton
President and CEO

12-5-07
Date

Subscribed and sworn before me

This 5th day of December, 2007



Notary Public

My Commission Expires: 10/31/2012

Attachments as noted

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

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Attachment 1

Haddam Neck Plant

**Update of License Termination Plan
Revision 7**

Detailed Description and Reasons for Each Change

December 2007

**Attachment 1
Haddam Neck Plant
License Termination Plan, Revision 7
Summary of Changes**

Item No.	LTP Page or Section	Description of Change	Reason for Change	Downgrade in Commitment
1	Table of Contents, Pages i through x	Various changes to mirror changes made within the LTP	Necessary to reflect changes in pagination and figure designations	No
2	LEP-1, & LEP-2	Changed List of Effective Pages to reflect changes made in Revision 7	Self-explanatory	No
3	1-1	Added text describing release of all non-ISFSI areas from the NRC license and that content of the HNP LTP will not be updated until preparations for decommissioning the ISFSI related areas was begun.	Reflect status of the site now that all non-ISFSI areas have been removed from the NRC license.	No
4	End of Chapter 1	Add Figure 1-1 showing the status of the HNP site after the removal of the non-ISFSI related areas from the NRC license.	Reflect status of the site now that all non-ISFSI areas have been removed from the NRC license.	No
5	2-1	Added text explaining that content of the HNP LTP will not be updated until preparations for decommissioning the ISFSI related areas has begun.	Reflect status of the HNP LTP now that all non-ISFSI areas have been removed from the NRC license.	No
6	3-1	Added text explaining that content of the HNP LTP will not be updated until preparations for decommissioning the ISFSI related areas has begun.	Reflect status of the HNP LTP now that all non-ISFSI areas have been removed from the NRC license.	No
7	4-1	Added text explaining that content of the HNP LTP will not be updated until preparations for decommissioning the ISFSI related areas has begun.	Reflect status of the HNP LTP now that all non-ISFSI areas have been removed from the NRC license.	No
8	5-1	Added text explaining that content of the HNP LTP will not be updated until preparations for decommissioning the ISFSI related areas has begun.	Reflect status of the HNP LTP now that all non-ISFSI areas have been removed from the NRC license.	No

**Attachment 1
Haddam Neck Plant
License Termination Plan, Revision 7
Summary of Changes**

Item No.	LTP Page or Section	Description of Change	Reason for Change	Downgrade in Commitment
9	6-1	Added text explaining that content of the HNP LTP will not be updated until preparations for decommissioning the ISFSI related areas has begun.	Reflect status of the HNP LTP now that all non-ISFSI areas have been removed from the NRC license.	No
10	7-1	Added text explaining that content of the HNP LTP will not be updated until preparations for decommissioning the ISFSI related areas has begun.	Reflect status of the HNP LTP now that all non-ISFSI areas have been removed from the NRC license.	No
11	8-1	Added text explaining that content of the HNP LTP will not be updated until preparations for decommissioning the ISFSI related areas has begun.	Reflect status of the HNP LTP now that all non-ISFSI areas have been removed from the NRC license.	No

CY-07-127

Attachment 2

Haddam Neck Plant

Update of License Termination Plan
Revision 7

Revised Pages

December 2007

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1 GENERAL INFORMATION

1.1 Purpose

The objective for decommissioning the Haddam Neck Plant (HNP) site is to reduce residual radioactivity to levels that permit release of the site for unrestricted use and for termination of the 10CFR50 license, in accordance with the Commission's site release criteria set forth in 10CFR20, Subpart E. The purpose of this HNP License Termination Plan (LTP) is to satisfy the requirements of 10CFR50.82, "Termination of License" (Reference 1-1) using the guidance provided in Regulatory Guide 1.179, "Standard Format and Content of License Termination Plans for Nuclear Power Reactors" (Reference 1-2) and Draft Regulatory Guide-4006, "Demonstrating Compliance with the Radiological Criteria for License Termination" (Reference 1-3). In September of 2000, the NRC incorporated much of the guidance of DG-4006 into various sections of NUREG-1727 (Reference 1-4). References to the corresponding sections of NUREG-1727 (in which the guidance of DG-4006 have been incorporated) has been given in specific sections of this LTP, as appropriate.

The LTP describes the decommissioning activities that will be performed, the process for performing the final status surveys, and the method for demonstrating that the site meets the criteria for release for unrestricted use. The LTP contains specific information on:

- Historical Site Assessment and Site Characterization;
- Remaining Decommissioning Activities;
- Site Remediation Plans;
- Final Status Survey Design and Implementation Plan;
- Dose Modeling Scenarios;
- Update to the Site-Specific Decommissioning Cost Estimate; and
- Supplement to the Environmental Report.

Each section of the LTP is summarized in Section 1.3.

As of October of 2007, CYAPCO had completed all activities required to remove all areas of the site other than those related to the Independent Spent Fuel Storage Installation (ISFSI) from the Haddam Neck Plant NRC license, Docket No. 50-213 (License NO. DPR-61). The NRC approved the removal of the non-ISFSI areas from the license via a partial site release in Reference 1-22. The approximately 4.6 acre sized area related to the ISFSI is shown in Figure 1-1. The area to remain in the license includes portion of Survey Areas 9523, 9524 and 9528 as described in Section 2. CYAPCO has subsequently revised the description of the licensed area of the site in the HNP Updated Final Safety Analysis Report (UFSAR) and Quality Assurance Plan (QAP).

The ISFSI related areas of site will remain in the HNP license until:

- The spent nuclear fuel has been shipped from the site for storage/or disposal
- The facilities in the areas shown in Figure 1-1 have been decommissioned
- A Final Status Survey has been conducted and the results submitted to the NRC

- The NRC approves the partial site release of remaining areas covered by the HNP license

The HNP LTP which follows describes the status of the plant, decommissioning activities, site release criteria and final status survey plans that describe the site as it existed partially through the decommissioning process.. All activates required by the LTP for the non-ISFSI areas of the site have been completed and all non-ISFSI related areas have been released from the HNP license. In order to provide a starting point for future activates required to remove the ISFSI required areas of the site from the HNP license, the HNP LTP will be left in it's current state until such time as decommissioning of the ISFSI related facilities can begin.

1.2 Historical Background

The HNP is located on the east bank of the Connecticut River, approximately 21 miles south-southeast of Hartford, at 362 Injun Hollow Road, Haddam, Middlesex County, Connecticut. HNP is owned by Connecticut Yankee Atomic Power Company, CYAPCO (Reference 1-5). Figures depicting the site area and buildings are provided at the end of LTP Chapter 2.

HNP, Docket No. 50-213 (License NO. DPR-61), began commercial operation in January 1968. The 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; instrumentation and control systems; the necessary auxiliaries; and structures to house plant systems and other onsite facilities. HNP was designed to produce 1,825 MW of thermal power and 590 MW of gross electrical power (Reference 1-6).

On December 4, 1996, HNP permanently shut down after approximately 28 years of operation. On December 5, 1996, CYAPCO notified the Nuclear Regulatory Commission (NRC) of the permanent cessation of operations at the HNP and the permanent removal of all fuel assemblies from the Reactor Pressure Vessel and their placement in the Spent Fuel Pool (Reference 1.7). Following the cessation of operations, CYAPCO began to decommission the HNP. The Post Shutdown Decommissioning Activities Report (PSDAR) was submitted, in accordance with 10CFR50.82(a)(4), on August 22, 1997 (Reference 1-8), and was accepted by the NRC (Reference 1.9). On January 26, 1998, CYAPCO transmitted an Updated Final Safety Analysis Report to reflect the plant's permanent shutdown status (Reference 1-10), and on June 30, 1998, the NRC amended the HNP Facility Operating License to reflect this plant condition (Reference 1-11). On October 19, 1999, the Operating License was amended to reflect the decommissioning status of the plant and long-term storage of the spent fuel in the spent fuel pool (Reference 1-12). Additional licensing basis documents were also revised and submitted to reflect long-term fuel storage in the spent fuel pool (Defueled Emergency Plan, QA program, and Operator Training Program).

In April of 1999, CYAPCO contracted Bechtel Power Corporation, as the Decommissioning Operations Contractor (DOC), to perform the decommissioning activities at the HNP. CYAPCO continued to perform Spent Fuel Pool Island Operations and provide oversight of the activities performed by the DOC, until June 2003, when CYAPCO terminated the DOC contract. CYAPCO is now managing the decommissioning using staff augmentation and subcontractors for specialty work.

1.3 Plan Summary

Termination of the NRC license and environmental closure of the HNP site are closely related activities, completion of which will allow the site to be released for future use. The License Termination Plan (LTP) describes the processes to be used in meeting the requirements for terminating the NRC license. An integrated site closure plan has been prepared to include the processes to be used for non-radiological cleanup and release of the site. This information was submitted to the appropriate regulatory agencies. An integrated approach to site release processes will be used to the extent practicable.

The decommissioning will be conducted by performing radiological and hazardous environmental surveys to allow for controlled demolition of structures, removal of the wastes generated from the site, performing the Final Status Survey (FSS) of the remaining foundations/basements and/or soils, and the use of appropriate backfill materials to restore the site to grade elevation. Soils identified to be contaminated above release limits will be removed, an FSS or assessment performed, the area restored to grade using an appropriate backfill material and an FSS satisfactorily completed if required.

The LTP provides the detailed information related to the decommissioning approach, dismantlement and bulk disposal, which will be used by CYAPCO to complete the decommissioning of the HNP site. Due to a change in the approach to waste disposal, some previously identified survey areas were removed from Table 2-10. Appendix H contains historical information from Table 2-10. If areas are later determined to require an FSS (due to a change in waste disposal approach), the classification information provided in Appendix H will be used.

1.3.1 General Information

This LTP has been prepared for the HNP in accordance with the requirements of 10CFR50.82(a)(9). The LTP is being maintained as a supplement to the HNP Updated Final Safety Analysis Report. Each of the sections required by 10CFR50.82(a)(9) are outlined in the subsections below. Note that figures are located at the end of the corresponding Chapters.

1.3.2 Site Characterization

Chapter 2 discusses site characterization activities. The site characterization for HNP includes the results of surveys and evaluations conducted to determine the extent and nature of the contamination at the site. The initial characterization, performed in accordance with the guidelines of the "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)," (Reference 1-13) began in 1997 and was completed in 1999. This initial characterization included a Historical Site Assessment (HSA) a review of historical documents, and measurements, samples, and analyses to further define the current conditions of the site. The effort also evaluated hazardous and state-regulated non-radioactive materials at the site that may require remediation and disposal.

The HSA consisted of a review and compilation of the following information: historical records, plant and radiological incident files, operational survey records, and annual environmental reports to the NRC. Personnel interviews were conducted with present and former plant employees and contractors to obtain additional information regarding operational events that caused contamination in areas or systems not designed to contain radioactive or hazardous materials.

Information from previous surveys was reviewed for historical information regarding radiological conditions throughout the site. The current HNP Radiation Protection Program requires that site radiological conditions be assessed and documented by performing operational surveys and evaluations throughout the decommissioning process. The radiological data collected during this process will supplement the initial characterization data and provide a basis for developing plans for remediation and final status surveys.

The information developed during the initial HNP characterization program represents a radiological and hazardous material assessment based on the knowledge and information available at the end of 1999. The objectives of this initial characterization program were:

1. To divide the HNP site into manageable sections or areas for survey and classification purposes;
2. To identify the potential and known sources of radioactive contamination in systems, on structures, in surface or subsurface soils, and in ground water;
3. To determine the initial classification of each survey area;
4. To develop the initial radiological and hazardous material information to support decommissioning planning including building decontamination, demolition, and waste disposal;
5. To develop the information to support Final Status Survey design including instrument performance standards and quality requirements; and
6. To identify any unique radiological or hazardous material health and safety issues associated with decommissioning.

Operational radiation surveys and additional characterization measurements and samples obtained during cleanup activities will be used to confirm the area classification and effectiveness of the cleanup activities before completing the Final Status Survey.

The site characterization and historical site assessment efforts are summarized in two documents: "Connecticut Yankee Haddam Neck Plant Characterization Report" (Reference 1-14) and the "Haddam Neck plant Historical Site Assessment Supplement" (Reference 1-15).

The LTP includes a summary of information contained in References 1-14 and 1-15. Additional characterization information and confirmation will continue throughout the decommissioning as

part of the FSS process. The LTP will generally not be updated to include this additional characterization.

1.3.3 Identification of Remaining Site Dismantlement Activities

CYAPCO is conducting decontamination and dismantlement activities at the HNP site consistent with activities discussed in the HNP PSDAR. Chapter 3 of the LTP describes those dismantlement and decontamination activities that remain at the HNP as of August 2006. Also included in this section are estimates of radiation dose to workers from decommissioning activities and projected volumes of radioactive waste.

CYAPCO's primary goals are to decommission the HNP safely and to maintain the safe storage of spent fuel and Greater Than Class C (GTCC) waste. On March 30, 2005, all spent fuel and GTCC waste have been removed from the Spent Fuel Pool and stored in an Independent Spent Fuel Storage Installation (ISFSI) at the HNP site. To the extent practical, impacted facility materials and surfaces that remain will be decontaminated to allow for beneficial reuse. Materials that cannot be decontaminated will be sent to an offsite radioactive waste processor to recycle or to a Low-Level Waste (LLW) disposal site. Completion of decommissioning the HNP site depends on the availability of low-level waste disposal sites. Currently, HNP has access to low-level waste disposal facilities including those in Barnwell, South Carolina, and Clive, Utah.

One of two types of radiological surveys will be performed on systems, structures, or components that will be demolished and the wastes generated shipped to a LLW storage facility or a licensed clean material landfill, as appropriate:

1. If a Structure, System, or Component (SSC) is known to be contaminated and is to be demolished, a Contamination Verification Survey (CVS) will be performed to ensure that contamination levels are within the established levels to permit controlled demolition.
2. If the SSC is not suspected to be contaminated, an Unrestricted Release Survey (URS), in compliance with the HNP Radiation Protection Program, will be performed to document that the SSC meets the criteria for unrestricted release.

If a contaminated SSC is to remain on site, it will be decontaminated to the required levels, and a final status survey will be performed and documented. This survey will confirm that the site meets the release criteria. The final status survey results for each survey area will be compiled into a release record documenting the as-left radiological conditions demonstrating compliance with site remediation criteria. Several release records will be compiled in a series of reports by area(s). These reports, each made up of several release records will be made available for NRC inspection. Following completion of the final status survey and in the absence of any NRC inspection finding the report deficient, surveyed areas may be released from NRC license control.

1.3.4 Site Remediation Plans

Chapter 4 of the LTP describes various methods that can be used during HNP decommissioning to reduce the levels of radioactivity to those which meet the NRC radiological release criteria, that is, does not exceed 25 mrem/yr Total Effective Dose Equivalent (TEDE) and is As Low As Reasonably Achievable (ALARA). This section describes the methodology that will be used to demonstrate that the residual radioactivity has been reduced to a level that is ALARA in compliance with the NRC requirements.

An ALARA analysis determines when cleanup, beyond that required to meet the 25 mrem/yr TEDE dose limit, is appropriate. Figure 4-1 shows the ALARA evaluation process. Generic ALARA screening values may be determined at the planning stage, prior to the start of cleanup, or after some or all of the characterization work is complete. Survey unit-specific ALARA evaluations may be performed later in the remediation and survey processes.

These ALARA evaluations establish remediation levels at which additional cleanup actions are to be taken to reduce residual radioactivity. These different types of cleanup actions may include but are not limited to, chemical decontamination, wiping, vacuuming, scabbling, or high-pressure washing. The methodology and equations to be used for calculating remediation levels are those provided in NRC's Draft Regulatory Guide DG-4006, "Demonstrating Compliance with the Radiological Criteria for License Termination," which was subsequently included in Appendix D to NUREG-1727 (Reference 1-4).

1.3.5 Final Status Survey Plan

The primary objectives of the final status survey are to:

- Select/verify survey unit classification,
- Demonstrate that the level of residual radioactivity for each survey unit is below the release criterion, and
- Demonstrate that the potential dose from small areas of elevated activity is below the release criterion for each survey unit.

The purpose of the Final Status Survey Plan is to describe the methods to be used in planning, designing, conducting, and evaluating final status surveys at the HNP site to demonstrate that the site meets the NRC's radiological criteria for unrestricted use. Chapter 5 of the LTP describes the Final Status Survey plan, which is consistent with the guidelines of MARSSIM. The HNP survey plan allows for the use of advance technologies as long as the survey quality is equal to or better than traditional methods described in MARSSIM. Since MARSSIM is not readily applicable to complex nonstructural components within buildings, the current "no detectable" criteria will be applied to nonstructural components and systems at the time of FSS (with the exception of those items discussed in Section 5.4.7.5). The plan also describes methods and techniques used to implement isolation controls to prevent contaminating remediated areas (as discussed in additional detail in Section 5.4.6). The HNP Final Status Survey Plan incorporates measures to ensure that final survey activities are planned and communicated to regulatory agencies to allow the scheduling of inspection activities by these agencies if so desired.

1.3.6 Compliance with the Radiological Criteria for License Termination

Chapter 6 together with Chapter 5, and the Final Status Survey Plan, describes the process to demonstrate compliance with the radiological criteria of 10CFR20.1402 (Reference 1-16) for unrestricted use for the HNP site. CYAPCO has selected the RESRAD computer code (Version 5.91) to model dose from soils, and ground water, and its counterpart, RESARD-BUILD (Version 2.37), to model dose from structures.

For building basements to remain after unrestricted release of the site, the Basement Fill Model is used to calculate the future groundwater dose. The future groundwater dose is that which results from the leaching of radionuclides from buried concrete, and embedded piping that is contained in foundations or footings that are to remain. This model is discussed in detail in Section 6.8.2. The characterization sampling to be performed to supply the input to the calculation of future groundwater dose using the Basement Fill Model is discussed in Chapter 5 (or with the discharge tunnel if they are assessed after the completion of the containment basement fill model).

For building footings, an alternate criteria to the concrete debris Derived Concentration Guideline Levels (DCGLs) will be applied as part of the Basement Fill Model. For footings that are to remain and are volumetrically contaminated, the radioactivity inventory in the footing will be assessed and the total quantity will be conservatively included with the other sources to the containment basement (or with the discharge tunnel if they are assessed after the completion of the containment basement fill model) in calculating future groundwater dose. This bounds the dose calculation as the calculation of the future groundwater concentration in containment includes the major radioactivity sources contained in subsurface structures to remain after license termination. Basements other than the containment and the fuel pit will be analyzed independently using the Basement Fill Model as they are not expected to contain significant levels of radioactivity and occur later in the decommissioning.

Two primary scenarios have been selected as input to the RESRAD codes for calculating the radionuclide-specific DCGLs. DCGLs are the concentration and surface radioactivity limits that will be the basis for performing the final status survey. These scenarios are the resident farmer scenario for site soils, and ground water and the building occupancy scenario for site buildings. Current decommissioning plans do not include the placement of concrete debris in facility basements, the concrete debris scenario, approved as part of the LTP approved in November 2002 is no longer applicable. If the decommissioning plans change, the option to use concrete debris as backfill and the associated concrete debris DCGLs is retained.

1.3.7 Update of Site-Specific Decommissioning Costs

In accordance with 10CFR50.82(a)(9)(ii)(F), Chapter 7 provides an updated, site-specific estimate of the remaining decommissioning costs. It also includes a comparison of these estimated costs with the present funds set aside for decommissioning and a description of the means to ensure that there will be sufficient funds for completing decommissioning.

1.3.8 Supplement to the Environmental Report

In accordance with 10CFR50.82(a)(9)(ii)(G), Chapter 8 demonstrates that decommissioning activities will be accomplished with no significant adverse environmental impacts.

Decommissioning and license termination activities remain bounded by the site-specific decommissioning activities described in:

- the PSDAR,
- the previously issued environmental assessment,
- the environmental impact statement,
- NUREG-0586, “Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities (FGEIS)” (Reference 1-17), and
- NUREG-1496, “Generic Environmental Impact Statement in Support Rulemaking for Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities.” (Reference 1-18).

The HNP PSDAR was submitted to the NRC in accordance with 10CFR50.82(a)(4)(i). In the PSDAR, CYAPCO performed an environmental review to evaluate actual or potential environmental impacts associated with proposed decommissioning activities. This evaluation used NUREG-0586 and two previous site-specific environmental assessments as its basis. One site-specific assessment was performed from the conversion of the provisional operating license to a full-term operating license, and another was performed more recently from the recapture of the construction period time duration. The environmental review concluded that the impacts due to HNP decommissioning are bounded by the previously issued environmental impact statements.

As discussed in Chapter 6, the DCGLs for site buildings are calculated using the building occupancy scenario as the primary modeling scenario. Buildings to remain after release from the NRC License which are decontaminated at or below the DCGLs, could be allowed to remain standing after the final status survey. Consideration of the building occupancy scenario in determining the DCGL is compatible with the information in SECY-00-41 (Reference 1-19). SECY 00-41 concluded that the building occupancy and resident farmer scenarios, as well as assumptions used in the FGEIS to estimate public dose, are sufficiently conservative to bound such a condition. Chapter 8 also provides a summary description of the process CYAPCO will use to ensure that the non-radiological aspects of decommissioning meet state and federal requirements for release of the site.

1.4 Decommissioning Approach

1.4.1 Overview

This section provides an overview of CYAPCO’s approach to decommissioning the HNP site. References to the section in the LTP, where details concerning the particular step or stage of the decommissioning process are described, are given in parentheses.

Upon the decision to permanently cease power operations at the HNP site, CYAPCO began site characterization activities (Chapter 2). This characterization effort, which was performed to the guidelines of MARSSIM, included a Historical Site Assessment(HSA); a review of historical survey documentation; and measurements, samples, and analyses to further define the present radiological conditions of the site. The effort also addressed the status of the site relative to hazardous and state regulated non-radioactive materials.

The initial site characterization, together with geologic and hydrogeologic investigations of the site, provides the basis for the conceptualization of the site and the selection of the appropriate scenarios, models, and critical groups to address the possible future uses of the site. Conceptualization (creating the overall model for the site), which considers future use, characterization, geologic and hydrogeologic data, is also important in selecting the dose modeling code to be used to calculate the DCGLs and in the development of the Basement Fill Model for calculating “future groundwater” dose. These DCGLs correspond to a dose to the average member of the selected critical group that does not exceed 25 mrem/yr TEDE (Chapter 6).

Concurrent with site characterization and the conceptualization of the site, decommissioning activities are taking place. Activities performed during this period include the removal of contaminated components from the site for final disposition and demolition of most site buildings (Chapter3).

Remediation of some site structures and soils will be performed, based upon the input of the initial site characterization and the DCGLs determined by dose modeling. In addition, remediation of groundwater may also be necessary to meet the dose criteria. Title 10 of the CFR, Section 20.1402 has dual criteria, namely 25 mrem/yr TEDE and ALARA. Accordingly additional remediation activities are evaluated to determine the cost/benefit of remediation beyond that which is necessary to meet the DCGLs along with the future groundwater dose calculated by the Basement Fill Model for the remaining portions of the SSCs. If the additional remediation activities are determined to be appropriate, they will be performed (Chapter 4). Once survey areas have been remediated to the required level, controls will be put into place to prevent re-contamination of the surveyed areas. (Section 5.4.6)

The Final Status Survey Plan (Chapter 5) describes the methodology by which land areas and buildings will be verified to be at or below the DCGLs (after accounting for the future groundwater dose), and thus meet the site release criteria for unrestricted use. Once final status surveys are performed for a specific land area or building, the data collected will be documented in a release record. Periodically, several release records will be compiled into a FSS Report and made available to the NRC as evidence of completion of activities and acceptability of the area for unrestricted release. CYAPCO plans to communicate the schedules for these final status surveys to the NRC so that independent confirmatory surveys can be scheduled and performed, as necessary.

CYAPCO may pursue backfill activities once the survey results for a survey area or group of survey areas are completed. For facility SSCs remaining onsite, the final status survey results will be compiled in a series of reports by survey area(s) and will be made available for NRC

review and inspection. CYAPCO plans to demolish most structures generally to 4 feet below grade and selected basements and to dispose of the wastes generated at an LLW waste or other appropriate facility. Final status surveys will be performed to document the radiological condition of all remaining footings/basements and soil. The dose modeling approach, described in Chapter 6, evaluates potential exposures resulting from any remaining concrete structures, footings/basements to ensure that the doses are bounded by the conservative DCGLs (after accounting for future groundwater dose) specified in the plan. CYAPCO does not intend to use on-site burial, disposal or incineration of any low-level radioactive waste. Materials remaining onsite will meet the appropriate DCGLs, after accounting for “future groundwater” dose for unrestricted release, and thus are not low-level radioactive waste.

CYAPCO may also choose to remove specific land areas (and any associated buildings) from the 10CFR50 license after they have been surveyed and the results documented and provided to the NRC for its review and concurrence. A more detailed discussion of the phased release approach is provided in the following subsection. Upon completion of remediation and/or demolition, final status surveys, and confirmation that land areas (and any associated buildings) on the HNP site meet the site release criteria, CYAPCO will have completed the decommissioning process.

1.4.2 Phased Release Approach

CYAPCO may choose to remove specific areas from the license in a phased manner. The approach for phased release and removal from the license, after approval of the License Termination Plan, is as follows:

1. Following completion of decommissioning activities and final status survey of a survey unit, CYAPCO will compile a final status survey report to address the area or building, where decommissioning and remediation tasks are complete and the criteria of 10CFR20.1402 have been met. The results of these surveys will be documented in a report, which is provided to the NRC for its review. A report will contain a compilation of release records of the areas surveyed. A release record documents the as-left radiological condition of a survey area or survey unit.
2. Prior to a request to release a survey area from the license, the licensee will perform a Capture Zone Analysis and will assure that the ground water dose contribution is included for all applicable survey areas per the process described in Section 5.4.7.1 of the LTP.
3. CYAPCO will review and assess the impacts on the following documents in preparation of removing a land area (and any associated buildings) from the license:
 - Updated Final Safety Analysis Report and Technical Specifications;
 - Environmental Monitoring Program;
 - Offsite Dose Calculation Manual;
 - Defueled Emergency Plan;
 - Security Plan;
 - Post Shutdown Decommissioning Activities Report;
 - License Termination Plan;

- Ground Water Monitoring Program;
- 10CFR100 Siting Criteria; and
- Environmental Report.

The reviews will include an assessment to ensure that the land area(s), and any associated building(s), to be released will have no adverse impact on the ability of the site in aggregate to meet the part 20, Subpart E, criteria for unrestricted release. The reviews will also include the impacts on the discharge of effluents and the limits of 10CFR30, as they pertain to the public.

4. A letter of intent to remove a portion of the property from the Part 50 license will be sent to the NRC, at least sixty (60) days before the anticipated date for release of the subject survey area(s). This letter will contain a summary of the assessments performed, as described above, and, for areas designated as “impacted,” will include the FSS report for the subject survey unit(s) or area(s).
5. Once the land area(s), and any associated building(s), have been verified ready for release, no additional surveys or decontamination of the subject building or area will be required (beyond those outlined in Section 5.4.6 intended for isolation and control) unless administrative controls to prevent re-contamination are known or suspected to have been compromised. Following completion of the final status survey and submittal of the associated report, the NRC will review the report and conduct the applicable NRC confirmatory inspections.
6. Once the area(s), and any associated building(s), have been released from the license, remaining material can be dispositioned in accordance with state and federal requirements.
7. Upon completion of the HNP Decommissioning Project, a final report will be prepared, summarizing the release of areas of the HNP site from the 10CFR50 license.

1.5 License Termination Plan Change Process

CYAPCO submitted the License Termination Plan to the NRC as a supplement to the Updated Final Safety Analysis Report (Reference 1.20). The NRC subsequently approved the License Termination Plan via License Amendment No. 197 (Reference 1-21). License Amendment 197 also adds a license condition, which provides the criteria against which changes to the License Termination Plan are evaluated to determine if prior NRC approval is required in addition to the criteria specified in 10 CFR 50.59 and 10 CFR 50.82(a)(6) and (a) (7). A change to the LTP requires NRC approval prior to being implemented, if the change:

- (a) Increases the radionuclide-specific derived concentration guidelines levels (as discussed in Section 6 of the LTP) or area factors (as discussed in Section 5.4.7.4 of the LTP);

- (b) Increases the probability of making a Type 1 decision error above the level stated in the LTP (discussed in Section 5.5.1.1 of the LTP);
- (c) Increases the investigation level thresholds for a given survey unit classification (as given in Table 5-8 of the LTP);
- (d) Changes the classification of a survey unit from a more restrictive classification to a less restrictive classification (e.g., Class 1 to Class 2, or Class A to Class B). Definitions for the different classifications for structures and surface soils are provided in Section 2.3.3.2 of the LTP, and definitions for the different classifications for subsurface soils are provided in Section 2.3.3.1.5 of the LTP;
- (e) Reduces the coverage requirements for scan measurements (Table 5-9 of the LTP); or
- (f) Involves reliance upon statistical tests other than the WRS or Sign Test (as discussed in Section 5.8 of the LTP) for data evaluation.

1.6 References

- 1-1 Code of Federal Regulations, Title 10, Part 50.82, "Termination of License".
- 1-2 Regulatory Guide 1.179, "Standard Format and Content of License Termination Plans for Nuclear Power Reactors," January 1999.
- 1-3 Draft Regulatory Guide-4006, "Demonstrating Compliance with the Radiological Criteria for License Termination," August 1998.
- 1-4 NUREG-1727, "NMSS Decommissioning Standard Review Plan," dated September 2000.
- 1-5 Haddam Neck Facility Operating License (DRP-61) issued December 27, 1974, as amended December 14, 1999.
- 1-6 Haddam Neck Updated Final Safety Analysis Report, dated August 8, 2000.
- 1-7 Letter B16066 from CYAPCO to the USNRC, "Haddam Neck Plant Certifications of Permanent Cessation of Power Operations and that Fuel Has Been Permanently Removed from the Reactor," dated December 5, 1996.
- 1-8 Letter CY-97-075 from CYAPCO to the USNRC, "Haddam Neck Plant Post Shutdown Decommissioning Activities Report," dated August 22, 1997.
- 1-9 USNRC Memorandum from Fairtile to Weiss dated January 28, 2000, regarding CYAPCO Post-Shutdown Decommissioning Activities Report.
- 1-10 Letter CY-98-005 from CYAPCO to the USNRC, "Decommissioning Updated Final Safety Analysis Report," dated January 26, 1998.
- 1-11 USNRC Safety Evaluation, related to Amendment No. 193 to Facility Operating License No. DPR-61, Connecticut Yankee Atomic Power Company, Connecticut Yankee Atomic Power Station, Docket 50-213, dated June 30, 1998.
- 1-12 USNRC Safety Evaluation, related to Amendment No. 195 to Facility Operating License No. DPR-61, Connecticut Yankee Atomic Power Company, Connecticut Yankee Atomic Power Station, Docket 50-213, dated October 19, 1999.
- 1-13 NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual," dated December 1997.
- 1-14 "Connecticut Yankee Haddam Neck Plant Characterization Report," dated January 6, 2000.

- 1-15 "Haddam Neck Plant Historical Site Assessment Supplement," dated August 14, 2001.
- 1-16 Code of Federal Regulations, Title 10, part 20.1402, "Radiological Criteria for Unrestricted Use."
- 1-17 NRUEG-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," dated August 1988, as supplemented on November 2002.
- 1-18 NUREG-1496, "Generic Environmental Impact Statement in Support Rulemaking for Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities," dated July 1997.
- 1-19 SECY-00-41, "Use of Rubblized Concrete Dismantlement to Address 10CFR Part 20, Subpart E, Radiological Criteria for License Termination," February 14, 2000.
- 1-20 Connecticut Yankee Atomic Power Company (CYAPC) letter to the USNRC dated July 7, 2000, and supplemental letters dated June 14, July 31, August 15, August 22, September 6, and September 7, 2001, and August 20 and October 10, 2002.
- 1-21 J. Donohew (USNRC) to K. J. Heider (CYAPCO), "Haddam Neck Plant-Issuance of Amendment RE-Approval of License Termination Plan (LTP) TAC No. MA9791, "dated November 25, 2002.
- 1-22 K. McConnell (USNRC) to W. Norton (CYAPCO), "Haddam Neck Plant – Release of Land from Part 50 License," dated November 26, 2007.

2 GENERAL INFORMATION

2.1 Purpose

This section provides site characterization information that describes the site as it existed partially through the decommissioning process. All activates required by the LTP for the non-ISFSI areas of the site have been completed and all non-ISFSI related areas have been released from the HNP license. As described at the beginning of Chapter 1, in order to provide a starting point for future activates required to remove the ISFSI required areas of the site from the HNP license, the HNP LTP will be left in it's current state until such time as decommissioning of the ISFSI related facilities can begin.

Initial site characterization of the Haddam Neck Plant (HNP) began following the permanent cessation of operations in the fall of 1977, and was completed in the fall of 1999. This initial characterization effort included a historical site assessment (HSA) – a review of historical survey documentation and measurements, samples, and analyses to further define the present radiological conditions of the site. The effort also addressed the status of the site relative to hazardous and state regulated non-radioactive materials. The initial characterization was performed to the guidelines of NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)" (Reference 2-1). The HSA consisted of a review and compilation of site historical records, e.g., 10CFR50.75(g) records, radiological incident files, operational survey records, and annual environmental reports to the NRC. Personnel interviews were conducted with present and former plant employees and selected contractors to determine operational events that caused contamination in areas of systems not designed to contain radioactive or hazardous materials. Documentation from operational surveys, available through site document control facilities, was reviewed for historical information regarding radiological conditions throughout the site. The operational Radiation Protection Program provides continuing input regarding site radiological conditions. Measurements and samples beyond the scope of the operational survey program have been conducted in areas recognized as needing additional information in order to assess the type, magnitude, and extent of contamination.

The site characterization program used the same QA practices as employed by the operational radiation safety program. These practices included the use of approved procedures for the calibration, testing and use of both laboratory and portable equipment. Trained and qualified personnel collected data. Samples were controlled by administrative procedures to ensure that sample integrity was maintained. When offsite laboratories were used, they were required to perform daily instrumentation checks. Other quality control measures for offsite laboratories included periodic method blanks, replicate (duplicate) samples and participation in an inter-laboratory comparison program (e.g., cross checks). Performance of these "quality controls" by offsite laboratories, was verified periodically by QA auditors.

The objectives of a characterization program are to collect data adequate to:

1. Divide the HNP site into manageable sections or areas for survey and classification purposes;
2. Identify the potential and known sources of radioactive contamination in systems, or structures, in surface or subsurface soils, and in groundwater;
3. Determine the initial classification of each survey area or unit;
4. Develop the initial radiological and hazardous material information in support of facility dismantlement and remediation planning and radioactive waste disposal activities;

3 IDENTIFICATION OF REMAINING SITE DISMANTLEMENT ACTIVITIES

3.1 Introduction

This section provides the remaining site dismantlement activities based on the site as it existed partially through the decommissioning process. All activities required by the LTP for the non-ISFSI areas of the site have been completed and all non-ISFSI related areas have been released from the HNP license. As described at the beginning of Chapter 1, in order to provide a starting point for future activities required to remove the ISFSI required areas of the site from the HNP license, the HNP LTP will be left in its current state until such time as decommissioning of the ISFSI related facilities can begin.

In accordance with 10CFR50.82 (a)(9)(ii)(B) (Reference 3-1), the LTP must identify the major dismantlement and decontamination activities that remain. The information includes those areas and equipment that need further remediation and an estimate of the radiological conditions that may be encountered. Included are estimates of associated occupational radiation dose and projected volumes of radioactive waste. These activities are undertaken pursuant to the current 10CFR50 license, are consistent with the PSDAR, and do not depend upon LTP approval to proceed.

CYAPCO's primary goals are to decommission the HNP safely and to maintain the continued safe storage of spent fuel. CYAPCO will decontaminate and dismantle the HNP in accordance with the DECON alternative, as described in the NRC's final Generic Environmental Impact Statement. Completion of the DECON option is contingent upon continued access to one or more low level waste disposal sites. Currently, HNP has access to low-level waste disposal facilities including those in Barnwell, South Carolina.

CYAPCO is currently conducting active decontamination and dismantlement activities at the HNP site in accordance with the HNP PSDAR (Reference 3-2). Decommissioning activities are being coordinated with the appropriate Federal and State regulatory agencies in accordance with plant administrative procedures.

Decommissioning activities at Haddam Neck will be conducted in accordance with the Haddam Neck UFSAR, Technical Specifications, existing Part 50 License and the requirements of 10CFR50.82(a)(6) and (a)(7). If an activity requires prior NRC approval under 10CFR50.59(c)(2) or a change to the Haddam Neck Plant Technical specifications, or license, a submittal will be made to the NRC for review and approval before implementing the activity in questions. Decommissioning activities are conducted under the scrutiny of the existing CYAPCO Radiation Protection Program, Industrial Safety Program, and Waste Management Program. Such activities will be conducted in accordance with these programs which are well established and frequently inspected by the NRC. Activities conducted during decommissioning do not pose any greater radiological or safety risk than those conducted during operations, especially those during major maintenance and outage evolutions.

Decontamination and dismantlement activities continue to be performed, as described in Section 3.3, while taking into account the specific system considerations as discussed in Sections 3.4.1 and 3.4.2. These sections provide an overview and describe the major remaining components of contaminated plant systems and, as appropriate, a description of specific equipment remediation considerations. Table 3-1 contains a list of major systems and components that have been or are to be removed.

4 SITE REMEDIATION PLANS

4.1 Introduction

This section provides site remediation plans that are based on the site as it existed partially through the decommissioning process. All activates required by the LTP for the non-ISFSI areas of the site have been completed and all non-ISFSI related areas have been released from the HNP license. As described at the beginning of Chapter 1, in order to provide a starting point for future activates required to remove the ISFSI required areas of the site from the HNP license, the HNP LTP will be left in it's current state until such time as decommissioning of the ISFSI related facilities can begin.

In accordance with 10CFR50.82(a)(9)(ii)(C) (Reference 4-1), the LTP must provide the "plans for site remediation." These plans must include the provisions to meet the criteria from Subpart E of 10CFR20 (Reference 4-2) before the site may be released for unrestricted use:

- Annual total effective dose equivalent to the average member of the critical group not to exceed 25 mrem, and
- The dose to the public msut be "as low as reasonably achievable," or ALARA.

Decontamination and dismantlement activities will be conducted in accordance with the CY Radiation Protection, Safety and Waste Management Programs, which are well established and frequently inspected. Changes have been made to these programs for D&D activities, and any future changes that may be made will be documented and processed with existing plant administrative procedures using 10CFR50.59 and the guidance contained in Regulatory Guide 1.187.

This section describes the methodologies and criteria that will be used to perform remediation activities of residual radioactivity and to demonstrate compliance with the ALARA criteria, required by 10CFR20. More specific detail regarding remediation activities may be found in Chapter 3.

4.2 Remediation Levels and ALARA Evaluations

When dismantlement and decontamination actions are completed, residual radioactivity may remain on building surfaces and on site soils. Residual radioactivity must satisfy the provisions of 10CFR20, Subpart E. As depicted on Figure 4-1, the ALARA cleanup levels for the HNP decommissioning may be established at one of two levels:

- (1) a predefined generic ALARA screening, or
- (2) a survey unit-specific ALARA evaluation.

In either case, the ALARA evaluation uses an action level, referred to as a remediation level. This remediation level corresponds to a residual radioactivity concentration at which the averted collective radiation dose converted into dollars is equal to the costs of remediation (e.g., risk of transportation accidents converted into dollars, worker and public doses associated with the remediation action converted into dollars, and the actual costs to perform the remediation activity).

5 FINAL STATUS SURVEY PLAN

5.1 Introduction

This section provides a final status survey plan that is based on the site as it existed partially through the decommissioning process. All activates required by the LTP for the non-ISFSI areas of the site have been completed and all non-ISFSI related areas have been released from the HNP license. As described at the beginning of Chapter 1, in order to provide a starting point for future activates required to remove the ISFSI required areas of the site from the HNP license, the HNP LTP will be left in it's current state until such time as decommissioning of the ISFSI related facilities can begin.

The purpose of the Final Status Survey Plan is to describe the methods to be used in planning, designing, conducting, and evaluating final status surveys at the HNP site. These surveys serve as key elements to demonstrate that the dose from residual radioactivity is less than the maximum annual dose criterion for license termination for unrestricted use specified in 10CFR20.1402 (Reference 5-1). The additional requirement of 10CFR20.1402 that all residual radioactivity at the site be reduced to levels that are as low as reasonable achievable (ALARA) is addressed in Chapter 4. The Final Status Survey Plan was developed using the guidance of Draft Regulatory Guide DG-4006, "Demonstrating Compliance with the Radiological Criteria for License Termination" (Reference 5-2); NRUEG-1575, "The Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)" (Reference 5-3); and Regulatory Guide 1.179, "Standard Format and Content of License Termination Plans for Nuclear Power Reactors" (Reference 5-4). In September of 2000, the NRC incorporated much of the guidance of DG-4006 into various sections of NUREG-1727; "NMSS Decommissioning Standard Review Plan" dated September 2000 (Reference 5-5). References to the corresponding sections of NRUEG-1727 (in which the guidance of DG-4006 has been incorporated) have been given in specific sections of this LTP, as appropriate.

The final status survey process described in this plan adheres to the guidance of MARSSIM for the design of final status surveys. However, advanced survey technologies may be used to conduct radiological surveys that can effectively scan 100% of the surface and record the results. This survey plan allows for the use of these advanced technologies, where survey quality and efficiency can be increased, as long as certain criteria are met. These criteria ensure that the survey results are at least equivalent to those that would have been obtained using the non-parametric sampling methods of MARSSIM in terms of their statistical confidence. In cases where advanced survey technologies are to be used, a technical support document will be developed to describe the technology to be used and to demonstrate how the technology meets the objectives of the survey. These technical support documents will be referenced, as appropriate, in Final Status Survey Reports.

5.2 Scope

The final status survey plan encompasses the radiological assessment of all affected structures, systems and land areas for the purpose of quantifying the concentration of any residual activity that exists following all decontamination activities. Concentration limits will be established to represent the maximum annual dose rate criterion for unrestricted release specified in 10CFR20.1402.

6 COMPLIANCE WITH THE RADIOLOGICAL CRITERIA FOR LICENSE TERMINATION

6.1 Site Release Criteria

6.1.1 Radiological Criteria for Unrestricted Use

This section provides methods for showing compliance with the radiological criteria of license termination that are based on the site being partially through the decommissioning process. All activities required by the LTP for the non-ISFSI areas of the site have been completed and all non-ISFSI related areas have been released from the HNP license. As described at the beginning of Chapter 1, in order to provide a starting point for future activities required to remove the ISFSI required areas of the site from the HNP license, the HNP LTP will be left in its current state until such time as decommissioning of the ISFSI related facilities can begin.

The site release criteria for the Haddam Neck Plant (HNP) site will correspond to the radiological criteria for unrestricted use given in 10 CFR 20.1402 (Reference 6-1):

- Dose Criterion: The residual radioactivity that is distinguishable from background radiation results in a Total Effective Dose Equivalent (TEDE) to an average member of the critical group that does not exceed 25 mrem/year, including that from groundwater sources; and
- ALARA Criterion: The residual radioactivity has been reduced to levels that are As Low As Reasonably Achievable (ALARA).

6.1.2 Conditions Satisfying the Release Criteria

Levels of residual radioactivity that correspond to the allowable radiation dose and ALARA levels described above are calculated by analysis of various scenarios and pathways (e.g., direct radiation, inhalation, ingestion) through which exposures could be reasonably expected to occur. LTP Section 2.3.3.4 discusses the radionuclides for which Derived Concentration Guideline Levels (DCGLs) and the future groundwater dose must be calculated. These DCGLs and the future groundwater dose calculation methodology form the basis for the following conditions which, when met, satisfy the site release criteria as prescribed in 10 CFR 20.1402:

- The average residual radioactivity in soils, standing above grade buildings and existing groundwater above background is less than or equal to the applicable combined DCGLs.
- In the case of buried concrete, embedded piping and the below-grade containment liner, the “future groundwater” dose will be determined using the “Basement Fill Model”. This approach will ensure that the dose from all pathways will be less than the release criteria of 10 CFR 20.1402. The details of this model are presented in Section 6.8.2.
- Individual measurements, representing small areas of residual radioactivity, which exceed the DCGL, do not exceed the elevated measurement comparison $DCGL_{EMC}$. The use of the $DCGL_{EMC}$ is described in Section 5.4.7.4.

7 UPDATE OF SITE-SPECIFIC DECOMMISSIONING COSTS

7.1 Introduction

This section provides an update of site-specific decommissioning costs that are based on the site as it existed partially through the decommissioning process. All activates required by the LTP for the non-ISFSI areas of the site have been completed and all non-ISFSI related areas have been released from the HNP license. As described at the beginning of Chapter 1, in order to provide a starting point for future activates required to remove the ISFSI required areas of the site from the HNP license, the HNP LTP will be left in it's current state until such time as decommissioning of the ISFSI related facilities can begin.

In accordance with 10 CFR 50.82(a)(9)(ii)(F) and Regulatory Guide 1.179, the site specific cost estimates and funding plans are provided. Regulatory Guide 1.179 discusses the details of the information to be presented.

The License Termination Plan (LTP) must:

Provide an estimate of the remaining decommissioning costs, and compare the estimated costs with the present funds set aside for decommissioning. The financial assurance instrument required by 10CFR50.75 (Reference 7-1) must be funded to the amount of the cost estimate. If there is a deficit in the present funding, the LTP must indicate the means for ensuring adequate funds to complete the decommissioning.

The decommissioning cost estimate should include an evaluation of the following cost elements:

- Cost assumptions used, including contingency
- Major decommissioning activities and tasks
- Unit cost factors
- Estimated decontamination and equipment and structure removal
- Estimated cost of radioactive waste disposal including disposal surcharges
- Estimated final survey costs
- Estimated total costs

The cost estimate should focus on the remaining work, detailed activity by activity, including costs of labor, materials, equipment, energy, and services.

During plant operations, CYAPCO sold the entire electrical output of the Haddam Neck Plant (HNP) to wholesale power purchase contracts (i.e., Power Contracts) with the ten New England utilities that collectively own 100% of the common equity of CYAPCO (the "Customers"). Over the HNP's operating life, CYAPCO recovered, and since the shutdown continues to recover, its costs of providing service (including the estimated costs of decommissioning HNP) through a formula rate set forth in its Power Contracts. Collections for decommissioning have been placed in a trust established under Connecticut law, with two funds—the Qualified Fund and the Non-Qualified Fund (the "Decommissioning Trust").

On December 26, 1996, CYAPCO submitted amendments to its Power Contracts (the "Amendatory Agreements") for filing (Reference 7-2). These Amendatory Agreements were executed to implement the decision to cease operations permanently. Also in that filing, CYAPCO proposed to increase its annual decommissioning collections in order to allow CYAPCO to recover the estimated costs to decommission the HNP.

CY-07-127

Attachment 3

Haddam Neck Plant

**License Termination Plan
Revision 7**

Markup of Affected Pages

December 2007

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1 GENERAL INFORMATION

1.1 Purpose

The objective for decommissioning the Haddam Neck Plant (HNP) site is to reduce residual radioactivity to levels that permit release of the site for unrestricted use and for termination of the 10CFR50 license, in accordance with the Commission's site release criteria set forth in 10CFR20, Subpart E. The purpose of this HNP License Termination Plan (LTP) is to satisfy the requirements of 10CFR50.82, "Termination of License" (Reference 1-1) using the guidance provided in Regulatory Guide 1.179, "Standard Format and Content of License Termination Plans for Nuclear Power Reactors" (Reference 1-2) and Draft Regulatory Guide-4006, "Demonstrating Compliance with the Radiological Criteria for License Termination" (Reference 1-3). In September of 2000, the NRC incorporated much of the guidance of DG-4006 into various sections of NUREG-1727 (Reference 1-4). References to the corresponding sections of NUREG-1727 (in which the guidance of DG-4006 have been incorporated) has been given in specific sections of this LTP, as appropriate.

The LTP describes the decommissioning activities that will be performed, the process for performing the final status surveys, and the method for demonstrating that the site meets the criteria for release for unrestricted use. The LTP contains specific information on:

- Historical Site Assessment and Site Characterization;
- Remaining Decommissioning Activities;
- Site Remediation Plans;
- Final Status Survey Design and Implementation Plan;
- Dose Modeling Scenarios;
- Update to the Site-Specific Decommissioning Cost Estimate; and
- Supplement to the Environmental Report.

Each section of the LTP is summarized in Section 1.3.

As of October of 2007, CYAPCO had completed all activities required to remove all areas of the site other than those related to the Independent Spent Fuel Storage Installation (ISFSI) from the Haddam Neck Plant NRC license, Docket No. 50-213 (License NO. DPR-61). The NRC approved the removal of the non-ISFSI areas from the license via a partial site release in Reference 1-22. The approximately 4.6 acre sized area related to the ISFSI is shown in Figure 1-1. The area to remain in the license includes portion of Survey Areas 9523, 9524 and 9528 as described in Section 2. CYAPCO has subsequently revised the description of the licensed area of the site in the HNP Updated Final Safety Analysis Report (UFSAR) and Quality Assurance Plan (QAP).

The ISFSI related areas of site will remain in the HNP license until:

- The spent nuclear fuel has been shipped from the site for storage/or disposal
- The facilities in the areas shown in Figure 1-1 have been decommissioned
- A Final Status Survey has been conducted and the results submitted to the NRC

- The NRC approves the partial site release of remaining areas covered by the HNP license

The HNP LTP which follows describes the status of the plant, decommissioning activities, site release criteria and final status survey plans that describe the site as it existed partially through the decommissioning process.. All activates required by the LTP for the non-ISFSI areas of the site have been completed and all non-ISFSI related areas have been released from the HNP license. In order to provide a starting point for future activates required to remove the ISFSI required areas of the site from the HNP license, the HNP LTP will be left in it's current state until such time as decommissioning of the ISFSI related facilities can begin.

1.2 Historical Background

The HNP is located on the east bank of the Connecticut River, approximately 21 miles south-southeast of Hartford, at 362 Injun Hollow Road, Haddam, Middlesex County, Connecticut. HNP is owned by Connecticut Yankee Atomic Power Company, CYAPCO (Reference 1-5). Figures depicting the site area and buildings are provided at the end of LTP Chapter 2.

HNP, Docket No. 50-213 (License NO. DPR-61), began commercial operation in January 1968. The 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; instrumentation and control systems; the necessary auxiliaries; and structures to house plant systems and other onsite facilities. HNP was designed to produce 1,825 MW of thermal power and 590 MW of gross electrical power (Reference 1-6).

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- 1-15 “Haddam Neck Plant Historical Site Assessment Supplement,” dated August 14, 2001.
- 1-16 Code of Federal Regulations, Title 10, part 20.1402, “Radiological Criteria for Unrestricted Use.”
- 1-17 NRUEG-0586, “Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities,” dated August 1988, as supplemented on November 2002.
- 1-18 NUREG-1496, “Generic Environmental Impact Statement in Support Rulemaking for Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities,” dated July 1997.
- 1-19 SECY-00-41, “Use of Rubblized Concrete Dismantlement to Address 10CFR Part 20, Subpart E, Radiological Criteria for License Termination,” February 14, 2000.
- 1-20 Connecticut Yankee Atomic Power Company (CYAPC) letter to the USNRC dated July 7, 2000, and supplemental letters dated June 14, July 31, August 15, August 22, September 6, and September 7, 2001, and August 20 and October 10, 2002.
- 1-21 J. Donohew (USNRC) to K. J. Heider (CYAPCO), “Haddam Neck Plant-Issuance of Amendment RE-Approval of License Termination Plan (LTP) TAC No. MA9791, “dated November 25, 2002.
- 1-22 K. McConnell (USNRC) to W. Norton (CYAPCO), “Haddam Neck Plant – Release of Land from Part 50 License,” dated November 26, 2007..

2 GENERAL INFORMATION

2.1 Purpose

This section provides site characterization information that describes the site as it existed partially through the decommissioning process. All activities required by the LTP for the non-ISFSI areas of the site have been completed and all non-ISFSI related areas have been released from the HNP license. As described at the beginning of Chapter 1, in order to provide a starting point for future activities required to remove the ISFSI required areas of the site from the HNP license, the HNP LTP will be left in its current state until such time as decommissioning of the ISFSI related facilities can begin.

Initial site characterization of the Haddam Neck Plant (HNP) began following the permanent cessation of operations in the fall of 1977, and was completed in the fall of 1999. This initial characterization effort included a historical site assessment (HSA) – a review of historical survey documentation and measurements, samples, and analyses to further define the present radiological conditions of the site. The effort also addressed the status of the site relative to hazardous and state regulated non-radioactive materials. The initial characterization was performed to the guidelines of NUREG-1575, “Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)” (Reference 2-1). The HSA consisted of a review and compilation of site historical records, e.g., 10CFR50.75(g) records, radiological incident files, operational survey records, and annual environmental reports to the NRC. Personnel interviews were conducted with present and former plant employees and selected contractors to determine operational events that caused contamination in areas of systems not designed to contain radioactive or hazardous materials. Documentation from operational surveys, available through site document control facilities, was reviewed for historical information regarding radiological conditions throughout the site. The operational Radiation Protection Program provides continuing input regarding site radiological conditions. Measurements and samples beyond the scope of the operational survey program have been conducted in areas recognized as needing additional information in order to assess the type, magnitude, and extent of contamination.

The site characterization program used the same QA practices as employed by the operational radiation safety program. These practices included the use of approved procedures for the calibration, testing and use of both laboratory and portable equipment. Trained and qualified personnel collected data. Samples were controlled by administrative procedures to ensure that sample integrity was maintained. When offsite laboratories were used, they were required to perform daily instrumentation checks. Other quality control measures for offsite laboratories included periodic method blanks, replicate (duplicate) samples and participation in an inter-laboratory comparison program (e.g., cross checks). Performance of these “quality controls” by offsite laboratories, was verified periodically by QA auditors.

The objectives of a characterization program are to collect data adequate to:

1. Divide the HNP site into manageable sections or areas for survey and classification purposes;

3 IDENTIFICATION OF REMAINING SITE DISMANTLEMENT ACTIVITIES

3.1 Introduction

This section provides the remaining site dismantlement activities based on the site as it existed partially through the decommissioning process. All activities required by the LTP for the non-ISFSI areas of the site have been completed and all non-ISFSI related areas have been released from the HNP license. As described at the beginning of Chapter 1, in order to provide a starting point for future activities required to remove the ISFSI required areas of the site from the HNP license, the HNP LTP will be left in its current state until such time as decommissioning of the ISFSI related facilities can begin.

In accordance with 10CFR50.82 (a)(9)(ii)(B) (Reference 3-1), the LTP must identify the major dismantlement and decontamination activities that remain. The information includes those areas and equipment that need further remediation and an estimate of the radiological conditions that may be encountered. Included are estimates of associated occupational radiation dose and projected volumes of radioactive waste. These activities are undertaken pursuant to the current 10CFR50 license, are consistent with the PSDAR, and do not depend upon LTP approval to proceed.

CYAPCO's primary goals are to decommission the HNP safely and to maintain the continued safe storage of spent fuel. CYAPCO will decontaminate and dismantle the HNP in accordance with the DECON alternative, as described in the NRC's final Generic Environmental Impact Statement. Completion of the DECON option is contingent upon continued access to one or more low level waste disposal sites. Currently, HNP has access to low-level waste disposal facilities including those in Barnwell, South Carolina.

CYAPCO is currently conducting active decontamination and dismantlement activities at the HNP site in accordance with the HNP PSDAR (Reference 3-2). Decommissioning activities are being coordinated with the appropriate Federal and State regulatory agencies in accordance with plant administrative procedures.

Decommissioning activities at Haddam Neck will be conducted in accordance with the Haddam Neck UFSAR, Technical Specifications, existing Part 50 License and the requirements of 10CFR50.82(a)(6) and (a)(7). If an activity requires prior NRC approval under 10CFR50.59(c)(2) or a change to the Haddam Neck Plant Technical specifications, or license, a submittal will be made to the NRC for review and approval before implementing the activity in question. Decommissioning activities are conducted under the scrutiny of the existing CYAPCO Radiation Protection Program, Industrial Safety Program, and Waste Management Program. Such activities will be conducted in accordance with these programs which are well established and frequently inspected by the NRC. Activities conducted during decommissioning do not pose any greater radiological or safety risk than those conducted during operations, especially those during major maintenance and outage evolutions.

4 SITE REMEDIATION PLANS

4.1 Introduction

This section provides site remediation plans that are based on the site as it existed partially through the decommissioning process. All activities required by the LTP for the non-ISFSI areas of the site have been completed and all non-ISFSI related areas have been released from the HNP license. As described at the beginning of Chapter 1, in order to provide a starting point for future activities required to remove the ISFSI required areas of the site from the HNP license, the HNP LTP will be left in its current state until such time as decommissioning of the ISFSI related facilities can begin.

In accordance with 10CFR50.82(a)(9)(ii)(C) (Reference 4-1), the LTP must provide the “plans for site remediation.” These plans must include the provisions to meet the criteria from Subpart E of 10CFR20 (Reference 4-2) before the site may be released for unrestricted use:

- Annual total effective dose equivalent to the average member of the critical group not to exceed 25 mrem, and
- The dose to the public must be “as low as reasonably achievable,” or ALARA.

Decontamination and dismantlement activities will be conducted in accordance with the CY Radiation Protection, Safety and Waste Management Programs, which are well established and frequently inspected. Changes have been made to these programs for D&D activities, and any future changes that may be made will be documented and processed with existing plant administrative procedures using 10CFR50.59 and the guidance contained in Regulatory Guide 1.187.

This section describes the methodologies and criteria that will be used to perform remediation activities of residual radioactivity and to demonstrate compliance with the ALARA criteria, required by 10CFR20. More specific detail regarding remediation activities may be found in Chapter 3.

4.2 Remediation Levels and ALARA Evaluations

When dismantlement and decontamination actions are completed, residual radioactivity may remain on building surfaces and on site soils. Residual radioactivity must satisfy the provisions of 10CFR20, Subpart E. As depicted on Figure 4-1, the ALARA cleanup levels for the HNP decommissioning may be established at one of two levels:

- (1) a predefined generic ALARA screening, or
- (2) a survey unit-specific ALARA evaluation.

5 FINAL STATUS SURVEY PLAN

5.1 Introduction

This section provides a final status survey plan that is based on the site as it existed partially through the decommissioning process. All activities required by the LTP for the non-ISFSI areas of the site have been completed and all non-ISFSI related areas have been released from the HNP license. As described at the beginning of Chapter 1, in order to provide a starting point for future activities required to remove the ISFSI required areas of the site from the HNP license, the HNP LTP will be left in its current state until such time as decommissioning of the ISFSI related facilities can begin.

The purpose of the Final Status Survey Plan is to describe the methods to be used in planning, designing, conducting, and evaluating final status surveys at the HNP site. These surveys serve as key elements to demonstrate that the dose from residual radioactivity is less than the maximum annual dose criterion for license termination for unrestricted use specified in 10CFR20.1402 (Reference 5-1). The additional requirement of 10CFR20.1402 that all residual radioactivity at the site be reduced to levels that are as low as reasonable achievable (ALARA) is addressed in Chapter 4. The Final Status Survey Plan was developed using the guidance of Draft Regulatory Guide DG-4006, "Demonstrating Compliance with the Radiological Criteria for License Termination" (Reference 5-2); NRUEG-1575, "The Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)" (Reference 5-3); and Regulatory Guide 1.179, "Standard Format and Content of License Termination Plans for Nuclear Power Reactors" (Reference 5-4). In September of 2000, the NRC incorporated much of the guidance of DG-4006 into various sections of NUREG-1727; "NMSS Decommissioning Standard Review Plan" dated September 2000 (Reference 5-5). References to the corresponding sections of NRUEG-1727 (in which the guidance of DG-4006 has been incorporated) have been given in specific sections of this LTP, as appropriate.

The final status survey process described in this plan adheres to the guidance of MARSSIM for the design of final status surveys. However, advanced survey technologies may be used to conduct radiological surveys that can effectively scan 100% of the surface and record the results. This survey plan allows for the use of these advanced technologies, where survey quality and efficiency can be increased, as long as certain criteria are met. These criteria ensure that the survey results are at least equivalent to those that would have been obtained using the non-parametric sampling methods of MARSSIM in terms of their statistical confidence. In cases where advanced survey technologies are to be used, a technical support document will be developed to describe the technology to be used and to demonstrate how the technology meets the objectives of the survey. These technical support documents will be referenced, as appropriate, in Final Status Survey Reports.

6 COMPLIANCE WITH THE RADIOLOGICAL CRITERIA FOR LICENSE TERMINATION

6.1 Site Release Criteria

6.1.1 Radiological Criteria for Unrestricted Use

This section provides methods for showing compliance with the radiological criteria of license termination that are based on the site being partially through the decommissioning process. All activates required by the LTP for the non-ISFSI areas of the site have been completed and all non-ISFSI related areas have been released from the HNP license. As described at the beginning of Chapter 1, in order to provide a starting point for future activates required to remove the ISFSI required areas of the site from the HNP license, the HNP LTP will be left in it's current state until such time as decommissioning of the ISFSI related facilities can begin.

The site release criteria for the Haddam Neck Plant (HNP) site will correspond to the radiological criteria for unrestricted use given in 10 CFR 20.1402 (Reference 6-1):

- Dose Criterion: The residual radioactivity that is distinguishable from background radiation results in a Total Effective Dose Equivalent (TEDE) to an average member of the critical group that does not exceed 25 mrem/year, including that from groundwater sources; and
- ALARA Criterion: The residual radioactivity has been reduced to levels that are As Low As Reasonably Achievable (ALARA).

6.1.2 Conditions Satisfying the Release Criteria

Levels of residual radioactivity that correspond to the allowable radiation dose and ALARA levels described above are calculated by analysis of various scenarios and pathways (e.g., direct radiation, inhalation, ingestion) through which exposures could be reasonably expected to occur. LTP Section 2.3.3.4 discusses the radionuclides for which Derived Concentration Guideline Levels (DCGLs) and the future groundwater dose must be calculated. These DCGLs and the future groundwater dose calculation methodology form the basis for the following conditions which, when met, satisfy the site release criteria as prescribed in 10 CFR 20.1402:

- The average residual radioactivity in soils, standing above grade buildings and existing groundwater above background is less than or equal to the applicable combined DCGLs.
- In the case of buried concrete, embedded piping and the below-grade containment liner, the "future groundwater" dose will be determined using the "Basement Fill Model". This approach will ensure that the dose from all pathways will be less

7 UPDATE OF SITE-SPECIFIC DECOMMISSIONING COSTS

7.1 Introduction

This section provides an update of site-specific decommissioning costs that are based on the site as it existed partially through the decommissioning process. All activates required by the LTP for the non-ISFSI areas of the site have been completed and all non-ISFSI related areas have been released from the HNP license. As described at the beginning of Chapter 1, in order to provide a starting point for future activates required to remove the ISFSI required areas of the site from the HNP license, the HNP LTP will be left in it's current state until such time as decommissioning of the ISFSI related facilities can begin.

In accordance with 10 CFR 50.82(a)(9)(ii)(F) and Regulatory Guide 1.179, the site specific cost estimates and funding plans are provided. Regulatory Guide 1.179 discusses the details of the information to be presented.

The License Termination Plan (LTP) must:

Provide an estimate of the remaining decommissioning costs, and compare the estimated costs with the present funds set aside for decommissioning. The financial assurance instrument required by 10CFR50.75 (Reference 7-1) must be funded to the amount of the cost estimate. If there is a deficit in the present funding, the LTP must indicate the means for ensuring adequate funds to complete the decommissioning.

The decommissioning cost estimate should include an evaluation of the following cost elements:

- Cost assumptions used, including contingency
- Major decommissioning activities and tasks
- Unit cost factors
- Estimated decontamination and equipment and structure removal
- Estimated cost of radioactive waste disposal including disposal surcharges
- Estimated final survey costs
- Estimated total costs

The cost estimate should focus on the remaining work, detailed activity by activity, including costs of labor, materials, equipment, energy, and services.

During plant operations, CYAPCO sold the entire electrical output of the Haddam Neck Plant (HNP) to wholesale power purchase contracts (i.e., Power Contracts) with the ten New England utilities that collectively own 100% of the common equity of CYAPCO (the "Customers"). Over the HNP's operating life, CYAPCO recovered, and since the shutdown continues to recover, its costs of providing service (including the estimated costs of decommissioning HNP) through a formula rate set forth in its Power Contracts. Collections for decommissioning have been placed in a trust established under Connecticut law, with two funds—the Qualified Fund and the Non-Qualified Fund (the "Decommissioning Trust").