



CONNECTICUT YANKEE ATOMIC POWER COMPANY

HADDAM NECK PLANT
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February 22, 2017
CY-17-007
10 CFR 50.82(a)(7)

ATTN: Document Control Desk
Director, Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555 - 0001

Connecticut Yankee Atomic Power Company
Haddam Neck Plant Independent Spent Fuel Storage Installation
NRC License No. DPR-61 (NRC Docket No. 50-213)

Subject: Revision 6 to Haddam Neck Plant Post-Shutdown Decommissioning Activities Report


Pursuant to the requirements of 10 CFR 50.82(a)(7), Connecticut Yankee Atomic Power Company (CYAPCO) provides a complete copy of Revision 6 to the Haddam Neck Plant Post-Shutdown Decommissioning Activities Report (PSDAR) in Enclosure 1.

The PSDAR was revised to update the Decommissioning Cost Estimate and schedule to reflect a new Decommissioning Cost Estimate and schedule that was submitted to the Federal Energy Regulatory Commission (FERC) on September 30, 2016 and approved by FERC on November 15, 2016. CYAPCO previously notified the NRC of the intent to make these changes to the PSDAR in a letter dated January 5, 2017.

There are no commitments in the this letter.

If you have any questions regarding this letter, please do not hesitate to contact me at (860) 267-6426 x303.

Respectfully,


Matt Arsenault
ISFSI Manager

NM5524

Enclosure: Revision 6 of the Haddam Neck Plant Post-Shutdown Decommissioning Activities Report

cc: D. Dorman, NRC Region I Administrator
R. Powell, Chief, Decommissioning Branch, NRC, Region I
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ENCLOSURE TO CY-17-007

REVISION 6 OF THE HADDAM NECK PLANT

POST-SHUTDOWN DECOMMISSIONING ACTIVITIES REPORT

Haddam Neck Plant

Post Shutdown Decommissioning Activities Report

Revision 6

February 2017

**HADDAM NECK PLANT
POST-SHUTDOWN DECOMMISSIONING ACTIVITIES REPORT**

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LIST OF ACRONYMS

ALARA	As Low As Reasonably Achievable
CYAPCO	Connecticut Yankee Atomic Power Company
DECON	Immediate Decontamination and Dismantlement Option
DF	Decontamination Factor
DOE	Department of Energy
DOT	Department of Transportation
ENTOMB	Encasement in Concrete with Future Dismantlement Option
FERC	Federal Energy Regulatory Commission
FGEIS	Final Generic Environmental Impact Statement
GTCC	Greater Than Class C
HEPA	High Efficiency Particulate Air [filter]
HNP	Haddam Neck Plant
ISFSI	Independent Spent Fuel Storage Installation
LLW	Low Level Radioactive Waste
LTP	License Termination Plan
NRC	Nuclear Regulatory Commission
PSDAR	Post Shutdown Decommissioning Activities Report
PWR	Pressurized Water Reactor
RCS	Reactor Coolant System
SAFSTOR	Delayed Decontamination and Dismantlement Option
UFSAR	Updated Final Safety Analysis Report
10CFR61	Licensing Requirements for Land Disposal of Radioactive Waste
10CFR71	Packaging and Transportation of Radioactive Material

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INTRODUCTION

Under the provisions of 10CFR50.82(a)(4)(i), Connecticut Yankee Atomic Power Company (CYAPCO) submitted the Post Shutdown Decommissioning Activities Report (PSDAR) on August 22, 1997 [Reference 1]. It described planned decommissioning activities and the schedule for those activities, provided an estimate of expected costs, and discussed the reasons for concluding that the environmental impacts associated with site-specific decommissioning activities are bounded by appropriate previously issued environmental impact statements, specifically NUREG-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities" [Reference 3] and the Haddam Neck Plant site-specific Final Environmental Statement [Reference 4] and Environmental Assessment [Reference 5]. On October 22, 2002, Revision 1 [Reference 2] to the PSDAR was issued to: 1) identify that CYAPCO will utilize dry cask storage in an Independent Spent Fuel Storage Installation (ISFSI) to store spent fuel and Greater Than Class C (GTCC) waste until the material is shipped offsite (most likely to a Department of Energy (DOE) facility); and 2) update the status, plans, cost estimate and schedule regarding decommissioning activities.

Revision 2 to the PSDAR was issued to: 1) eliminate references to Bechtel as the decommissioning operations contactor; and 2) update the status, plans, cost estimate and schedule regarding decommissioning activities (Reference 11).

Revision 3 to the PSDAR is issued to update the status, plans, cost estimate, schedule, and environmental impacts regarding decommissioning activities, and to include a cost estimate regarding the management of spent fuel and GTCC waste.

BACKGROUND

The Haddam Neck Plant (HNP) achieved initial criticality on July 24, 1967, began commercial operation on January 1, 1968, and operated 28 years achieving an overall capacity factor of approximately 70 percent. The nuclear steam supply system was a four loop pressurized water reactor (PWR) designed by Westinghouse Electric Corporation with a thermal power design limit of 1825 MWt. The turbine generator was rated to produce 619 MWe.

Defueling began on November 13, 1996 and was completed on November 15, 1996, with all fuel assemblies being placed into the spent fuel pool for temporary storage. For economic reasons, CYAPCO opted to cease commercial operation of the HNP on December 4, 1996. Certification of permanent cessation of operation and removal of fuel, in accordance with 10CFR50.82(a)(1)(i) and (ii), was submitted to the U.S. Nuclear Regulatory Commission on December 5, 1996 [Reference 6].

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CYAPCO decommissioned the HNP in a safe and cost effective manner and transferred spent fuel and GTCC waste to the HNP Independent Spent Fuel Storage Installation (ISFSI), where it will be stored until the material is shipped offsite (most likely to a DOE facility). Following the removal of the spent fuel and GTCC waste from the site, CYAPCO will decontaminate and dismantle the HNP ISFSI, resulting in the timely removal of the existing nuclear plant in accordance with one of the options found acceptable by the NRC in its Final Generic Environmental Impact Statement (FGEIS). The NRC regulations refer to this option as the DECON alternative resulting in prompt dismantlement of the site. Completion of the DECON option is contingent upon continued access to one or more low level waste disposal sites.

DESCRIPTION OF PLANNED DECOMMISSIONING ACTIVITIES

Decommissioning Activities and Planning

The activities planned for decommissioning of the HNP reflect the selection of the DECON option for the site. CYAPCO will complete the detailed planning required for each decommissioning activity prior to the start of each activity.

Planning Activities Conducted Prior to Submittal of the PSDAR

The time period between the decision to permanently shut down and decommission the plant and the submittal of the PSDAR to the NRC on August 22, 1997, was utilized by CYAPCO to establish a decommissioning organization, prepare submittals for a revised Emergency Plan, a revised Security Plan, a revised Quality Assurance Program, revised Technical Specifications, and to initiate planning for decommissioning activities.

Planning and preparation for decommissioning included the following generalized types of tasks:

- Review of existing plant programs to assess their applicability to decommissioning,
- Review and reclassify systems important to decommissioning operations,
- Revision of procedures and license basis documents to reflect the plant's defueled and permanently shutdown configuration,
- Initiation of radiological and hazardous material characterization of the site,
- Design and procurement of equipment and facilities to support decommissioning activities,
- Preparation of detailed (area-by-area) work breakdown structures for decontamination/dismantling activities,
- Preparation of a dose estimate for decommissioning activities, and
- Evaluation of disposition options for facility components and structures.

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A key step in decommissioning planning was the selection of a project staff and establishment of an organizational structure with prior decommissioning experience. This step mobilized key management personnel with decommissioning experience, permanent CYAPCO management, supplemented with staff and specialty contractors to be utilized as needed.

Plant Dismantlement

CYAPCO executed a contract with Bechtel Power Corporation on April 3, 1999 to perform the decommissioning and dismantlement operations (the contract also provided for implementation of a dry cask ISFSI). CYAPCO retained licensee authority and oversight of Bechtel's operations until June 2003, when CYAPCO terminated Bechtel as the decommissioning operations contractor. CYAPCO managed the decommissioning of HNP using staff augmentation and subcontractors for specialty work. CYAPCO is now responsible for the management of the safe storage of spent fuel and GTCC waste at the HNP ISFSI. In the future, CYAPCO will manage the decommissioning of the ISFSI.

The decommissioning planning for the HNP was based on selecting the DECON option and resulted in the decontamination or dismantlement of the majority of plant structures and facilities by the end of year 2006. The structures and facilities that remain are those associated with the ISFSI. The ISFSI will be surveyed, decontaminated if required, and dismantled after the spent fuel and GTCC waste is removed from the ISFSI. The DOE is contractually obligated to accept spent fuel and high-level radioactive waste, i.e., the spent fuel and the GTCC waste.

The following describes activities included in the dismantlement period:

- Establishment of site construction power distribution system (completed),
- Performance of primary systems decontamination (completed),
- Performance of asbestos abatement program (completed),
- Separation of the fuel building from the rest of the site's mechanical and electrical systems (completed),
- Conduct of decommissioning activities, including major component removal (completed, with the exception of those associated with the ISFSI),
- Conduct of decontamination of facility surfaces, components and piping systems as required (completed, with the exception of those associated with the ISFSI),
- Conduct of soil remediation as required (completed, with the exception of any remediation required to decommission the ISFSI),
- Shipment and proper disposal of all remaining radioactive materials (completed, with the exception of that associated with the ISFSI), and

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- Performance of comprehensive final status surveys to demonstrate compliance with approved site release criteria per 10CFR20, subpart E (completed, with the exception of that associated with the ISFSI).

MAJOR DECOMMISSIONING ACTIVITIES

10CFR50.2 defines major decommissioning as any activity that results in permanent removal of major radioactive components (e.g., reactor vessel and internals, steam generators, pressurizer, large bore reactor coolant system piping, and other large components that are radioactive to a comparable degree), permanently modifies the structure of the containment, or results in dismantling components for shipment containing GTCC waste.

The following discusses the planned major decommissioning activities at the HNP:

On September 1, 2004, February 27, 2006, and November 26, 2007 (References 12 through 14), the NRC issued Safety Evaluation Reports that released the majority of the site from the 10 CFR 50 License. As a result, the only areas of the site that remain within the control of the 10 CFR 50 License are those areas associated with the HNP ISFSI, portions of Survey Units 9523-0000, 9528-0000, and 9528-0004.

With the exception of decommissioning activities at the ISFSI to be undertaken when all fuel and GTCC waste have been removed from the site, all decommissioning and dismantlement activities have been completed at this site.

The information included within this section includes historical information that will be maintained in its current form. This information will be reviewed, and revised as necessary, at the time of initiating the decommissioning activities for the ISFSI and associated land areas to ensure that appropriate information is available for the implementation of final status survey activities for the ISFSI and termination of the Part 50 License for the HNP site.

Reactor Vessel and Internals

The reactor vessel head was removed in accordance with the general decommissioning activities and shipped to a disposal facility. The reactor vessel (with the segmented internals, excluding those classified as the GTCC waste) was removed from the containment structure and shipped to the low level waste repository in Barnwell, SC. The reactor vessel was transported and disposed of in an approved container per 10 CFR 71.10 and under a Department of Transportation (DOT) exemption request pursuant to 49 CFR 107.105.

A portion of the highly activated reactor vessel internals was characterized as GTCC waste. These internals were segmented and placed into fuel assembly

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size canisters. The GTCC waste was transferred from the HNP spent fuel pool to the ISFSI, where it will be stored until the material is shipped offsite (most likely to a DOE facility).

Steam Generators

The steam generators were removed in two pieces (i.e., steam dome and lower assembly) and shipped to a disposal facility.

Pressurizer

The pressurizer was removed as a single piece and shipped to a disposal facility.

Reactor Coolant System (RCS) and Other Large Bore Piping

The RCS and other large bore piping were chemically decontaminated and were removed in accordance with the general decommissioning activities.

Containment

The containment surfaces and structure were decontaminated (as appropriate) and dismantled to grade and backfilled to four feet above grade.

Spent Fuel Pool

The spent fuel pool and associated structures and systems were decontaminated, as appropriate, dismantled and shipped offsite.

Independent Spent Fuel Storage Installation

After the spent fuel and GTCC waste is removed from the ISFSI, the ISFSI will be surveyed, decontaminated (if required), and dismantled in accordance with the general decommissioning activities.

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OTHER DECOMMISSIONING CONSIDERATIONS

The decontamination or dismantlement of contaminated systems, structures and components may be accomplished by decontamination in place, dismantlement and decontamination, or dismantlement and disposal. A combination of these methods may be utilized to reduce contamination levels, worker radiation exposures and project costs. General considerations applicable to these activities are described below.

Chemical Decontamination of Primary Coolant Systems

A chemical decontamination of the primary coolant system was performed prior to conducting major decommissioning activities. The chemical decontamination was a significant ALARA initiative to reduce personnel exposure during decommissioning work activities. It resulted in a dose savings of approximately 950 person-rem. The decontamination effort included the entire RCS (including reactor vessel, steam generators and pressurizer) as well as portions of the following appended systems: letdown and charging, residual heat removal, loop fill and drains, seal injection and return, and selected dead leg piping. Modifications were necessary to establish the required flow paths. The decontamination operation was controlled by approved plant procedures.

General Decommissioning Activities Relating to Removal of Radiological Components & Structures from the HNP

Components were safely and efficiently removed using the techniques and methods determined to be the most appropriate for the particular circumstances and as specified in engineering documents. Openings in components were typically covered and sealed to minimize the spread of contamination. The components were packaged into containers for shipment to a processing facility for decontamination or a low level radioactive waste disposal facility.

Concrete and structural steel components exceeding release criteria [10 CFR 20, Subpart E] were decontaminated or removed after contaminated and uncontaminated systems and equipment were removed from the area or building. The concrete removed was packaged into containers for shipment to a low-level radioactive waste disposal facility. Likewise, the structural steel components were decontaminated (if required) and packaged into containers for shipment to a processing facility for decontamination or to a low-level radioactive waste disposal facility.

Underground contaminated components (e.g., piping, drains) were addressed as described in the License Termination Plan [References 7 and 8].

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Decontamination Methods for the HNP

Contaminated systems and components were removed and sent to an off-site processing facility or to a low-level radioactive waste disposal facility. On-site decontamination of systems and components included activities needed to maintain personnel exposure ALARA, to expedite equipment removal, and to control the spread of contamination.

Application of coatings and hand wiping were the preferred methods for stabilizing or removing loose surface contamination. When other methods were utilized (e.g., grit blasting, high pressure water), airborne contamination control and waste processing systems were used as necessary to control and monitor any releases of contamination.

Concrete that exceeded the release criteria [10 CFR 20 Subpart E] as well as other contaminated materials were removed and sent to a low-level radioactive waste disposal facility. Vacuum removal of the dust and debris with HEPA filtration of the effluent was used as appropriate to minimize airborne contamination.

Dismantlement Methods for the HNP

Dismantlement methods utilized the following two basic types:

Mechanical Methods – The mechanical methods machined the surfaces of the material that were being cut. These methods typically were capable of cutting remotely without generating significant amounts of airborne contamination. This attribute makes these methods attractive for most of the contaminated piping, equipment, and components that will be removed at the HNP. Smaller bore contaminated piping, tubing, and supports can be cut using any of the mechanical methods (e.g., band saws, reciprocating saws, hydraulic shears).

Thermal Methods - Thermal methods melt or vaporize the surfaces of material that were being cut. The cutting debris was transported from the cut region with a gas jet or water spray. Although thermal methods are significantly quicker than mechanical methods, they have high power requirements and generate airborne contamination when used on contaminated systems in air. Generation of airborne contamination can be easily controlled when the method is used underwater. Thermal methods are suitable for segmenting large vessels in areas that can easily be sealed, filtered, or maintained underwater. The method is also suitable for use at a cutting station with air filtration. Thermal methods are appropriate for removing structural steel if it has been decontaminated or if a local containment with HEPA filtration is established.

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Explosives were used to weaken the turbine pedestal, reactor support structure and containment building.

Special or Unusual Programs Utilized to Decommission the HNP

There were no special or unusual programs. All procedures and processes that were used at the HNP were consistent with those considered in the Final Generic Environmental Impact Statement (FGEIS).

Removal of Low Level Radioactive Waste (LLW) and Compaction or Incineration associated with the HNP

LLW was processed in accordance with plant procedures and sent to LLW disposal facilities. No incineration occurred on-site. Onsite compaction was not used.

Soil Remediation associated with the HNP

Soils and pavement were surveyed and characterized as described in the License Termination Plan. As necessary, soils and pavement were remediated (i.e., removed, processed and disposed of at a licensed facility) if determined to contain contamination levels above the NRC site release criteria [10CFR20, Subpart E].

Processing and Disposal Site Locations

Currently, there are several facilities available for (1) the processing of waste materials to achieve volume reduction prior to disposal or (2) the disposal of low-level radioactive waste.

Removal of Mixed Wastes

Mixed wastes were managed according to all applicable federal and state regulations including NRC handling, storage, and transportation regulations.

Mixed wastes from the HNP were transported by authorized and licensed transporters and shipped only to authorized and licensed facilities.

Any mixed wastes associated with the decommissioning of the HNP ISFSI will be managed in the same manner described above for the Haddam Neck Plant. If technology, resources, and approved processes are available, processes will be evaluated to render the mixed waste non-hazardous.

Storage/Removal of Spent Fuel and GTCC Waste

Spent fuel and GTCC waste were transferred from the spent fuel pool to dry casks and are being stored at the ISFSI, until the material is shipped offsite (most

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likely to a DOE facility). The date of DOE's acceptance of the spent fuel and GTCC waste is assumed to occur in year 2034; however, a precise schedule of when the spent fuel and the GTCC waste will be removed from the HNP site is not available.

Decommissioning of the ISFSI

Following the removal of the spent fuel and GTCC waste, the ISFSI will be decommissioned. The current plan is to utilize the rip and ship method to dispose of the ISFSI pad and ISFSI casks.

Soils and pavement for areas associated with the ISFSI will be surveyed and characterized as described in the License Termination Plan. As necessary, soils and pavement will be remediated (i.e., removed, processed and disposed of at a licensed facility) if determined to contain contamination levels above the NRC site release criteria [10CFR20, Subpart E].

SCHEDULE FOR REMAINING DECOMMISSIONING ACTIVITIES

The following milestones define the schedule for the remaining major decommissioning activities (significant activities completed or scheduled). This schedule is based on the assumption that spent fuel and GTCC waste will be stored at the ISFSI until the material is removed from the site (most likely to a DOE facility).

Operating License Land Areas Reduced to ISFSI Only	- 11/2007
Transfer of Spent Fuel and GTCC Waste to DOE Complete	- 2035
ISFSI Demolition Complete	- 2035
Final Site Survey Complete	- 2036
CY License Termination	- 2036

Note: The decommissioning schedule is updated periodically; therefore, the dates of selected activities may differ from the dates presented above. CYAPCO will inform the NRC of significant schedule changes in accordance with 10 CFR 50.82(a)(7).

COST ESTIMATES FOR ISFSI DECOMMISSIONING AND MANAGEMENT OF SPENT FUEL AND GTCC WASTE

The current decommissioning cost estimate and cost estimate for management of spent fuel and GTCC waste (Docket # ER16-2723) was filed with the Federal Energy Regulatory Commission (FERC) on September 30, 2016 and approved by FERC on November 15, 2016 with no objections from the State Agencies that were party to the April 30, 2013 Stipulation and Settlement Agreement (Docket #

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ER13-1399-000) including the Connecticut Public Utilities Regulatory Authority, the Connecticut Office of Consumer Counsel, the Maine Public Utilities Commission, the Maine Office of Public Advocate, the Massachusetts Department of Public Utilities, and the Attorney General of Massachusetts.

This cost estimate includes the cost associated with the projected ISFSI decommissioning costs and a funding assumption of 15 years of operations costs to manage spent fuel and GTCC waste. A funding mechanism provides that damage awards and settlement proceeds that CYAPCO receives in future phases of its litigation with the Department of Energy (DOE) will be applied to maintain the adequacy of the Nuclear Decommissioning Trust (NDT) to cover 15 years of ISFSI operations (as well as all other projected decommissioning costs). In addition, CYAPCO has the right to resume collection of decommissioning charges from its customers subject to the submittal of a proposal under section 205 of the Federal Power Act, if needed.

CYAPCO has an account within its NDT entitled, "ISFSI Radiological Decom," that segregates the funds for radiological decommissioning of the ISFSI from the larger balance of funds for ongoing management of spent fuel and GTCC waste held in the NDT.

The assumptions of the current decommissioning cost estimate are discussed in the Decommissioning Funding Plan submitted to the NRC on December 14, 2015 in accordance with 10 CFR 72.30(c) (Reference 15). The decommissioning cost estimate incorporates the most recent assumptions with respect to the remaining decommissioning activities and related costs (i.e., those associated with the HNP ISFSI). The total un-escalated cost estimate for decommissioning the ISFSI, including contingency is \$20.3 million in 2016 dollars. This includes \$18.3 million for radiological removal in 2016 dollars and \$2.0 million for non-radiological removal in 2016 dollars.

ISFSI operations will continue until DOE removes the spent fuel and GTCC waste, allowing for the decommissioning of the ISFSI. CYAPCO expects that the ISFSI operating costs will continue to cover a number of categories, including payments for the storage of wet fuel at the General Electric facility in Morris, Illinois, regulatory fees, and costs for insurance, labor, security, materials and supplies, miscellaneous expenses, outside services, property taxes, regulatory fees, rentals and leases and utilities. The un-escalated cost estimate for the management of spent fuel and GTCC waste from 2016 through 2034, including contingency, is \$254.4 million in 2016 dollars.

The total un-escalated cost estimate is approximately \$274.7 million in 2016 dollars for decommissioning the ISFSI and managing the storage of spent fuel and GTCC waste for the time period of 2016 through 2036.

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CYAPCO will continue to inform the NRC regarding the status of this funding by complying with the obligations defined in: 1) 10 CFR 50.75(f)(1) and (2) to submit an annual Decommissioning Funding Status Report; 2) 10 CFR 50.82(a)(8)(v) to submit an annual financial assurance status report regarding decommissioning funding; 3) 10 CFR 72.30(c) to resubmit the decommissioning funding plan at intervals not to exceed three years; and 4) 10 CFR 50.82(a)(8)(vii) to submit an annual report regarding the status of the funding for managing irradiated fuel.

ENVIRONMENTAL IMPACTS

CYAPCO performed an environmental review [Reference 9] to evaluate the actual or potential environmental impacts associated with the proposed decommissioning activities. The basis for this evaluation was NUREG-0586, "Final Generic Environmental Impact Statement (FGEIS) on Decommissioning of Nuclear Facilities" [Reference 3]. Two previous site-specific environmental assessments from the conversion of the provisional operating license to a full-term operating license [Reference 4] and most recently, from the re-capture of the construction period time duration [Reference 5] in the operating license were also considered. This evaluation was reported in Revisions 0 and 1 of the PSDAR.

In November 2002, the NRC published Supplement 1 to NUREG-0586, "Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities" (Reference 10). The intent of this supplement is to consider in a comprehensive manner all aspects related to the radiological decommissioning of nuclear reactor facilities by incorporating updated information, regulation, and analyses. Since the 1988 NUREG-0586 FGEIS was written, the NRC and the industry have gained substantially more nuclear power facility decommissioning experience. The NRC noted that the activities which are performed in conjunction with decommissioning, such as ISFSI construction, maintenance, and decommissioning, as well as spent fuel storage and maintenance, are not considered within the scope of the 2002 Supplement 1 to NUREG-0586. The NRC also noted that the environmental impacts described in this supplement supersede those described for power reactor facilities in the 1988 NUREG-0586.

The environmental review concludes that the impacts due to decommissioning of the HNP and the HNP ISFSI will be bounded by the previously issued environmental impact statements, (specifically the FGEIS) and previously issued environmental assessments as well as Supplement 1 to NUREG-0586. This is principally due to the following reasons:

- The postulated impacts associated with the method chosen (DECON) have already been considered in Supplement 1 to NUREG-0586.

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- There are no unique aspects of the plant or HNP ISFSI or decommissioning techniques to be utilized that would invalidate the conclusions reached in Supplement 1 to NUREG-0586.
- The methods to be employed to dismantle and decontaminate the site (including the HNP ISFSI) are standard construction based techniques fully considered in Supplement 1 to NUREG-0586.
- The site-specific person-rem estimate for all decommissioning activities has been conservatively calculated using methods similar to and consistent with Supplement 1 to NUREG-0586.

Specifically, this review concludes that the HNP and HNP ISFSI decommissioning will result in generally positive environmental effects, in that:

- Radiological sources that create the potential for radiation exposure to site workers and the public will be minimized.
- The site will be returned to a condition that will be acceptable for unrestricted use.
- The thermal impact on the Connecticut River from facility operations will be eliminated.
- Noise levels in the vicinity of the facility will be reduced.
- Hazardous materials and chemicals will be removed.
- Local traffic will be reduced (fewer employees, contractors and materials shipments than are required to support an operating nuclear power plant).

Furthermore, the HNP and HNP ISFSI decommissioning will be accomplished with no significant adverse environmental impacts in that:

- No site specific factors pertaining to the HNP and HNP ISFSI would alter the conclusions of Supplement 1 to NUREG-0586.
- Radiation dose to the public will be minimal.
- Radiation dose to decommissioning workers will be a fraction of the dose accumulated during operations.
- Decommissioning is not an imminent health or safety problem and will generally have a positive environmental impact.

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In Revisions 0 and 1 of the PSDAR, the total occupational exposure (excluding public and transportation dose) impact for the proposed decommissioning activities was estimated to be approximately 935 person-rem. This dose number includes 66 person-rem for spent fuel storage and cask loading. The activities related to the spent fuel storage and cask loadings are not considered part of decommissioning activities (Reference 10). Since that estimate was made, a significant amount of the decommissioning tasks have been completed. An estimate of the total occupational exposure as of March 2004 established that the total occupational exposure estimate was within 10% of the original estimate. This estimate utilized the actual occupational exposure associated with the decommissioning tasks that had been completed and estimates for the tasks to be performed. The maximum estimate of the total occupational exposure remains within the 1,115 person-rem exposure estimate of Supplement 1 to NUREG-0586 (Section 4.3.8, Table 4-1) for a pressurized water reactor (PWR). The occupational dose associated with the decommissioning of the ISFSI is not expected to contribute significantly to the overall occupational dose associated with decommissioning the HNP site.

The total volume of HNP low level radioactive waste (LLRW) in Revision 1 of the PSDAR was expected to be 283,117 cubic feet. This was well bounded by the 1988 FGEIS DECON PWR volume of 647,600 cubic feet. It was also bounded by Table 4-7 of Supplement 1 to NUREG-0586, DECON PWR volume of 282,500 to 353,000 cubic feet. This scenario involved license termination with many buildings remaining on site.

Since then, the decommissioning approach has been modified, based upon lessons learned at other facilities. CYAPCO demolished buildings located in the radiological controlled area and disposed of them as low level radioactive waste. This increased the estimated volume of radioactive waste to approximately 1,158,000 cubic feet. This volume exceeds the 1988 NUREG 0586 volume for the referenced PWR by 79% and the Supplement 1 to NUREG 0586 estimate by 228%. In addition, the decommissioning cost estimate prepared in 2012 assumed that the materials that comprise the Vertical Concrete Casks (VCCs) and the ISFSI storage pad would be shipped offsite as low-level radioactive waste (LLRW). This increases the total amount of material that will be removed from site. However, no significant impacts are expected from the disposal of LLRW. Although the volume has increased significantly, there is minimal increase in the disposal of radioactive source term.

The change in waste volume is a result of the decision to demolish the buildings and ship a large portion of them as radioactive waste prior to License Termination. Under this approach, the only additional source term to be shipped is that which would have remained in the buildings after License Termination (e.g., that which met the 25 mrem/year criteria). Appendix K of Supplement 1 to NUREG 0586 classifies this type of waste as "Very Low Activity Waste" and states the "the activity estimates for very low level activity waste are sufficiently

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small that the activity may be neglected in the evaluation of the radiological impacts of transportation of LLW." Approximately 1,086,000 cubic feet of waste associated with the HNP and the total LLRW associated with the HNP ISFSI are considered very low activity waste and, therefore, this waste is neglected in the evaluation of radiological impacts of transportation of this very low activity waste. Thus, the increase in the waste volume due to the change in decommissioning methodology at the Haddam Neck Plant does not increase the estimated occupational, public or on-looker dose for the decommissioning. Therefore, the transportation dose impacts are not detectable or destabilizing.

The 1988 NUREG-0586 evaluated the generation of LLRW from decommissioning in the context of its impact on the commitment of radioactive waste disposal space and the dose to the public. The commitment of radioactive waste disposal space is related to the volume of LLRW for disposal. The commitment of LLRW disposal space for a volume of 647,600 cubic feet was estimated to be less than 2 acres, assuming shallow-land burial of radioactive wastes in standard trenches. The 1988 NUREG-0586 concluded that two acres of radioactive waste disposal space is small in comparison to the acreage freed up by decommissioning the reference plant (1,160 acres). The 1988 NUREG-0586 also concluded that while decommissioning will generate an appreciable fraction of the LLRW generated by a PWR over its lifetime, the quantity of waste from all operating reactors will considerably exceed that generated from those facilities being decommissioned.

The increased commitment of LLRW disposal space for the increased LLRW from the HNP plant decommissioning was determined by multiplying the FGEIS value of 2 acres by 79%, resulting in an additional 1.58 acres. Thus, it was estimated that the commitment of LLRW waste facility space was a total of 3.58 acres. This value is increased by the decision to rip and ship all of the material associated with the VCCs and the ISFSI storage pad. However, the total disposal space that would be utilized is very small in comparison to the 525 acres made available by the decommissioning of HNP and the HNP ISFSI.

Section 4.3.18 of Supplement 1 to NUREG-0586 addresses irreversible and irretrievable commitment of resources (e.g., land use). This section states in part, "Whether land is considered to be an irretrievable resource depends largely upon the decisions at the time of license termination. If the license is terminated for unrestricted use, then the land will be available for other use." In the case of land use at the HNP, the land will be available for unrestricted use after license termination and therefore, the land is considered retrievable. Therefore, the impact of HNP decommissioning on the increased commitment of LLRW disposal space for the increase LLRW is neither detectable nor destabilizing. In addition, Table 4-7 of Supplement 1 of NUREG 0586 estimates the volume of land required for disposal of waste in order to evaluate the potential impacts of waste volume on "irretrievable resources." The table lists estimated waste volumes of up to 1.5 million cubic feet for SAFSTOR PWR and concludes that the impact of

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such volumes is "neither detectable nor destabilizing" and the impacts are "small." Therefore, the HNP's decommissioning LLRW volume is consistent with the conclusions of the 1988 NUREG-0586 and Supplement 1 to NUREG-0586.

Section 4.3.17.3 and Appendix K of Supplement 1 of NUREG 0586 describes the methodology used to estimate the public and occupational dose from the transportation of waste. The waste was categorized as Very High Activity Waste, Low Activity Waste and Very Low Activity Waste. Very High Activity Waste was assumed to be at the regulatory maximum or 10 mrem/hr at 2 meters and the occupational dose rate was estimated to be 2 mrem/hr. Low activity waste dose rates were assumed to be one tenth of the high activity waste dose rates. In Supplement 1 to NUREG 0586 the very low activity waste dose rates were considered to be so low that they did not have to be considered in the dose estimate. As stated above, all of the material associated with the VCCs and the ISFSI storage pad is assumed in the decommissioning cost estimate to be shipped offsite as LLRW. This waste is considered to be very low activity waste, and is not addressed in the transportation dose analysis.

The radiological impact of the 1,158,000 cubic feet of radioactive waste was made using the methodologies and data of Supplement 1 of NUREG 0586. This estimate grouped the estimated number and types of radioactive waste shipments in accordance with the Supplement 1 NUREG 0586 categories of High, Low and Very Low Activity Waste. The evaluation used the estimated number of shipments, estimated number of miles and the corresponding person-rem per mile values from Supplement 1 of NUREG 0586 to estimate the Public, On-Looker and Occupational Dose for the planned HNP shipments. The estimates of the occupational dose for train crews and tug boat crews were made in accordance with the original PSDAR estimate since estimates for these types of shipments were not included in the Supplement 1 of NUREG 0586 analysis. A summary of the results compared to the Supplement 1 of NUREG 0586 data is provided below.

	<u>NUREG 0586</u>	<u>HNP</u>
Occupational (crew)	68.0	54.3
Public	14.9	8.6
On-lookers	14.2	8.1

The lower occupational and public doses calculated for HNP are largely attributable to the roughly 1000 mile one way trip to disposal facilities for the HNP high activity waste as opposed to the 3000 mile trip used in Supplement 1 to NUREG 0586.

The estimated 16.7 rem for public and on-looker dose is well under the Supplement 1 to NUREG-0586 estimate of 29.1 person-rem for public and on-lookers exposure for transportation of LLRW.

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The revised dose estimate for occupational exposure for transportation of waste is lower than the 61 person-rem estimated in Revision 1 of the PSDAR. The estimated 54.3 person-rem value obtained using the above methods is bounded by the Supplement 1 to NUREG-0586 estimate of 68 person-rem and the 100 person-rem estimate of the 1988 NUREG-0586 for transportation occupational exposure.

Radiation exposure to off-site individuals for expected conditions, or from postulated accidents, is bounded by the Environmental Protection Agency's Protective Action Guides and NRC regulations. Doses due to the release of radionuclides in effluents are expected to be less than allowable limits.

Finally, the non-radiological environmental impacts from decommissioning are temporary and are not significant. The largest occupational risk associated with decommissioning HNP and the HNP ISFSI is related to the risk of industrial accidents. The primary environmental effects are short term, small increases in noise levels and dust in the immediate vicinity of the site, and truck traffic to and from the site for hauling equipment and waste. No significant socioeconomic impacts, other than those associated with cessation of operation (loss of jobs and taxes), or impacts to local culture, terrestrial or aquatic resources have been identified.

Given the low level of contamination and the expected volume of waste, disposal of low level radioactive waste off-site in a timely manner should be possible. If for any reason some portion of these wastes needs to be stored temporarily on-site, adequate space exists. No significant environmental impacts are anticipated from temporary on-site storage because all applicable federal and state regulations will be complied with.

REFERENCES

1. Letter, CYAPCO to USNRC, "Haddam Neck Plant Post Shutdown Decommissioning Activities Reports (PSDAR)," dated August 22, 1997.
2. Letter, CYAPCO to USNRC, "Haddam Neck Plant, Revision 1 to Post Shutdown Decommissioning Activities Report (PSDAR)," dated October 22, 2002.
3. NUREG-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," August 1988.
4. USNRC, Final Environmental Statement, Haddam Neck (Connecticut Yankee) Nuclear Power Plant, Docket No. 50-213, October 1973.

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5. Letter, USNRC to CYAPCO, "Environmental Assessment for Proposed License Extension," dated November 23, 1987.
6. Letter, CYAPCO to USNRC, "Haddam Neck Plant Certifications Of Permanent Cessation Of Power Operation And That Fuel Has Been Permanently Removed From The Reactor," dated December 5, 1996.
7. Letter, CYAPCO to USNRC, "Revision 1 of Haddam Neck Plant License Termination Plan and Re-Submittal of License Amendment Request," dated August 20, 2002.
8. Letter, CYAPCO to USNRC, "Revision 1a to the Haddam Neck Plant License Termination Plan," dated October 10, 2002.
9. CYAPCO's Decommissioning Environmental Review issued August 1997, submitted via CYAPCO letter to USNRC, "Submittal of Decommissioning Environmental Review," dated August 1, 2000.
10. Supplement 1 to NUREG-0586, "Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities", November 2002.
11. Letter, CYAPCO to USNRC, "Revision 2 to Post Shutdown Decommissioning Activities Report (PSDAR)," dated April 28, 2004.
12. Letter from T. Smith (NRC) to W. Norton (CYAPCO), "Haddam Neck Plant – Release of East Site Grounds from Part 50 License," dated September 1, 2004.
13. Letter from T. Smith (NRC) to W. Norton (CYAPCO), "Haddam Neck Plant – Release of Phase II Areas from Part 50 License," dated February 27, 2006.
14. Letter from K. McConnell (NRC) to W. Norton (CYAPCO), "Haddam Neck Plant - Release of Land from Part 50 License," dated November 26, 2007.
15. Letter from C. Pizzella (CYAPCO) to Document Control Desk (NRC), "Three-Year Update to the Independent Spent Fuel Storage Installation Decommissioning Funding Plan," dated December 14, 2015.
16. Letter, Alston & Bird LLP to FERC, "Connecticut Yankee Atomic Power Company Docket No. ER16-____," dated September 30, 2016.