

February 27, 2006

Mr. Wayne Norton, President  
Connecticut Yankee Atomic Power Company  
362 Injun Hollow Road  
East Hampton, Connecticut 06424-3099

SUBJECT: HADDAM NECK PLANT - RELEASE OF PHASE II AREAS FROM PART 50  
LICENSE

Dear Mr. Norton:

This letter is in response to your letters of March 8, 2005, October 5, 2005, and December 6, 2005<sup>1</sup>, in which you provided Final Status Survey (FSS) reports, supplemental information and requested approval from the U.S. Nuclear Regulatory Commission (NRC) to release the Phase II areas from the Haddam Neck 10 CFR Part 50 license (DPR-061)). The Phase II areas are comprised of 15 survey units (9523, 9524, 9525, 9526-0000, 9526-0001, 9526-0002, 9528-0000, 9528-0003, 9528-0004, 9535-0001, 9535-0002, 9536, 9537, 9538, and 9806) as defined in the Haddam Neck License Termination Plan [(LTP), approved in November 2002]. Your letter indicated that Connecticut Yankee Atomic Power Company (CY) has reviewed and assessed the subject land area in accordance with NRC requirements and Section 1.4.2 of the LTP.

### Requirements

Chapter 1 of the LTP describes the process for phased site releases. Section 1.4.2 of the LTP and NRC's Safety Evaluation Report (SER)<sup>2</sup> both require CY to complete the following:

1. Compile FSS reports for NRC review, which contain a compilation of release records of the areas surveyed, documenting the as-left radiological conditions.
2. Perform a capture zone analysis and assure that the ground water dose contribution is included for all applicable survey units.
3. Review and assess the impacts on the following documents in preparation of removing a land area from the license.
  - Updated Final Safety Analysis Report (UFSAR) and Technical Specifications
  - Environmental Monitoring Program
  - Offsite Dose Calculations Manual
  - Defueled Emergency Plan
  - Security Plan

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<sup>1</sup> ML050870394, ML0528601650, and ML053490128 respectively.

<sup>2</sup> SER related to Amendment 197 to License DPR-61, dated 11/25/2002, ADAMS Accession No. ML022670388

- Post-Shutdown Decommissioning Activities Report (PSDAR)
  - License Termination Plan
  - Ground Water Monitoring Program
  - 10 CFR Part 100 Siting Criteria, and
  - Environmental Report
4. A letter of intent to remove a portion of the property from the Part 50 license.
  5. Following completion of the final status surveys and submittal of the associated report, NRC will review the report and conduct applicable confirmatory inspections.

### **Final Status Survey Reports**

CY's letter of March 8, 2005, provided NRC staff information and analysis for consideration in anticipation of release of Phase II areas of the site. This letter included FSS reports, an assessment of the existing groundwater dose, and a groundwater capture zone analysis.

CY's letter of December 6, 2005, provides additional information responsive to concerns raised by NRC staff during review of FSS reports, identified to the licensee in the course of the review. NRC staff concerns and CY's responses are summarized below:

- NRC staff expressed concern that the average concentrations of cesium (Cs) -137 in Class 3 survey units exceed the average concentration in Class 2 survey units, which might indicate they were improperly classified.

CY's supplement indicates that none of the Cs-137 concentrations in Class 3 units exceed the site specific Class 3 criterion, or the investigation level. CY however, performed additional sampling to ensure they understood the extent and mechanisms for the apparent elevated Cs-137 levels

CY further states that some of the differences were related to differences in the land areas. Specifically, some of the Class 2 areas have undergone non-radiological remediation, are subsurface sampling areas, paved areas, or otherwise open areas subject to runoff and leaching. These areas exhibit similar background Cs levels. The three Class 3 units that had slightly higher average concentrations of Cs-137 are wooded, show little signs of recent disturbance, and are not readily accessible.

Also, while some of the data sets for one survey unit had a high average, the data included biased samples taken around four apparent elevated areas. The areas are about one mile from the reactor facility and the elevated Cs-137 levels in these areas are most likely the result of deposition from atmospheric weapons tests. This conclusion is consistent with research studies on Cs-137 redistribution conducted for the United States Department of Agriculture, an Agricultural Research Service bibliography, and a 2002 Health Physics Society publication.

- The FSS did not contain sufficient information to determine how the number of samples for survey units were determined. In particular, it was not clear how the standard

deviation was calculated. CY's supplement provided a copy of the procedure used for these calculations.

- FSS report indicates that there were data outliers in some of the sample results, which NRC staff questioned. CY's supplement confirms that all survey data was included in the analysis, and would have been more appropriately called data which did not fit the typical distribution.
- NRC staff noted what appeared to be inconsistent usage of the terms Derived Concentration Guideline Level (DCGL), DCGLw, Administrative DCGL, Operational DCGL, and Surrogate or Surrogate-adjusted DCGL. CY's supplement clarified the usage and committed to consistent usage in future submittals.
- NRC staff were concerned about the basis for the classification and subdivision of survey units which may have been impacted by a stack release in 1979, or landfill usage. Specifically, NRC staff reviewed the Phase II FSS for hot particle survey methodology, and NRC notes that CY addressed the potential hot particle issues in the Phase II FSS process. CY identified from its 10 CFR Part 50.75(g) database that Survey Unit 9526-0000 could have been impacted by two radiological events that occurred in 1979 and 1997. CY surveys in 1980 and a 1997 scoping survey for the FSS report focused on those areas potentially impacted by the past events. The scoping surveys identified Cs-137 soil concentrations in the Phase II FSS reports and these soil concentrations were consistent with soil concentrations at non-impacted off-site locations.

CY's supplement indicates that these release events are considered as part of the classification determination in the LTP, and documented in their release records database. Sampling results for Cs-137 in class 3 survey units were consistent with fallout related residual radioactivity. Areas where cobalt-60 contamination was found were subdivided into new survey units, reclassified, and included in CY's LTP.

- NRC staff also specifically reviewed the Phase II FSS reports for the determination of surrogates in the FSS process to identify hard-to-detect (HTD) radioactive materials. Based on the FSS reports, NRC could not determine CY's methodology for use of surrogates to represent HTD materials. In their supplement, CY indicated that they did not have data adequate to establish a consistent HTD ratio. Instead of relying upon surrogate ratios CY performed direct analyses for the HTD radionuclides.
- NRC staff indicated it was unclear how one of the FSS reports' references was being incorporated. CY's supplement clarified the usage of Health Physics Technical Support Document BCY-HP-0063, "*Background Cs-137 Concentration in Soil.*" Specifically, the Cs-137 concentration sample data were utilized in the FSS reports, but the analysis procedures were not used, since they were developed for different purposes before the LTP processes were approved.
- CY's supplement also corrected some typographical errors and nomenclature inconsistencies in the FSS reports. CY's supplement clarified nomenclature usage and committed to using standard nomenclature in future reports.

- Survey unit 9528-0000 includes land that will remain under license for operation of CY's Independent Spent Fuel Storage Installation (ISFSI), as delineated in the licensee's submittal. In section 2.4 of its submittal, CY discusses ISFSI area dose calculations. For the ISFSI, the licensee must comply with 10 CFR Part 72.104, which limits the annual dose from fuel cycle operations. This annual dose is comprised of three components: (1) discharges of radioactive materials, (2) direct radiation from the ISFSI operations, and (3) any other radiation from uranium fuel cycle operations within the region. This third component should include dose from the residual radioactivity in the ISFSI area (e.g. in the soil under and immediately surrounding the ISFSI pad) and outside the controlled area (as defined in 10 CFR Part 72.3).

The licensee did not directly address this third component of the dose calculation. The NRC staff discussed with the licensee this third component of the dose calculation. The licensee indicated that the ISFSI pad and the ISFSI controlled area are entirely within Survey Unit 9528-0000 of the Phase II area. The NRC staff reviewed the FSS report for this survey unit. For Survey Unit 9528-0000, the main contaminant found was Cs-137. While it appears likely that at least part of the Cs-137 may be due to weapons testing fallout, the licensee has included all Cs-137 as part of the FSS dose for the CY plant. The concentrations measured for Survey Unit 9528-0000 were well within the DCGL.

The staff concludes that if the dose from this third component is added to the doses from the other components described by the licensee, the total dose is highly likely to be within the 25 mrem/year whole body dose limit. Thus the NRC staff does not have concerns about the ISFSI operations complying with 10 CFR Part 72.104.

CY's supplement adequately addresses NRC staff concerns related to the Phase II FSS reports.

### **Capture Zone Analysis and Groundwater Dose Contribution**

CY's March 8, 2005, letter included a groundwater dose contribution calculation and capture zone analysis for the Phase II release areas. CY's analysis concludes that there is no existing groundwater contamination dose that needs to be included in CY's unrestricted use criteria in their LTP, and that the estimated capture zone for hypothetical water supply wells are within the 100 meter radius criteria established in the LTP. NRC staff agrees with these conclusions.

### **Document Changes**

CY's phased release request provides an assessment of the impacts to each of the documents listed above, and identifies the following changes to implement the Phase II release:

1. Section 2.1.1, 2.1.2 and Figure 2.1.5 of the UFSAR will be modified to describe the reduced site area and boundary lines resulting from release of Phase II survey area from license DPR-61.
2. The Off-Site Dose Calculation Model will be revised consistent with the site boundary change.

3. The Ground Water Monitoring Program will not need be changed, as the Phase II areas have no existing groundwater contamination.
4. The LTP will be revised to describe the reduced site area and removal of 15 survey units.
5. CY will maintain authority, in accordance with 10 CFR Part 100.3, over all activities conducted within the exclusion area boundary while active decommissioning is ongoing. CY notes that when decommissioning is complete, the plant exclusion area boundary will no longer be a meaningful reference. Instead, they will be maintaining a controlled area for their spent fuel storage facility, in accordance with 10 CFR Part 72.106.
6. The Technical Specifications, the Environmental Report, the Defueled Emergency Plan, the Security Plan, the Environmental Monitoring Program, the Fire Protection Program, the Training Program, and the PSDAR, will not be affected by the release of Phase II areas from the site license.

**NRC Findings:**

NRC inspectors and survey contractors from the Oak Ridge Institute for Science and Education (ORISE) performed an independent survey of 10 of the 15 survey units in Phase II, which included 57 surface soil samples, 7 subsurface (1.5 meters deep) soil samples, surface scans of over 50% of class 2 areas and surface scans of over 10% of class 3 areas. Samples were tested by gamma spectroscopy for Co-60, Cs-137, and other (Hard-to-Detect) gamma-emitting radionuclides associated with the Haddam Neck Plant. NRC Inspection Report and ORISE Confirmatory Survey Report<sup>3</sup>, corroborated that the radiological conditions of the open land areas survey units that were reviewed met the approved site-specific DCGLs, and that CY's laboratory data were consistent and in agreement with the ORISE's analytical results.

NRC staff has completed the review of the Phase II FSS reports and concludes that: (1) the FSSs were conducted in accordance with the LTP, (2) the FSS reports, as supplemented, contain the information identified in NUREG 1757, "Consolidated NMSS Decommissioning Guidance," Volume II, Section 4.5, and (3) the FSS results demonstrate that the Phase II survey units meet the radiological criteria for unrestricted release. By this letter, NRC approves releasing the Phase II survey areas from the license, as specified in your October 2005 request and subject to the following comments:

1. NRC staff note that Figure 1-1 of CY's Letter of Intent incorrectly shows survey units 9521 and 9528-0002 included as part of the Phase II release. In a January 24, 2006, telephone conversation, CY staff indicated that these two survey units were inadvertently included in the figure.
2. NRC staff suggests that before the next phased release submittal request, the licensee and NRC staff discuss the methodology for use of the Appendix L Worksheet in NUREG-1757, Volume 2<sup>4</sup>.

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<sup>3</sup> ML042650317 and ML042170277, respectively.

<sup>4</sup> NUREG-1757, Vol. 2, Consolidated NMSS Decommissioning Guidance: Characterization, Survey and Determination of Radiological Criteria, <http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1757/v2/sr1757v2.pdf>

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In accordance with 10 CFR Part 2.390 of NRC's "Rules of Practice," a copy of letter will be available electronically for public inspection in NRC Public Document Room, or from the Publicly Available Records component of NRC's Agencywide Document Access Management System (ADAMS). ADAMS is accessible from NRC Web site: <http://www.nrc.gov/reading-rm/adams.html>.

If you have any questions concerning this evaluation, please contact me by phone at (301) 415-6721, or by e-mail at [tbs1@nrc.gov](mailto:tbs1@nrc.gov).

Sincerely,

**/RA/**

Theodore Smith, Project Manager  
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Division of Waste Management  
and Environmental Protection  
Office of Nuclear Material Safety  
and Safeguards

Docket No.: 50-213  
License No.: DPR-61

cc: Haddam Neck distribution list

Incoming: ML050870394, ML0528601650, ML053490128

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If you have any questions concerning this evaluation, please contact me by phone at (301) 415-6721, or by e-mail at tbs1@nrc.gov.

Sincerely,

**/RA/**

Theodore Smith, Project Manager  
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