

1 GENERAL INFORMATION

1.1 Executive Summary

The objective for decommissioning the Yankee Nuclear Power Station (YNPS) 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 Nuclear Regulatory Commission's (NRC's) site release criteria set forth in 10CFR20, Subpart E. The purpose of this YNPS 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). NRC staff review guidance, in the form of NUREG-1700 (Reference 1-3) and NUREG-1757 (Reference 1-4), has also been considered.

This 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;
- site characterization;
- remaining decommissioning activities;
- site remediation plans;
- final status survey design and implementation;
- 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 1.4.

1.2 Description of the YNPS Site and Surrounding Areas

1.2.1 YNPS Site

The Yankee Nuclear Power Station (YNPS) is located at 49 Yankee Road, Rowe, in Franklin County, Massachusetts. Yankee Atomic Electric Company (YAEC) is the license holder for YNPS. The plant site contains 2200 acres, approximately 10 acres of which were developed for plant use. The site is at the bottom of a deep valley along the Deerfield River (elevation 1022') at the southeast corner of Sherman Reservoir (also referred to as Sherman Pond). The area surrounding the site is mostly wooded with very steep slopes on both sides of the Deerfield River. The hills on either side of the site rise about 1000 feet above the river and extend from 12 miles north to 8 miles southeast of the site. Sherman Reservoir served as the source of cooling water for the plant.

YAEC, or USGen New England, Inc. (referred hereafter as “USGen”), owns all of the land located within the licensed site property boundary (see Figure 1-1), and all of the property within the exclusion area is under the control of YAEC. The USGen property is associated with the Deerfield River Project and is generally located along the riverbank and Sherman Reservoir. The portions of the YAEC industrial area located on USGen property are the circulating water discharge seal pit, the Screenwell Pump House, and the meteorological tower located on a peninsula at the northeast corner of the site. USGen also owns that portion of the northeast yard area that fronts Sherman Reservoir and the property outside of the industrial area fence located between Yankee Road and the Deerfield River. A portion of the USGen property is considered impacted by licensed activities and is included in license termination activities. The boundaries of survey areas have been drawn along the property lines for convenience. The current nearest resident is located approximately 0.8 miles from the plant site (Reference 1-5).

The significant features of the site are shown in Figure 1-2.

1.2.2 Surrounding Areas

The following paragraphs describe the features and uses of land within 5 miles of the plant. Included is a summary of the population centers within 10 miles of the YNPS site.

Major Bodies of Water: In addition to Sherman Reservoir and the Deerfield River (including tributaries and brooks feeding it), other major bodies of water are located within 5 miles of the YNPS site. These include: Sadawga Pond (184 acres), Shippee Pond (25 acres), North Pond (17 acres), and Clara Lake (12 acres) in Whittingham, Vermont; Howe Pond (42 acres) in Readsboro, Vermont; and Bear Swamp Upper Reservoir (128 acres) and Pelham Lake (89 acres) in Rowe, Massachusetts.

Industry: There are no exclusively commercial areas within 5 miles of the plant. The only industry within the area is the YNPS and the USGen hydroelectric stations. USGen has five powerhouses within 5 miles of YNPS. There are three stations as a part of the Deerfield River Project. They are the Harriman, Sherman, and No. 5 Stations. In addition the Bear Swamp and Fife Brook stations are a part of the Bear Swamp Pumped storage facility.

Public Lands and Conservation Areas: There are several public lands/conservation areas within 5 miles of the YNPS site. These areas offer a variety of recreational opportunities including fishing, hunting, boating, swimming, picnicking, and hiking.

Schools: There are two schools within 5 miles of the plant: Rowe Elementary located about 2.5 miles southeast of the site on Pond Road in Rowe, Massachusetts and Readsboro Central School, located off of Route 100 near the center of Readsboro, Vermont.

Farms: Information was collected by YAEC to document the current nearest garden and milk animal locations. These locations may include farms or simply private gardens or dairying locations. Table 1-1 identifies these locations by sector.

Water Supplies: Water supplies within the Deerfield River Drainage Basin, including the entire area within 5 miles of the plant, generally consist of private wells. The only communal source of water within 5 miles of the plant site is Phelps Brook, which services some of the residents of Monroe, Massachusetts. Beyond 5 miles, downstream there are two small water supply wells servicing local private developments: the Deerfield River Club and Heath Stage Apartments in Charlemont, Massachusetts. Still further downstream, the closest public water supply wells, Stillwater Springs, are in the town of Deerfield, 20 to 25 miles south of the YNPS. Stillwater Springs has a safe yield of about 120,000 gallons per day. This well field is immediately adjacent to the Deerfield River. Another supply well, the Deerfield Well Field, off of Route 116, has been closed due to contamination from nearby agricultural uses. The Quabbin Reservoir, serving the greater Boston area, is 35 to 40 miles southeast of the YNPS.

Population: The population within 10 miles of the site is estimated to be 39,300 and includes 17 municipalities in two states. Table 1-2 shows the total population in each town with borders within 10 miles of the plant. In general, the area is rural, with North Adams being the most populous municipality.

1.3 Historical Information

YNPS (Docket No. 50-029) achieved initial criticality in 1960 and began commercial operations in 1961. The nuclear steam supply system was a four-loop pressurized water reactor designed by Westinghouse Electric Corporation. The original thermal power design limit of 485 MWt was upgraded to 600 MWt in 1963. The turbine generator, also designed by Westinghouse, was rated to produce 185 MWe.

On February 26, 1992, the Yankee Atomic Electric Company (YAEC) Board of Directors decided to cease power operations permanently at YNPS. This decision was based upon the following two factors:

1. Economic analyses indicated that shutdown of the plant before expiration of the NRC operating license in July 2000 could produce a substantial savings to the electricity producers.
2. Significant regulatory uncertainty existed concerning the timing and cost of completion of the NRC's review of the integrity of the YNPS Reactor Pressure Vessel.

On August 5, 1992, the NRC amended the YNPS Facility Operating License to a possession only status.

The YNPS Decommissioning Plan (Reference 1-6) was submitted March 29, 1994, and received final approval in October 28, 1996 (References 1-7 and 1-8). In May 1997, Yankee submitted to the NRC for approval a License Termination Plan (LTP) for YNPS, pursuant to 10CFR50.82(a)(9). The initial YNPS LTP employed a survey methodology based upon the "Manual for Conducting Radiological Surveys in Support of License Termination, (Reference 1-9)," also referred to as the Draft NUREG/CR-5849 methodology. Subsequently the

NRC, jointly with the DOD, DOE, and EPA, approved an alternate survey methodology documented in MARSSIM (“Multi-Agency Radiation Survey and Site Investigation Manual” or NUREG-1575, Reference 1-10). In May 1999, Yankee advised the NRC that it intended to shift from the survey methodology in NUREG/CR-5849 to the MARSSIM methodology, and withdrew its previously submitted LTP application. The current LTP is written to reflect the MARSSIM methodology, as well as appropriate regulatory guidance made available since the previous LTP submittal.

In 2000, Yankee created a Post-Shutdown Decommissioning Activities Report (PSDAR) within the Final Safety Analysis Report (FSAR). NRC Draft Regulatory Guide DG-1071 recommends that licensees with approved Decommissioning Plans (D Plans) “extract pertinent detail from the decommissioning plan and submit a PSDAR update in the format and content specified by [DG-1071].” Based on the NRC draft guidance, Yankee segregated, updated and condensed certain information concerning post-shutdown decommissioning activities in a manner that conforms to the standard format and content of a PSDAR.

1.4 Plan Summary

1.4.1 General Information

This LTP has been prepared by YAEC in accordance with the requirements of 10CFR50.82(a)(9). The LTP is being maintained as a supplement to the YNPS FSAR to support the application for a license amendment to meet 10CFR50.82(a)(9) and 10CFR50.90. Each of the sections required by 10CFR50.82(a)(9) are outlined in the subsections below.

1.4.2 HSA and Site Classification

The objectives of the site classification are:

1. To divide the site into survey areas for classification purposes;
2. To identify the potential and known sources of radioactive contamination in systems, on structures, in surface or subsurface soils, and in groundwater;
3. To determine the initial classification of each survey area; and
4. To develop the information to support Final Status Survey design including instrument performance standards and quality requirements.

The site classification is based upon the Historical Site Assessment (HSA). The HSA consisted of a review and compilation of the following types of 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, including those in support of the previous Final Status Survey campaign, was reviewed for radiological conditions throughout the site. The radiological data collected during this process provides a basis for developing plans for remediation and Final Status Surveys.

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

As a result of the HSA, and site classification, approximately 2170 acres of the 2200-acre plant site have been identified as “non impacted” as defined in MARSSIM. Tables 2-1 and 2-2 provide the area classifications for the various survey areas of the YNPS site.

1.4.3 Identification of Remaining Site Dismantlement Activities

In previous phases of decommissioning, major plant systems and components were removed from site buildings. These included the steam generators, reactor vessel, and reactor coolant piping, as well as the turbines, generator and other plant systems not serving spent fuel pit support functions. After component removal, some buildings and land areas were remediated in preparation for the Final Status Survey and some underground and embedded piping were removed. As previously discussed, LTP-related and Final Status Survey activities were halted in September of 1999, based upon the availability of new survey guidance in MARSSIM. The focus then shifted from decommissioning activities to spent fuel storage activities, and all fuel and greater-than-class-C (GTCC) waste was removed from the spent fuel pit and placed in storage casks on the pad at the onsite independent spent fuel storage installation (ISFSI). Removal of spent fuel and GTCC waste from the pool and placement on the ISFSI pad was completed in June of 2003.

In the current phase of decommissioning, YAEC, with the assistance of a demolition contractor, is demolishing site structures to grade. Structural demolition debris is surveyed using site procedures which invoke the “no detectable radioactivity” criterion (consistent with the guidance in NRC Circular IEC 81-07, “Control of Radioactively Contaminated Material”). Materials meeting this criterion may remain onsite and may be used as backfill, subject to regulations on the use of such materials by the Commonwealth of Massachusetts, or removed offsite for disposal. The demolition contractor is removing demolition debris that does not meet the “no detectable radioactivity” criterion and disposing of this debris as radioactive waste. The Vapor Container (including all interior structures) is being dismantled and removed from the plant site and disposed of as radioactive waste.

1.4.4 Site Remediation Plans

Section 4 of the LTP describes various methods that can be used during YNPS decommissioning to reduce the levels of radioactivity to those which meet the NRC radiological release criteria, that is, do not exceed 25 mrem/yr total effective dose equivalent (TEDE) and are 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 in compliance with the NRC requirements.

1.4.5 Final Status Survey Plan

The primary objectives of the Final Status Survey are to:

- verify proper survey unit classification (or reclassify survey unit),
- 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 YNPS site to demonstrate that the site meets the NRC's radiological criteria for unrestricted use. Section 5 of the LTP describes the Final Status Survey Plan, which is consistent with the guidelines of MARSSIM. The plan also describes methods and techniques used to implement isolation controls to prevent re-contaminating previously remediated areas.

1.4.6 Compliance with the Radiological Criteria for License Termination

Section 6 together with Section 5, Final Status Survey Plan, describes the process to demonstrate compliance with the radiological criteria of 10CFR20.1402 for unrestricted use for the YNPS site. YAEC has selected the RESRAD computer code (Version 6.21) to model the dose from soils and its counterpart, RESRAD-BUILD (Version 3.21), to model the dose from structures.

Two scenarios have been selected for use with the RESRAD family of codes for calculating the radionuclide-specific derived concentration guideline levels (DCGLs). These scenarios are the resident farmer scenario for site soils and volumetrically contaminated concrete, as appropriate. The building occupancy scenario is being used for surficial contamination in structures. DCGLs are the concentration and surface radioactivity limits that will be the basis for performing the Final Status Survey.

1.4.7 Update of the Site-Specific Decommissioning Costs

In accordance with 10CFR50.82 (a)(9)(ii)(F), Section 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.

1.4.8 Supplement to the Environmental Report

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

Supplement 1 to NUREG-0586, “Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities (FGEIS)” (Reference 1-11) provides an assessment of the aspects of decommissioning with the potential to impact the environment. This assessment includes an evaluation of the significance of the impact of the activity (SMALL, MODERATE, or LARGE), as well as its applicability (generic to all or to a group of plants or site-specific). Section 8 is focused on the evaluation of those aspects of decommissioning whose impacts could not be generically addressed (i.e., those determined to have site-specific impacts) and on whether remaining license termination activities and end use of the site are bounded by prior assessments.

1.5 Partial Site Release Process

YAEC may choose to remove specific areas from the license in a phased manner before license termination. 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, YAEC will compile a report, which will be provided to the NRC for its review and will contain the following information:
 - a description and location of the survey unit or area being surveyed;
 - certification that dismantlement/decommissioning activities, as described in the LTP, have been completed for the subject building or area;
 - an evaluation of the potential for possible recontamination of the area and a description of controls in place to prevent such recontamination;
 - Final Status Survey results for the survey unit or area, as demonstration of compliance with the LTP release criteria (not applicable to areas designated as “non-impacted”);
 - Expected date of removal of the area from the 10CFR50 license.
2. YAEC will review and assess the impacts on the following programs and documents in preparation for removal of a survey unit or area from the license:
 - Final Safety Analysis Report and Technical Specifications;
 - Radiological Environmental Monitoring Program;
 - Offsite Dose Calculation Manual;
 - Defueled Emergency Plan;
 - Security Plan;
 - License Termination Plan;
 - Ground Water Monitoring Program;
 - 10CFR100 Siting Criteria; and
 - Decommissioning 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 10CFR 20, as they pertain to the public.

3. A letter of intent to remove a portion of the property from the Part 50 license will be sent to the NRC, no later than 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 units(s) or area(s).
4. 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 5.4.5 intended for isolation and controls) unless administrative controls to prevent recontamination 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, as appropriate, the applicable NRC confirmatory inspections.
5. Upon completion of the YNPS Decommissioning Project, a final report will be prepared, summarizing the release of areas of the YNPS site from the 10CFR50 license.

1.6 Change Criteria for the License Termination Plan

YAEC is submitting this License Termination Plan as a supplement to the FSAR. Accordingly, the License Termination Plan will be updated in accordance with 10CFR50.71(e). Once the LTP has been approved, the following change criteria will be used, in addition to those criteria specified in 10CFR50.59 and 10CFR50.82(a)(6). A change to the LTP requires NRC approval prior to being implemented, if the change:

- (a) Increases the probability of making a Type I decision error above the level stated in the LTP;
- (b) Increases the radionuclide -specific derived concentration guideline levels (DCGLs) and related minimum detectable concentrations;
- (c) Increases the radioactivity level, relative to the applicable DCGL, at which investigation occurs;
- (d) Changes the statistical test applied to one other than the Sign Test or Wilcoxon Rank Sum Test.

Re-classification of survey areas from a less to a more restrictive classification (e.g., from a Class 3 to a Class 2 area) may be done without prior NRC notification; however, re-classification

to a less restrictive classification (e.g., Class 1 to a Class 2 area) will require NRC notification at least 14 days prior to implementation.

1.7 References

- 1-1 Title 10 to the Code of Federal Regulations, Part 50.82, "Termination of license."
- 1-2 Regulatory Guide 1.179, "Standard Format and Content of License Termination Plans for Power Reactors," dated January 1999.
- 1-3 NUREG-1700, Revision 1, "Standard Review Plan for Evaluating Nuclear Power Reactor License Termination Plans," dated April 2003.
- 1-4 NUREG-1757, Volume 2, "Consolidated NMSS Decommissioning Guidance," dated September 2003.
- 1-5 Yankee Rowe Station 2002 Annual Radiological Environmental Operating Report, dated April 28, 2003.
- 1-6 Yankee Nuclear Power Station Decommissioning Plan, Revision 0.0.
- 1-7 Letter, M.B. Fairtile (USNRC) to J.A. Kay (YAEC), "Order Approving the Decommissioning of the Yankee Nuclear Power Station, February 14, 1995.
- 1-8 Letter, M.B. Fairtile (USNRC) to J.A. Kay (YAEC), "Completion of Hearing Process Regarding Approval of Decommissioning Plan for the Yankee Nuclear Power Station, October 28, 1996.
- 1-9 NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination," dated June 1992.
- 1-10 NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual," Revision 1, dated August 2000.
- 1-11 Supplement 1 to NUREG-0586, "Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," dated November 2002.
- 1-12 YNPS Decommissioning Environmental Report, dated December 1993.
- 1-13 "Massachusetts: 2000, Summary Population and Housing Characteristics," U.S. Department of Commerce, issued September 2002.
- 1-14 "Vermont: 2000, Summary Population and Housing Characteristics," U.S. Department of Commerce, issued October 2002.

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Table 1-1**Current Nearest Resident, Garden, and Milk Animal Locations within 5 Miles of YNPS (Reference 1-5)**

Sector	Nearest Resident (mi)	Nearest Garden (mi)	Nearest Milk Animal (mi)
N	3.2	3.7	*
NNE	2.7	3.0	*
NE	2.1	2.1	*
ENE	2.3	3.6	*
E	1.8	2.3	*
ESE	2.1	2.1	*
SE	1.3	2.1	*
SSE	1.2	1.2	*
S	1.3	1.8	*
SSW	*	*	2.0**
SW	0.8	4.5	*
WSW	0.8	1.2	*
W	1.3	1.8	*
WNW	1.3	1.3	*
NW	1.5	2.0	*
NNW	1.8	2.3	*

* No location was identified within 5 miles of the plant.

**Limited number of goats. Not able to supply enough milk for sampling.

Table 1-2**Permanent Population Estimates for Municipalities within
10 Miles of the Yankee Nuclear Power Station**

	1980 Census (Ref 1-12)	1990 Census (Ref 1-12)	2000 Census (Ref 1-13 and 1-14)
Massachusetts			
Adams	10,381	9,445	8,809
Clarksburg	1,871	1,745	1,686
Florida	730	732	676
North Adams	18,063	16,797	14,681
Savoy	644	634	705
Buckland	1,864	1,928	1,996
Charlemont	1,149	1,249	1,358
Colrain	1,552	1,757	1,813
Hawley	280	317	336
Heath	482	716	805
Monroe	179	115	93
Rowe	336	387	351
Vermont			
Halifax	488	782	782
Whitingham	1,043	1,298	1,298
Wilmington	1,808	1,968	2,225
Readsboro	638	762	809
Stamford	773	773	813

Figure 1-2
Site Design (As of June 2003)

