Connecticut Yankee Atomic Power Company

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A053

HADDAM NECK PLANT
FINAL SAFETY ANALYSIS REPORT
November 2004 Update
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CHAPTER 2

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CHAPTER 2

SITE CHARACTERISTICS

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

2.1 GEOGRAPHY AND DEMOGRAPHY

2.1.1 Site Location and Description

2.1.1.1 Specification of Location

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

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

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

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

2.1.1.2 Site Area Map

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

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

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

2.1.1.3 Boundaries for Establishing Effluent Release Limits

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

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

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

2.1.2 Exclusion Area Authority and Control

2.1.2.1 Authority

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

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

2.1.2.2 Control of Activities Unrelated to Plant Operation

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

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

2.1.2.3 Arrangements for Traffic Control

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

2.1.2.4 Abandonment or Relocation of Roads

No abandonment or relocation of roads is necessary.

2.1.3 Population Distribution

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

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

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

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

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

REFERENCES

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

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

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

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

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

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

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

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

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

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

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

SUPPORTING REFERENCES

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

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

Regulatory Guide 1.101, "Emergency Planning and Preparedness for Nuclear Power Reactors," Revision 3, August 2003.

Regulatory Guide 1.101, "Content of the Updated Final Safety Analysis Report in Accordance with 10 CFR 50.71(e)," [illegible]

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

Connecticut Office of Policy Management, Interim Population Projections Series 91.1, 1991.

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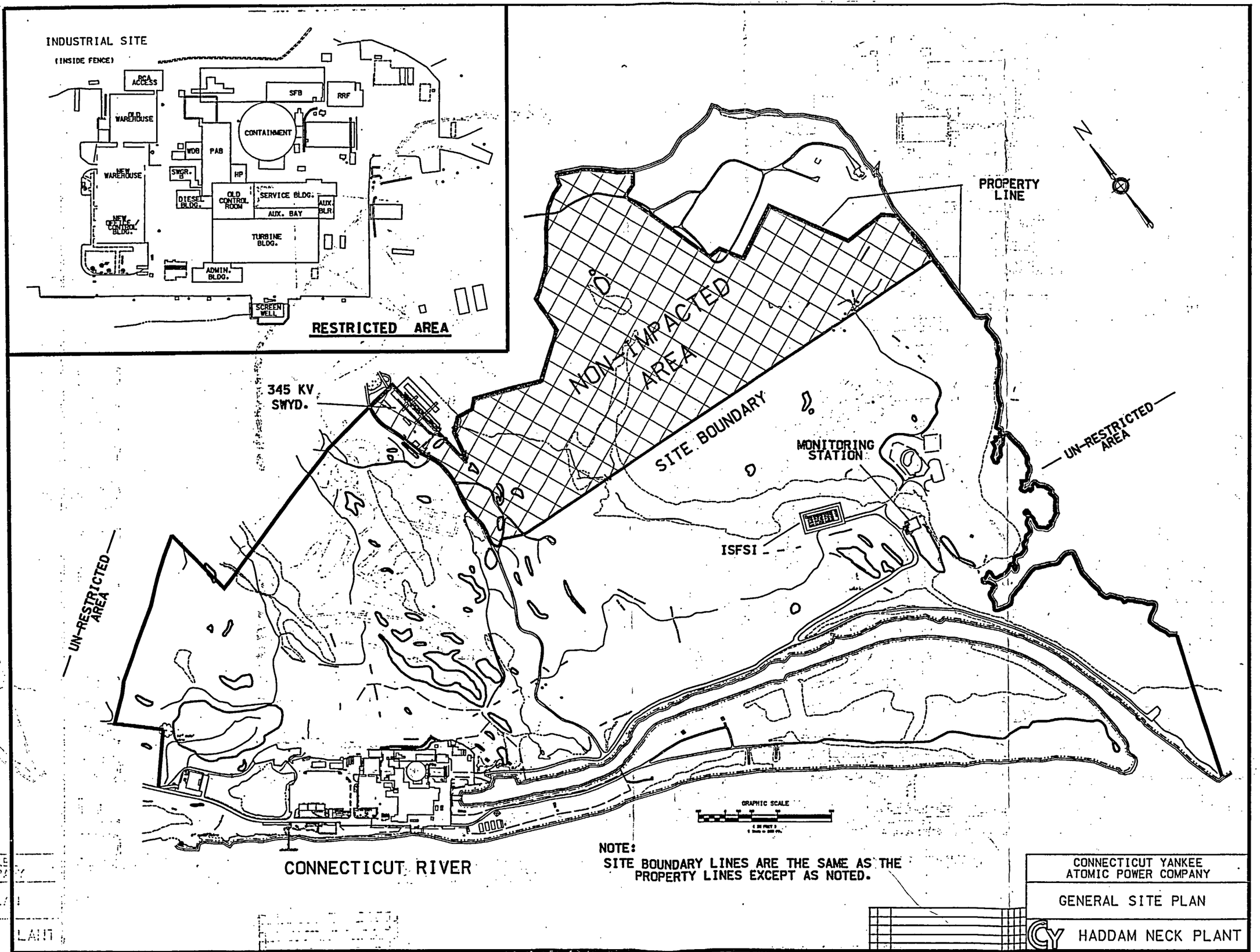
U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population and Housing, Census Tract, 1983 Version, 1984.

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

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

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



UFSAR FIGURE 2.1-3

1772 LINE

HADDAM 115KV

1772-12R-6

3990

12R-2251-4

399

SS XFMR 12R-225 12/16/20 MVA, 3Ø 110-4.16KV

P & W 115KV

SFPI POWER BUS SYSTEM

DECOMMISSIONING POWER BUS SYSTEM

4160V BUS 12

4160V BUS 14

12R3-2

SS XFMR 13 1500 KVA, 3Ø 4160-480V

480V BUS 13

12R-2253-2

12R2-2

12R1-2

1200AF

1200A

CLR 4.16KV 1.0mH

LBS 4.16KV,600A

3 CLF 400A,4.16KV

SS XFMR 16 1500 KVA, 3Ø 4160-480V

480V BUS 10

SS XFMR 10 1500 KVA, 3Ø 4160-480V

SS XFMR 11 1500 KVA, 3Ø 4160-480V

3200AF

800AF

BUS 13 ENCLOSURE

PP-2

150A

BUS 12 ENCLOSURE

PP-3

480V BUS 16

RRF BLDG.

PP-1

XF-PP-1 30 KVA, 3Ø 480-120/208V

XF-PP-1 50 KVA, 3Ø 480-120/208V

LP1-RRF

LP2-RRF

600A

MCC-2-4

MCC-2A

XF-IPP-1 15 KVA, 3Ø 480-120/208V

IPP-1

480V MCC 1

LP-W1-1A

LP-W1-1

480V MCC 7

LP-R4-1

LP-R1-1

LP-R3-1A

480V BUS 11

480V BUS 13 (CONT.)

MCC-2B

MCC2-5

EG

EGB 450KW

LOAD BANK

XF-CR 45 KVA, 3Ø 480-120/208V

SEC PNL

EPP-CR

PP-CR

ELP-CR

LP-CR

NEW CONTROL ROOM/PAP

XF-IPP-2 15 KVA, 3Ø 480-120/208V

IPP-2

15KVA,1PH 480-120/240V

LP-URF

LP-F2-1

LP-F1-1

480V MCC 9

ABANDONED

480V MCC 12

B-LP-U8-1

T-LP-U8-1

LP-U8-1

480V-120V 3Ø 15KVA

NOTES:

L-Ø DENOTES MANUALLY OPERATED BREAKER-NO TRIP

REFERENCE DRAWINGS:

16112-30008 SH. 1 — ONE LINE DIAG. SFPI BUS 12 & 13

16112-30002 — 480V ONE LINE DIAG. MCC-2A

16112-30003 — 480V ONE LINE DIAG. MCC-2B

16112-30004 — 480V ONE LINE DIAG. MCC2-4 & MCC2-5

LEGEND

POWER CIRCUIT BREAKER

MOLDED CASE CIRCUIT BREAKER

MOTOR OPERATED DISCONNECT

OPERATIONS CRITICAL Q.A.

CAD

NO	BY	DATE	REVISIONS	DWN	CHK	APP
CT-97005	2	6-5-02	AS BUILT PER DCT-00-0245-99	CWL	CWL	—
DCR 98027	1	12-7-99	AS BUILT PER DCT-00-0241-99	RAM	CWL	—
				BY	CHK	APP

REVISIONS DURING CONSTRUCTION — P.A. NO.

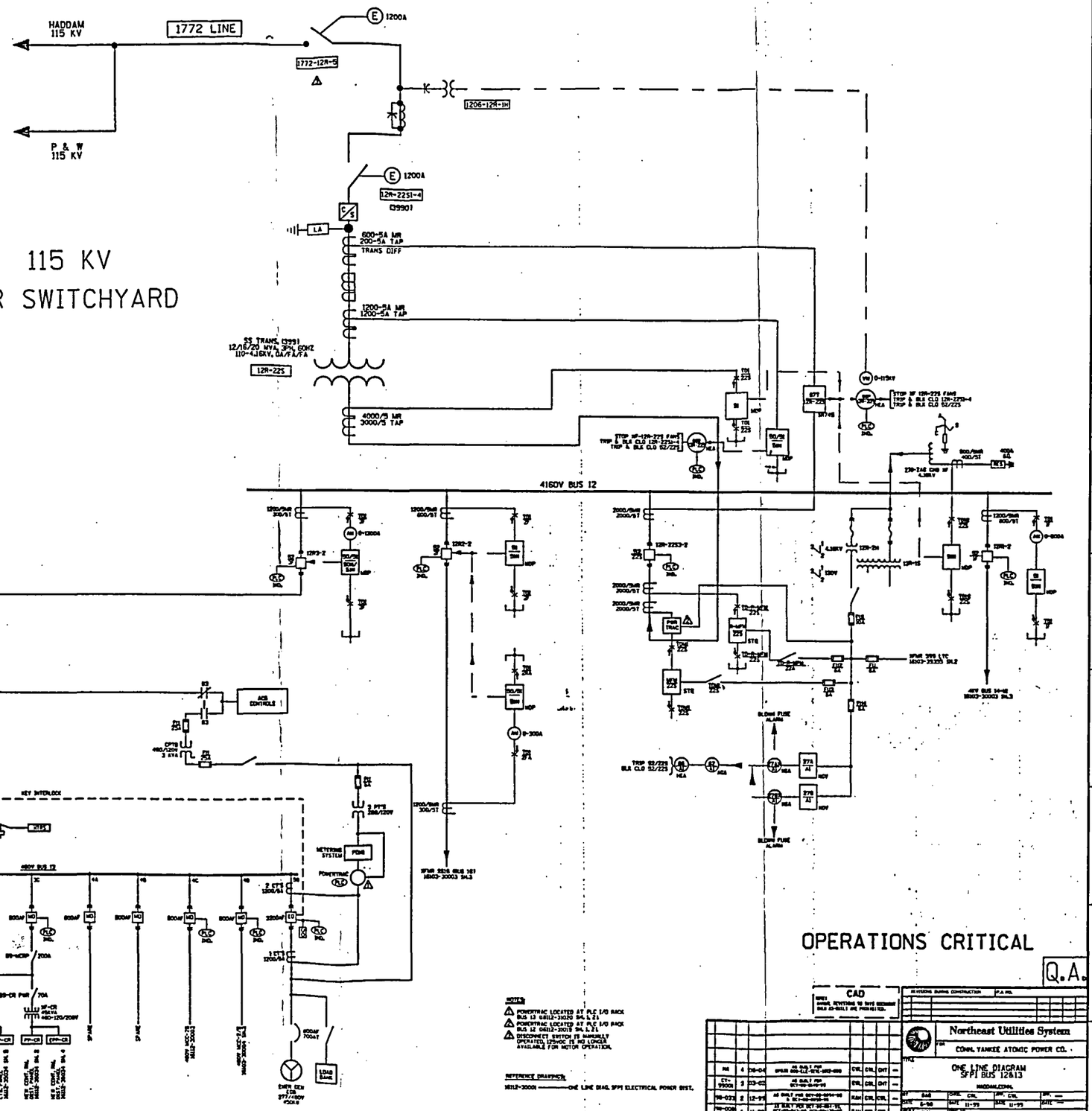
Northeast Utilities System

CONN. YANKEE ATOMIC POWER CO.

TITLE: ONE LINE DIAGRAM CY ELECTRICAL POWER DIST. HADDAM, CONN.

BY	DWG. CWL	APP. CWL	APP. —
DSN 11-99	DRFT 11-99	DATE 11-99	DATE —
SCALE N/A	DWG NO.		
J.T. N/A	16112-30001		

UFSAR FIG. 8.1-1



3.8 DESIGN OF CLASS I AND CLASS II STRUCTURES

With the decision to decommission the Haddam Neck Plant the only remaining safety related structures are those associated with the spent fuel island. As a result, this chapter has been modified to address those safety or regulatory functions that are still served by these and other plant structures.

3.8.1 Containment Structure

Due to decommissioning, the functions of the containment structure have changed from those of an operating plant. The containment structure presently serves the following purposes:

1. The containment shell serves as a barrier to the release of airborne activity from ongoing work.
2. A portion of the containment interior structure serves as an extension of the fuel transfer tube.
3. A portion of the containment shell serves as a seismic support for the yard crane.
4. A portion of the containment shell serves as a seismic support for the fuel transfer tube.

All greater than Class C (GTCC) waste was transferred from containment to the spent fuel pool and the flange on the fuel transfer tube was sealed to form the spent fuel pool boundary.

3.8.2 Auxiliary Structures

3.8.2.1 Spent Fuel Building

The Spent Fuel Building, shown on Figure 3.8-2, is of concrete construction to elevation 47 with an insulated Galbestos superstructure on steel framing above the spent fuel pool area. The roof of the spent fuel building truck bay, at elevation 47 and the roof of the spent fuel area at elevation 76, are both of concrete construction.

A cask handling area is provided in the building for NAC-MPC canister handling and loading activities. The area consists of a concrete pad which extends out of the east side of the building to allow loading/unloading of fuel transfer components to the heavy haul trailer.

Air is provided locally by an air compressor. Water is provided by the makeup water system only.

8.2 OFF-SITE POWER SYSTEM

8.2.1 Description

The 115 kV off-site power system is designed to provide reliable and adequate source of power for SFI operations. Details of the off-site power system are shown on Figure 8.1-1.

The switchyard arrangement consist of a 115 kV transmission line tap and multiple station service circuits. One station service supplies power to the SFI while the others supply interim power to support decommissioning.

8.2.1.1 Transmission Lines

The transmission line tap which terminates at the switchyard is connected to the Pratt & Whitney, CY, Haddam 1772 line. This 1772 line is connected to:

- Haddam substation 11C
- Pratt & Whitney Aircraft Substation 23B (Line 1772) which is connected to Middletown Switchyard 5A (Line 1572)

8.2.1.2 115 kV Switchyard

The 115 kV system is designed to deliver all station service power for all conditions. The 115 kV off-site AC power is obtained via line 1772, and stepped down to 4160V through station service transformer 12R-22S. Transformer 12R-22S is then used to power the 4160 V Bus 12 which in turn powers the SFI Bus 13, via 4160 V to 480 V station service transformer 13. Other breakers in Bus 12 are designated to supply interim decommissioning power for the rest of the station.

The principal equipment located in the 115 kV switchyard which supplies power to SFI includes:

(1) One 12/16/20 MVA, OA/FA/FA, 110-4.16 kV, three-phase, grounded wye-delta connected transformers with tank-mounted 90kV lightning arresters (Station Service Transformer 12R-22S)

(2) One 115 kV, 1200 amp, three-pole, motor-operated line disconnect switches (manually operated), (1772-12R-5) without ground blades

(3) One 115kV, 2000 amp, three-pole, combination circuit switcher-motor operated disconnect (12R-22S1-4)

Controls for the 115 kV switchyard devices, and associated relays and meters are located in the 4160 V Bus 12 Enclosure. The 115 kV line protection includes step-distance primary and backup protective relays installed at Haddam Substation 11C and Middletown Switchyard 5A (Line 1572). These protective relays are all independent of the pilot schemes. Therefore, the relaying at the two terminals will operate independent of each other.

Fault protection for transformer 12R-22S is provided locally by relaying within 4160 V Bus 12 enclosure. The 4160 V Bus 12 primary and backup protection schemes are supplied from one 48 V DC supply located in Bus 12 enclosure.

Each of Channels R-19A and R-19B has been categorized as Operable, as defined in Section 1.1 (See Section 11.5.3) and shown on Figure 9.1-1. Electrical power for these Channels is provided by the electrical distribution system for the Spent Fuel Island (See Section 8.3). The sensitivities for each of these two Channels are listed in Table 11.5-1. The operating ranges for each of these two Channels is listed in Table 11.5-2.

11.5.2.3 Spent Fuel Island: Area Radiation Monitoring for Spent Fuel Building

This system is primarily intended to warn personnel of escalating radiation levels in the Spent Fuel Building that could be hazardous to personnel at various locations in the plant. The system includes a single area radiation monitor channel, R-3, which is categorized as Operable, as defined in Section 1.1 (See Section 11.5.3). Electrical power for these Channels is provided by the electrical distribution system for the Spent Fuel Island (See Section 8.3) See Section 12.3.4 for additional description of the area radiation monitoring system for the Spent Fuel Building.

11.5.2.4 Monitoring of Liquid Effluents

Channel R-22: Test Tank Effluent Monitor

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

Channel R-22 has been categorized as Operable, as defined in Section 1.1 (See Section 11.5.3). Channel R-22 supports corresponding requirements of the Radiological Effluent and Monitoring and Offsite Dose Calculation Manual (REMODCM) (Reference 11.5-1) concerning radioactive effluent monitoring instrumentation. The REMODCM also includes alternative action requirements corresponding to a status of Channel R-22 that does not support the same effluent monitoring instrument requirements. The REMODCM includes corresponding requirements for instrumentation to monitor the discharge flow rate from the Recycle Test Tank discharge line. Additionally, the REMODCM includes alternative action requirements corresponding to a status of the discharge line flow instrument that does not support the same effluent monitoring instrument requirements.

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

11.5.2.5 Monitoring of Miscellaneous Point Exhausts

Separate Miscellaneous Point exhaust filter units are operated to support ventilation of the Primary Auxiliary Building (PAB), Waste Disposal Building, and Tank Farm Tent, and ventilation of the Containment Structure (see Section 6.2.2 "Containment Ventilation"), and other miscellaneous tents and small structures used during the demolition process. These ventilation flow paths exhaust to the environment via separate outlet ducts.