ATTACHMENT 2

LICENSE AMENDMENT REQUEST
STRETCH POWER UPRATE

SUPPLEMENTAL ENVIRONMENTAL REPORT

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNIT 3

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1.0 Executive Summary

This Supplemental Environmental Report contains Dominion Nuclear Connecticut Inc. (DNC) assessment of the environmental impacts of the proposed Millstone Power Station Unit 3 (MPS3) Stretch Power Uprate (SPU) from the current core power level of 3411 MWt to a core power level of 3650 MWt. The intent of this Supplemental Environmental Report is to provide sufficient information for the NRC to evaluate the environmental impact of the SPU in accordance with the requirements of 10 CFR 51.

The potential environmental impact of the proposed SPU are described and compared to those previously identified by the NRC in NUREG-1064, *Final Environmental Statement Related to the Operation of the Millstone Nuclear Power Station Unit 3 dated December, 1984* and NUREG-1437 *Generic Environmental Impact Statement for the License Renewal of Nuclear Power Plants, Supplement 22, Millstone Power Station, Units 2 and 3 Final Report* issued in July 2005, to address the license renewal of MPS. The comparisons show the conclusions of the Final Environmental Statement (FES) and NUREG-1437, Supplement 22 remain valid for operation at SPU conditions.

The MPS3 SPU would be implemented without making extensive changes to plant systems that directly or indirectly interface with the environment. All necessary modifications would be within existing buildings at MPS3; none would involve land disturbance or new construction outside of the established facility areas. There would be no change in the amount or intake velocity of water withdrawn from Long Island Sound and Niantic Bay. The waste heat discharge to the quarry would increase approximately 7 percent and would continue to meet, and necessitate no change to, MPS' existing National Pollutant Discharge Elimination System ("NPDES") permit limits. The generation of low-level radioactive waste would not increase significantly over the current generation rate and would be bounded by FES values. There would be no change in the volume of radioactive effluents (liquid and gaseous) released to the environment; however, the radioactive content of the liquid and gaseous releases would increase proportionally to the size of the SPU but would remain bounded by the FES analysis. All offsite radiation doses would remain small and within applicable regulatory requirements. There would be no impact on the size of the regular or outage workforce to accommodate the SPU.

DNC evaluated the compliance requirements associated with implementing the proposed SPU. DNC will maintain compliance with all Connecticut State permits, licenses, approvals or other requirements currently held by MPS.

DNC concludes the proposed SPU would not significantly adversely increase environmental impacts of operation described in the FES or NUREG-1437,

Supplement 22. The environmental impacts of operation at a core power level of 3650 MWt are bounded by the prior environmental reviews, and plant effluents will remain within levels permitted by existing regulations and permits. As a result, DNC has determined that the SPU would not significantly affect human health or the natural environment.

2.0 Introduction

DNC is committed to operating MPS3 in an environmentally responsible manner. Plant activities including design, construction, maintenance, and operations are conducted in a manner so as to protect the environment and to responsibly manage natural resources on and near Niantic Bay. DNC believes proper care of the environment is essential to the well-being of our corporation, its employees, its neighbors, and the broader global community. DNC and the original owners of the facility have operated at this site for more than 36 years while providing safe, reliable, and economical electrical power to their customers in New England.

In keeping with this commitment to environmental stewardship and in accordance with regulatory requirements, DNC has conducted a thorough environmental evaluation of the proposed SPU LAR to alter MPS3 from a core power level of 3411 megawatts thermal (MWt) to a core power level of 3650 MWt. This would increase electrical output from 1211 megawatts electric (MWe) to approximately 1296 MWe without the need to site a new power plant, implement major new construction, or add additional operational air emissions to the environment. The uprated NSSS power level of 3666 MWt (3650 MWt core power + 16 MWt RCS net heat input) was assumed for purpose of analyses. This is approximately 7% higher than the current NSSS power level of 3425 MWt. The proposed uprate would serve the future power requirements of New England.

This environmental evaluation is provided pursuant to 10 CFR 51.41 ("Regulations to Submit Environmental Information") and is intended to support the NRC environmental review of the proposed uprate. The proposed SPU License Amendment Request (LAR) would require the issuance of an operating license amendment.

In January 1985, the NRC published NUREG-1064 *Final Environmental Statement Related to the Operation of Millstone Nuclear Power Station Unit 3.* The NRC concluded that the issuance of the full term operating license, subject to certain conditions related to monitoring, was the appropriate course of action under NEPA. This decision was based on the analysis presented in the FES and the weight of environmental, economic, and technical information reviewed by the NRC. It also took into consideration the environmental costs and economic benefits of operating MPS3.

In January 2004, DNC filed for renewal of the MPS2 and MPS3 operating licenses. In July 2005, NRC published Supplement 22 of the *Generic Environmental Impact Statement for the License Renewal of Nuclear Power Plants* that addressed the license renewal of MPS2 and MPS3. NRC determined that the adverse environmental impacts of license renewal (i.e., operating an additional 20 years) are not so great that preserving the option of license renewal for energy-planning decision makers would be unreasonable. The decision was based upon the analysis presented in NUREG-1437, *Generic Environmental Impact Statement for the Renewal of Nuclear Power Plants,* Supplement 22.

General information about the design and operational features of MPS3 that are of interest from an environmental impact standpoint is available in several documents. In addition to the FES and Supplement 22 of the GEIS discussed above, another comprehensive source of information is the MPS3 Final Safety Analysis Report prepared and maintained by DNC.

This Supplemental Environmental Report is intended to provide sufficient detail on both the potential radiological and non-radiological environmental impacts of the proposed SPU License Amendment Request to allow NRC to make an informed decision regarding the proposed action. It does not reassess the environmental impacts of operating at the current licensed power level of 3411 MWt. Rather, this document demonstrates that the proposed SPU will not significantly increase the environmental impacts described in the FES or the more recent Supplement 22 of the GEIS, or alter the NRC's findings in those documents.

2.1 Background on MPS3 NRC Licensing

The Millstone site is comprised of three nuclear units.

The Construction Permit for MPS3 was issued on August 9, 1974, and the MPS3 FSAR and Environmental Report were filed October 29, 1982. The Full Term Operating License as well as the Full Power License were issued on January 31, 1986. The Unit was at 100% Power on April 17, 1986 and entered commercial operations on April 23, 1986.

DNC filed for Renewal of the Millstone Power Station Unit 2 (MPS2) and MPS3 Operating License in January 2004. In July 2005, the NRC issued supplement 22 of the GEIS for License Renewal for the two units. The Operating License for MPS2 now expires on July 31, 2035 while the MPS3 Operating License now expires on November 25, 2045.

Plans for the SPU were initiated in 2006 with planned implementation in 2008.

As mentioned above, MPS2 is currently licensed until 2035; Millstone Power Station Unit 1 (MPS1) permanently ceased operation on July 21, 1998, and is currently being decommissioned.

2.2 References

2.1 Applicant's Environmental Report – Operating License Renewal Stage. Millstone Power Station Units 2 and 3; Dominion Nuclear Connecticut, Docket No. 50-336, License No. DPR-65; Docket No. 50-423, License No. NPF-49, January 2004.

2.2 U.S. Nuclear Regulatory Commission. July 2005. Generic Environmental Impact Statement for License Renewal of Nuclear Plants. Supplement 22 - Millstone Power Station, Units 2 and 3 Final Report. Office of Nuclear Reactor Regulation. NUREG 1437.

3.0 Proposed Action and Need

The Millstone Power Station (MPS) is located in the Town of Waterford, Connecticut about 40 miles east of New Haven and 40 miles southeast of Hartford, CT. MPS is located on Millstone Point between the Niantic and Thames Rivers. The site sits on the edge of Long Island Sound and Niantic Bay and is approximately 20 miles west of Rhode Island. Figures 3-1 and 3-2 are MPS 50-mile and 6-mile vicinity maps, respectively.

The site is approximately 525 acres (see Figure 3-3) including the developed portion of the site, which is approximately 220 acres in size. In addition to MPS3, the site includes the shut-down MPS1 reactor and the operating MPS2 reactor. MPS1 is in decommissioning phase and operations at MPS2 will not be altered by the MPS3 SPU.

Other features of the site include a natural area (approximately 50 acres), and recreational playing fields licensed to the Town of Waterford (approximately 30 acres). In all, more than half of the site (approximately 300 acres) is outside the land developed for the power station. The transmission lines that connect the MPS to the New England grid along with the switchyard equipment are owned and maintained by the Connecticut Light and Power Company.

The exclusion area coincides with the site property boundary. The nearest residences are approximately 2,400 feet from the reactors (Reference 3.1). The region within six miles of the site includes parts of the towns of Waterford, New London, Groton, East Lyme and Old Lyme.

3.1 Proposed Action

The proposed action is to increase the licensed core power from 3411 MWt to 3650 MWt, which represents an increase of approximately 7%. This change in core thermal power level would require the NRC to amend the facility's operating license. The purpose of the proposed SPU is to increase gross electrical output from 1211 MWe to approximately 1296 MWe. The proposed action is considered an SPU by the NRC since the modifications that are required to be made to MPS3 are minor and the power increase is not greater than 7%. Refer to Chapter 4 for a list of the modifications.

The proposed plant changes all occur within the existing buildings at the station. The proposed plant changes would not involve any land disturbance or visual alteration to the appearance of the site.

DNC intends to implement the SPU during the scheduled Fall 2008 refueling outage period for MPS3. DNC expects to complete the 7% uprate during that refueling outage period. On restart after this scheduled outage and power ascension and testing, MPS3 is expected to begin operating at the SPU core power level of 3650 MWt.

3.2 Need for Action

The proposed action is intended to provide an additional supply of electric generation in the State of Connecticut without the need to site and construct new facilities, or to impose new sources of air or water discharges to the environment. The SPU will supply approximately 85 MW of additional electric capacity in a region of the New England Independent System Operator (ISO-NE) system where peak loads generally exceed local generation capacity.

The capital cost for adding this new generating capacity associated with the MPS3 SPU is comparable to the capital expenditure to install new dual fuel (natural gas and diesel) combustion turbines on this site. However, new gas/diesel combustion turbines would have much higher operational costs associated with the relatively high and variable costs for fuel than that of the existing MPS3 unit. See Section 6 of this report for additional information on operating costs.

3.3 References

3.1 Dominion Nuclear Connecticut, Inc. 2002. Millstone Nuclear Power Station Unit 3 Final Safety Analysis Report Section 2.1.2.

Figure 3-1
50-Mile Vicinity Map

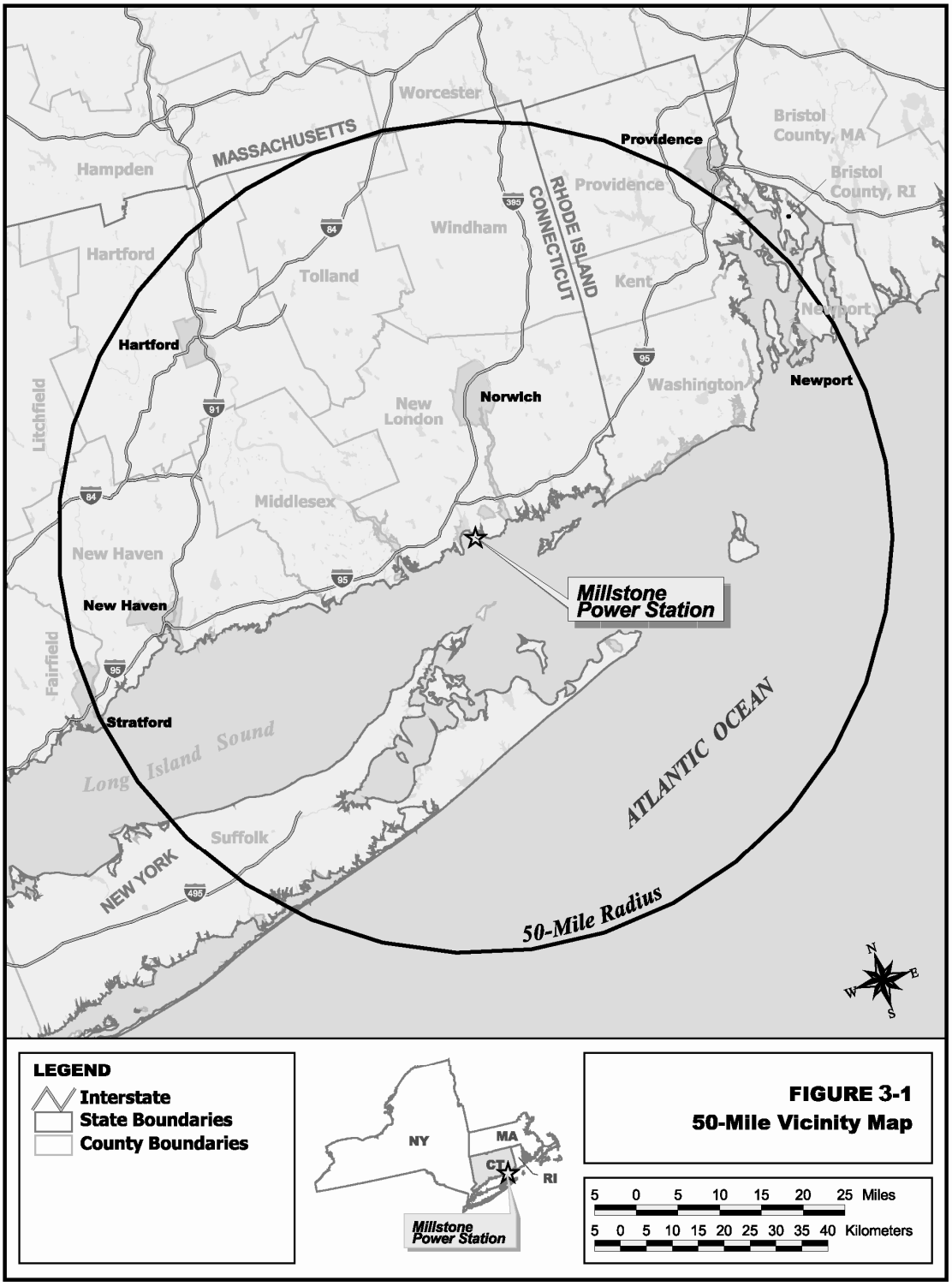


Figure 3-2
6-Mile Vicinity Map

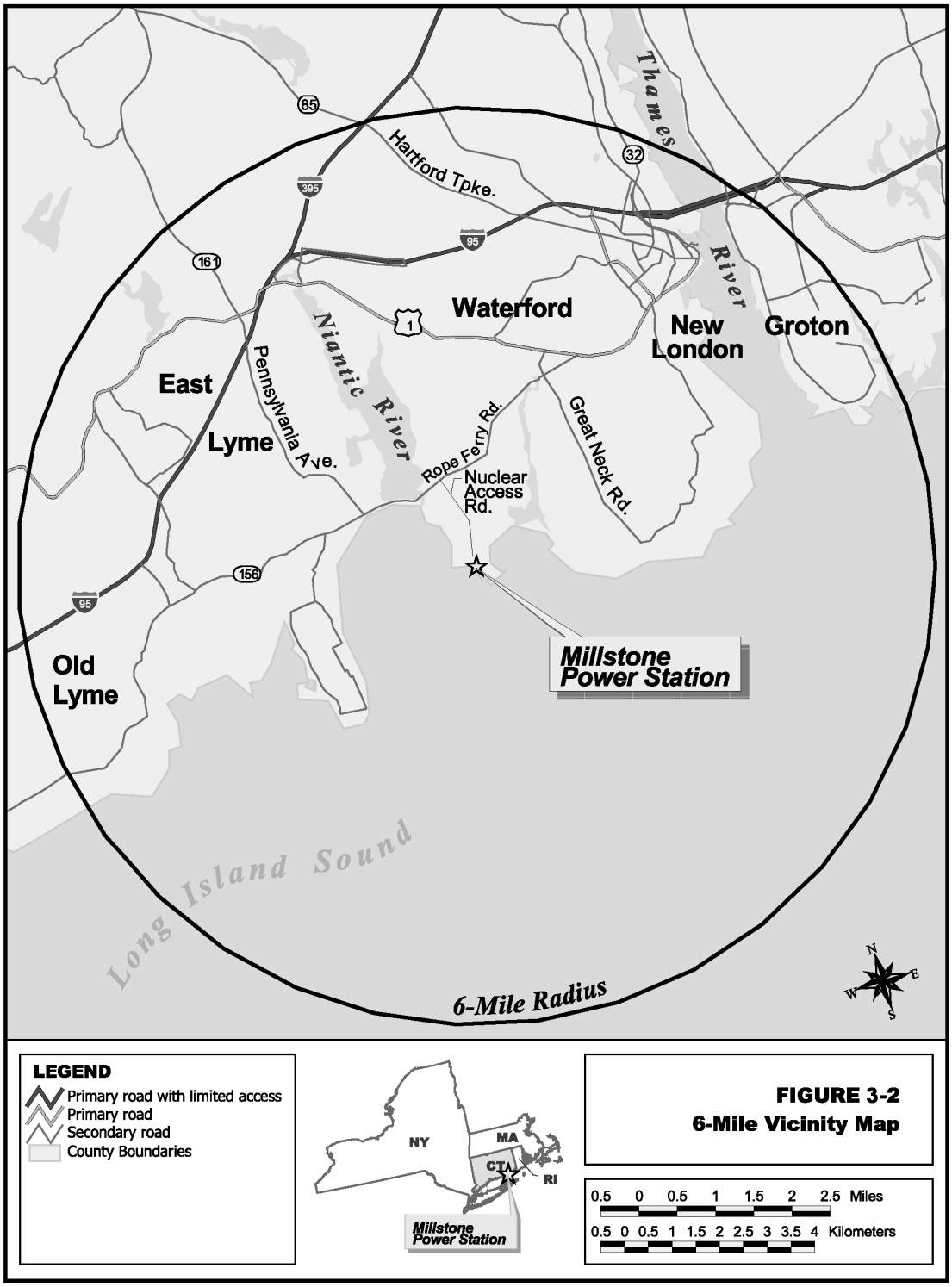
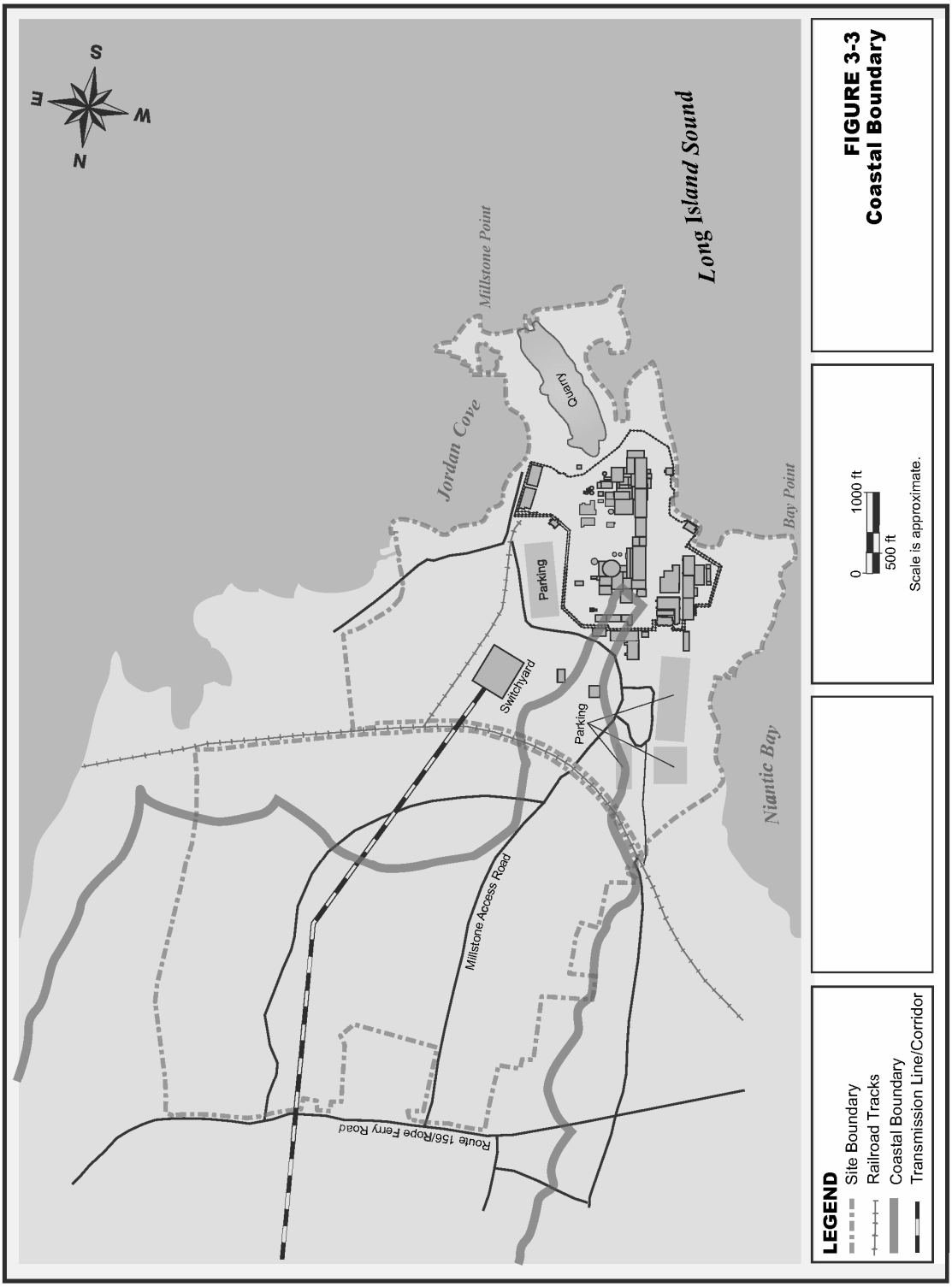


Figure 3-3
Coastal Boundary Map



4.0 Overview of Operational and Equipment Changes

The SPU will result in an increase in the electrical output of MPS3 to approximately 1296 MWe by increasing the core power from 3411 MWt to 3650 MWt. This SPU involves minor plant modifications to existing instruments and equipment.

The activities needed to produce the thermal power increase are a combination of those that directly produce more power and those that will accommodate the effects of the power increase. The primary means of producing more power are a change in the reactor and nuclear thermal-hydraulic parameters. The required modifications are listed in License Report Table 1.0-1. Of the physical modifications listed in Table 1.0-1, only the Cold Leg Injection Permissive Modification will require NRC advance approval. The remaining modifications could be performed under the 10CFR50.59 process. 10CFR50.59 establishes the criteria and record requirements for plant changes and tests that do not require NRC approval.

As documented in the MPS3 Licensing Report, the SPU evaluation included the systems and components identified in the NRC Review Standard (RS-001). The SPU will not require any additional equipment to be added to the plant that will be visible from outside the existing operation buildings.

DNC intends to implement the SPU during the scheduled Fall 2008 refueling outage period. On restart after this scheduled outage, and after power ascension, MPS3 is expected to operate at the core power of 3650 MWt with a new electric generating capacity of approximately 1296 MWe.

5.0 Socioeconomic Considerations

The socioeconomic benefits to the surrounding communities relative to MPS3 include payments of taxes to the Town of Waterford located in New London County.

A discussion pertaining to tax assessment and distribution of revenues is presented in Reference 5.1 and the results of the NRC review of this topic are presented in Reference 5.2.

5.1 Stretch Power Uprate Impacts to Socioeconomics

DNC employs a permanent workforce of approximately 1260 employees, supplemented by approximately 300 contractors at the MPS site. No additional permanent employees are expected as a result of the implementation of SPU. Therefore, there would be no effect on housing availability, transportation, or public services associated with the permanent workforce.

DNC refuels MPS3 at intervals of approximately 18 months. During refueling outages, site employment increases as a result of the arrival of temporary workers. The number of temporary workers is contingent upon the extent of work scheduled to be performed during the outage and may vary from 700-800 workers for varying durations over the course of the outage. SPU modifications to MPS3 will be implemented during the Fall 2008 refueling outage. It is not anticipated that the size of the labor force required to implement the SPU modifications will increase beyond the size of the work force associated with outages of similar duration. Therefore, the socioeconomic costs and benefits associated with employment should remain essentially the same as those for outages of similar duration and workforce levels.

DNC pays annual taxes to the Town of Waterford located in New London County. Tax revenues fund Waterford's General Fund which supports programs such as school systems, libraries, public works, public health programs, emergency management services, fire departments, parks and recreation, planning and land use commissions, the police department, the Retirement Commission, and others (Reference 5.1).

Due to the electric power industry restructuring enacted in Connecticut in 1998, MPS' subsequent tax payments to the Town of Waterford have decreased. As a part of restructuring, the State legislature passed a program called the Systems Benefit Charge which is designed to, among other things, reimburse any affected towns for the revenue loss created by the change in property valuation assessment methodologies for electric power generation assets. The Connecticut Department of Public Utility Control (DPUC) directs the state electric distribution companies to fund the program and the Connecticut Office of Policy and Management (OPM) oversees this fund (Reference 5.1). The program operates on a graduated schedule, reducing reimbursements 10 percent annually over 10 years, allowing towns to locate other sources of revenue and adjust their budgets gradually. In 2000, MPS' tax payments represented approximately 36 percent of Waterford's tax revenues before the Systems Benefit Charge reimbursement. The reimbursement amount was $21,818,848 (Reference 5.1). As the program phases out, revenues will be recouped through millage rate increases and budget adjustments. As discussed in References 5.1 and 5.2, the amount of future property tax payments to the operating budget of the Town Waterford are dependent upon future market value of the MPS site and other factors. Table 5-1 presents the taxes paid to the Town of Waterford by MPS between 1996 and 2006.

The amount of future property tax payments are dependent on the future market value of the units, future valuations of other properties in these jurisdictions, and other factors. While these payments cannot be accurately projected, the SPU would be expected to improve the economic viability of MPS3, ensuring that it would continue to contribute positively to the surrounding communities.

5.2 Conclusion

The socioeconomic impacts associated with implementing the proposed SPU at MPS3 include a positive contribution, although minor, in relation to the contribution of the overall outage scope to local and regional economies. The implementation of the SPU modifications via the Fall 2008 outage in and of itself does not necessarily differentiate itself from other outages in terms of benefits to local and regional economies. However, the overall outage effort has an impact on the continuation of employment of the local population with the associated expenditures for goods and services and contributions to income and sales taxes which both positively impact local and regional economies.

5.3 References

5.1 Applicant's Environmental Report – Operating License Renewal Stage. Millstone Power Station Units 2 and 3; Dominion Nuclear Connecticut, Docket No. 50-336, License No. DPR-65; Docket No. 50-423, License No. NPF-49, January 2004.

5.2 U.S. Nuclear Regulatory Commission. July 2005. Generic Environmental Impact Statement for License Renewal of Nuclear Plants. Supplement 22 - Millstone Power Station, Units 2 and 3 Final Report. Office of Nuclear Reactor Regulation. NUREG 1437. Washington, DC.

Table 5-1
Millstone Power Station Tax Payments and Waterford Tax Revenues 1996-2006

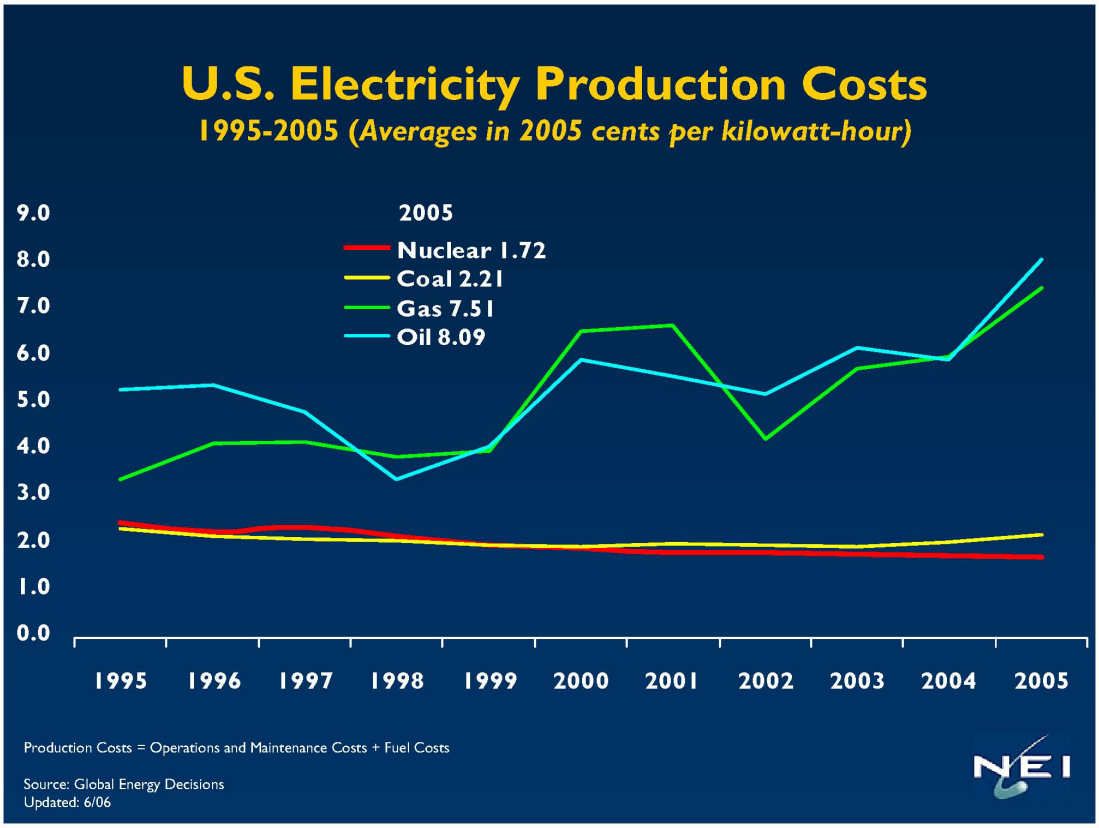
Year	Tax Paid by Millstone Power Station
1996	$34,768,749
1997	$34,163,131
1998	$33,495,022
1999	$33,725,414
2000	$11,738,993
2001	$19,594,978
2002	$13,490,786
2003	$11,667,689
2004	$12,826,388
2005	$13,972,048
2006	$15,681,084

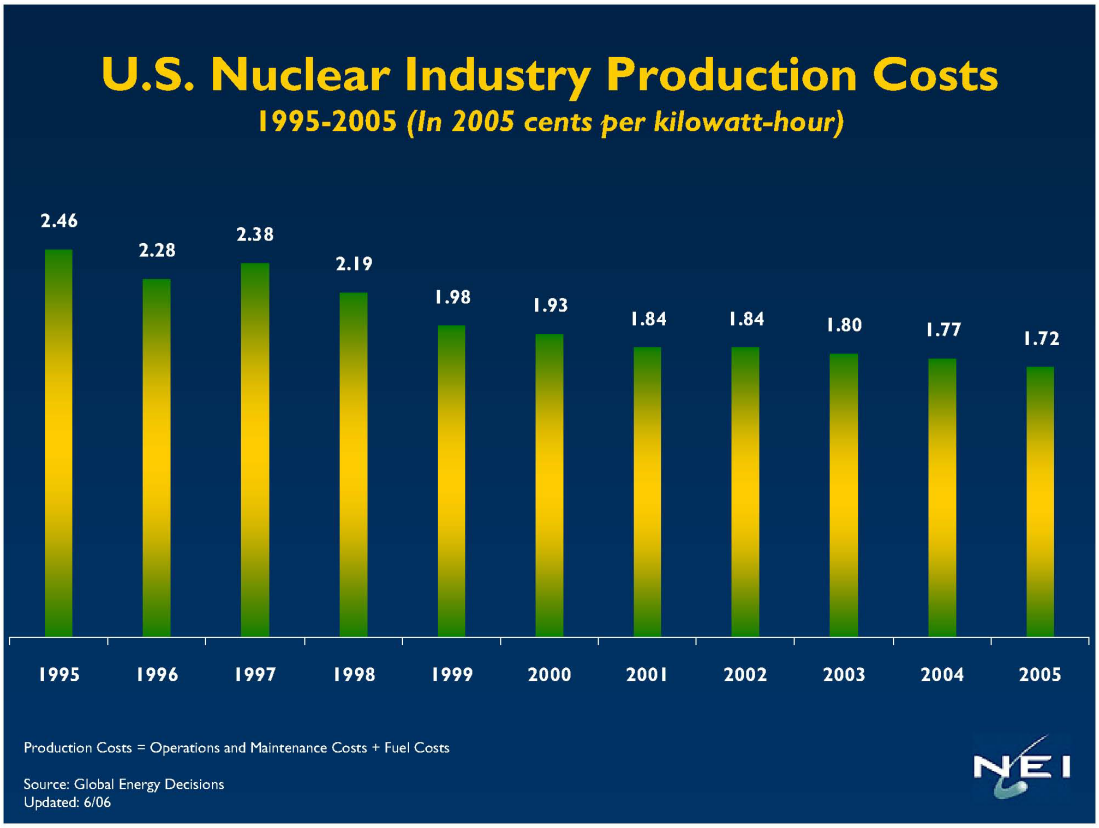
Source: For years 1996 - 2000 - Reference 5.1.
For Years 2001 – 2006 Sum is total Millstone Property Tax paid.

6.0 Economic Analysis

The greatest benefit resulting from the proposed SPU to MPS3 current capacity is the additional supply of approximately 85 megawatts of reliable electrical power for residential and commercial customers. That benefit will accrue not only to DNC for the sale of that new source of electric power to the ISO New England system, but also to local electric consumers who could expect this new baseload generation source would competitively displace higher cost cycling and peaking electric generation sources.

A national comparison of electric generation alternatives updated through June of 2006, indicates nuclear power generation production costs are lower than those of coal-fired power, oil-fired power, and natural gas-fired power production. Power production costs represent a combination of fuel, operations, and maintenance costs. The figures below, from the Nuclear Energy Institute, show the production cost of existing nuclear generating facilities are considerably less than oil or natural gas fired steam electric generation sources and even less than that of coal. The second NEI figure shows the production cost of nuclear generation continues to decrease in recent years (Reference 6.1).





These comparative production costs are also reflected in the ISO New England regulated market. This is the market into which DNC sells the power produced from MPS3. The ISO New England market is a competitive, uniform-price auction market where every generator with bid capacity below the clearing price is paid the hourly clearing price. The clearing price is based on bids supplied by all the independent wholesale generators and the ISO-NE estimated hourly demand for the day-ahead market. In these competitive markets, the base load nuclear facilities, of which there are five in New England, generally bid low enough to ensure that the facility will operate at full load through the entire 24 hour day-ahead bid period (Reference 6.2). Because nuclear-fueled generating facilities seek to operate at their highest efficiency points on a continuous basis it is not practical to moderate steam generation on an hourly basis to follow the daily electric load. What this competitive market does is to encourage base load generation plants, such as MPS3, to bid low enough each hour of the day to ensure continuous operation of their power plant while the cycling and peaking generating units generally compete to establish the higher clearing price.

Significant new adverse environmental impacts would be avoided by implementing an SPU at MPS3 compared with other new power development

options to deliver additional capacity. Unlike fossil fuel plants, an SPU would not result in a significant source of nitrogen oxides, sulfur dioxide, particulates (PM_{10} and $PM_{2.5}$), carbon dioxide, or other regulated atmospheric pollutants as a part of normal operations. Routine operation of MPS3 at SPU conditions would not contribute to greenhouse gases or acid rain and may displace operation of other fossil fueled generation in the region.

The radiological effects of the uranium fuel cycle are described in 10CFR51.51 and 51.52 and are classified as small. As discussed in section 9.0, the tables in 10CFR51.52 bound those effects associated with the MPS3 SPU. The proposed action would produce additional spent nuclear fuel, which would be accommodated by MPS3's existing spent fuel storage strategy, without significant environmental impact.

Based upon these considerations, it is reasonable to conclude the proposed MPS3 SPU would provide an overall economic advantage over development of other generation alternatives. The proposed SPU involves a cost-effective utilization of an existing asset, with minimal adverse environmental impact, making it the preferred means of securing additional generating capacity to support the growing electric demand in Connecticut.

6.1 References

6.1 http://www.nei.org/documents/U.S._Electricity_Production_Costs.pdf. As provided on March 12, 2007.

6.2 United States of America, Electric Energy Market Competition Task Force and the Federal Energy Regulatory Commission. Electric Energy Market Competition. FERC Docket No. AD05-17-000. Task Force Comments of the ISO/RTO Council on Draft Competition Task Force Report. June 26, 2006 Comments on the Draft Report to Congress on Competition in the Wholesale and Retail Markets for Electric Energy Issued on June 5, 2006.

7.0 Non-Radiological Environmental Impacts

The terrestrial and aquatic resources in the vicinity of MPS are discussed below as well as potential for any significant adverse impacts to those resources from the proposed SPU.

7.1 Terrestrial Impacts

7.1.1 Land Use

The overall Millstone site is approximately 525 acres, including the developed area which is approximately 220 acres in size (See Figure 3-3) (Reference 7.1). The lands at Millstone are designated as "public utility" on the 1996 *Existing Land Use* map for the Town of Waterford. The site is within an industrial zone south of the Amtrak Northeast Corridor rail line, and the site extends to the north in an industrial park zoning district north of the rail lines. Waterford's *Future Land Use Plan* map calls out the Millstone site as an "electric generation facility." This plan specifies that this land use applies to "The area presently devoted to use by Millstone and associated facilities necessary for the generation and transmission of electricity." Also shown on the *Future Land Use Plan* map at Millstone are lands on the site designated for "natural resources." The plan notes that these are:

> "…areas that exhibit significant environmental constraints ... and that represent the highest priorities for conservation. Use of these areas should be generally restricted or discouraged."

These areas include wetlands and coastal resource areas. The entire shoreline of Millstone and of Waterford is considered a scenic area according to the Waterford Plan. The Coastal Boundary established by the 1982 Municipal Coastal Program (pursuant to Connecticut General Statutes Section 22a-94) encircles all of Millstone Point and includes offshore waters and lands within about 1000 ft of the shore. Restoring freshwater wetlands at Millstone Point is encouraged by the plan. Adjacent land uses (existing and future) are shown for waterfront business development, residential, open space, and power transmission (Reference 7.3, as cited in Reference 7.2).

The current land uses on the land abutting the Millstone site are nearly exclusively single-family residential neighborhoods. A large undeveloped tract of forested private land that is also zoned for single-family residential uses abuts the site to the east of the recreation fields across Gardiners Wood Road. There is a small eighteenth century burial ground, owned and maintained by the Town, that abuts the site to the north and fronts Rope Ferry Road. A convalescent residential care center is located across from the main entrance to Millstone on the north side of Rope Ferry Road. The nearest commercial areas are found nearly 3 miles away, where there are several small shopping centers and stand-alone retail establishments at Jordan Village, which is also the center for Town government and the location of the high school. Maritime enterprises that cater to small fishing and pleasure craft are found at Mago Point, about 0.6 miles from Millstone (Reference 7.2).

The proposed SPU for MPS3 would not affect land use at the site. No new construction is planned outside of existing facilities, and no expansion of buildings, roads, parking lots, equipment storage areas, or transmission facilities would be required to support the proposed SPU. The SPU would not require the storage of additional industrial chemicals, fuels, or storage tanks on the site.

7.1.2 Historic and Archaeological Resources At and Near Millstone

As of 2002, 181 properties in New London County were listed in the National Register of Historic Places, with 62 falling within a radius of 6 miles of the Millstone facility. None of these properties are on the Millstone site (Ref 7.2). An archaeological records' search was performed on the archaeological assessment survey conducted for Waterford in 1998 (Reference 7.4 as cited in Ref 7.2), and a general literature review was conducted in 2004 at the Waterford Public Library as a part of the license renewal application preparation (Reference 7.2).

No SPU-related impacts to historic or archaeological resources are anticipated. In addition, DNC is not aware of any significant historic or archaeological resources that have been affected to date by MPS operations. By letter dated August 5, 2003, as shown in Section 4.19 of Reference 7.1, the Connecticut State Historic Preservation Office concluded license renewal would have "no effect on historic, architectural, or archaeological resources listed on or eligible for the National Register of Historic Places." Because no land disturbance would be required and because there would be no expansion of the existing workforce for the SPU, impacts to historical/archeological resources would be negligible.

7.1.3 Transmission Facilities

Four existing 345-kV transmission line circuits connect with the station through the existing station switchyard. The proposed SPU would not require any new transmission lines, transmission line reconductoring, or new transmission equipment to support SPU operation and would not require changes in the maintenance and operation of existing transmission lines, switchyards, or substations. Right-of-way maintenance practices, including vegetation management, would not be affected by the proposed SPU.

The increase in electrical power output would cause a corresponding increase in current on the transmission system, and this would result in an increased electromagnetic field. DNC adopts by reference the NRC conclusion that chronic effects of EMF on humans are not quantified at this time, and no significant impacts to terrestrial biota have been identified (Reference 7.1).
Acute shock hazards are precluded by maintaining compliance with National Electric Safety Code (NESC) Standards for limiting induced current to 5 mA. Clearances for transmission lines are based on NESC requirements. The

increase in current across transmission lines due to MPS3 power uprate will not change the potential for electric shock hazards. Transmission line rated voltage remains unchanged, and therefore required transmission line clearances remain unchanged. Line loadings remain within current ratings. The line ratings contained within the system model consider transmission line sag due to loading (current, wind, ice, and ambient temperature).

7.1.4 Miscellaneous Effluents

Miscellaneous effluents (non-radiological) are generated from a number of plant systems and are discharged from MPS in accordance with MPS' existing NPDES permit. Included are effluents from the Makeup Water Treatment System, Condensate Polishing Demineralizer System, Biocide Wastes, Non-radioactive floor and equipment drainage, Steam Generator Blowdown, Waste Test Tank Discharges, Corrosion Inhibitors, and Sanitary Wastes. Chemical discharge limits from the above list of generating sources are described in MPS' NPDES permit. Discharges from these systems are not expected to change under the proposed SPU conditions; therefore, the impact on the environment would not change. These discharges would not exceed or necessitate any change to the limits established in the NPDES permit. Consequently, the SPU would not increase the impacts associated with discharge of miscellaneous waste.

DNC has reviewed how SPU operations might impact the operation or testing of the auxiliary boilers and the emergency diesel generators. There would be no changes in the auxiliary boiler operations. In addition, in LR Section 2.3.3, AC Onsite Power Systems, DNC concludes that the emergency diesel generators are not impacted by the SPU. Therefore, there would be no change in non-radiological air emissions and no need to conduct additional review of the SPU with respect to prevention of significant deterioration for air resources. Existing air permit limits are not impacted as a result of the implementation of the SPU.

Operations under SPU conditions are not expected to generate any other additional solid or otherwise regulated non-radiological wastes.

7.1.5 Noise

The proposed SPU would not produce measurable changes in the character, sources, or intensity of noises generated at Millstone Station. No significant increase in ambient noise levels is expected inside or outside the plant.

7.1.6 Terrestrial Biota

The MPS site covers approximately 525 acres. Natural terrestrial habitats at the site consist of old field, mesic hardwood forest, coastal marsh, and beach.

Although they are not "natural" habitats, a transmission line corridor as well as the onsite meeting area available to Millstone personnel at the site also provide habitat for wildlife and plants. These habitats support a variety of wildlife species typical of similar habitats in New England. The abundant mast produced by the oak-hickory forest provides food for upland species such as white-tailed deer, gray squirrel, and wild turkey. Forest openings and the old field habitat support mammals such as the cottontail rabbit, red fox, and woodchuck (Reference 7.1).

The MPS site supports various songbirds and birds of prey such as Peregrine Falcons which have been observed nesting on-site in 2006, and is located on the Atlantic Coast flyway for migratory birds. The coastal marshes at MPS provide habitat for waterfowl such as the mallard, blue-winged teal, ring-necked duck, and Canada goose, as well as wading birds such as herons and egrets. Osprey nest platforms have been maintained at MPS since 1967; the osprey is a Connecticut species of special concern. (Reference 7.1)

DNC maintains a 50-acre wildlife refuge in the eastern portion of the MPS site. Extending from Jordan Cove northward into mesic hardwood forest, the wildlife refuge provides habitat for a variety of wildlife species.

Ponds in this area are used by waterfowl such as wood ducks, common mergansers, and black ducks, as well as herons and egrets. Several small vernal pools are located east of the transmission corridor within the mesic hardwood forest at MPS. These small depressions fill with melting snow and spring rain. The vernal pools are also used by species such as spotted turtles, spring peepers, and a variety of invertebrates. The environmental report submitted in support of the MPS2 and 3 plant license renewal application contains detailed descriptions of the various terrestrial habitats, and the plant and animal communities that are typically associated with them (Reference 7.1).

Terrestrial species that are federally protected under the Endangered Species Act and listed by the U. S. Fish and Wildlife Service, and that have the potential to occur in the vicinity of MPS3 or along the transmission right-of-ways (ROWs) are presented in Table 7.1-1. Table 7.1-1 also includes terrestrial species listed by the state of Connecticut that are not listed under the Federal Endangered Species Act (ESA).

Six terrestrial species federally protected under the ESA are known to exist in counties occupied by the MPS site (New London) or are crossed by the Millstone transmission line ROWs (Hartford, Middlesex, New London, and Tolland counties). The piping plover *(Charadrius melodus)* is known to be present in New London county but not on the MPS site or transmission ROWs and therefore are not likely to be affected by the SPU. Both the bald eagle *(Haliaeetus leucocephalus),* and the roseate tern *(Sterna dougalli)* have been sighted at the Millstone site. The New England cottontail rabbit *(Sylvilagus transitionalis)* has

not been reported on the site or within the transmission ROWs. Habitat for the small whorled pogonia *(Isotria medeoloides)* may exist at the MPS site or along associated transmission line ROWs, but is not expected to be altered by the SPU (Reference 7.2).

As proposed, all equipment changes would take place within existing structures or existing equipment housed within the confines of existing buildings. As the proposed action would not involve any land disturbances or increases in noise level outside the plant, there would be no significant direct impact on the terrestrial environment of the site or the transmission lines.

7.2 Aquatic Impacts

7.2.1 The Aquatic Site Environment of Niantic Bay and LIS near MPS3

7.2.1.1 Introduction

The aquatic resources of the Millstone Point area have been monitored continuously since 1968, when pre-operational baseline studies of phytoplankton, zooplankton, benthic organisms, and fish were initiated (Reference 7.7). Studies to determine the potential impacts, if any, of operation of MPS1 and MPS2 followed in the 1970s, and were summarized in the MPS Clean Water Act Section 316(b) Demonstration (Reference 7.8) and related documents.

The Environmental Report – Operating License Stage for Millstone Unit 3 (Reference 7.9) that was submitted to the NRC along with the FSAR on October 29, 1982, reviewed and summarized pre-operational and operational monitoring studies of impacts of MPS1 and MPS2 operation through 1980. In addition to these monitoring studies, which examined the abundance and distribution of a variety of marine organisms, more focused investigations of fish were carried out in support of the 1993 and 2001 cooling water intake feasibility studies (Ref 7.10; Reference 7.11) performed at the request of the Connecticut Department of Environmental Protection.

The Millstone annual ecological reports prepared by the Millstone Environmental Laboratory are a comprehensive source of information on aquatic communities in the Millstone area. These annual reports have been prepared continuously since 1975 and submitted to the Connecticut Department of Environmental Protection and the Connecticut Siting Council. The most recent report is the Millstone Annual Report for 2006, Monitoring the Marine Environment of Long Island Sound at Millstone Power Station, Waterford, Connecticut (Ref 7.13). In addition to up-to-date information on aquatic communities in the Millstone area, the 2006 Annual Report contains useful information on MPS operations and a chronology of “major construction and operations events,” beginning with groundbreaking for the station in December 1965.

7.2.1.2 Location, Currents and Water Temperature and Salinity

MPS is located on Millstone Point, about 5 miles west-southwest of New London on the Connecticut shore of Long Island Sound (LIS) (see Figure 3-2). Millstone Point is bounded to the west by Niantic Bay, to the east by Jordan Cove, and to the south by Twotree Island Channel.

Strong tidal currents are characteristic of eastern Long Island Sound (Reference 7.14 as cited in Reference 7.1) and predominate in the area of MPS. Velocities of currents in the waters surrounding Millstone Station generally range between 0.5 and 2.0 feet per second (Reference 7.8 as cited in Ref 7.1), and are slightly higher in Twotree Island Channel than in the immediate vicinity of Millstone Point and in Niantic Bay. Tidal currents are relatively weak in Jordan Cove and the Upper Niantic River (Reference 7.15 as cited in Reference 7.1). The currents are driven by semi-diurnal tides that have a mean and maximum range of 2.6 and 3.3 feet, respectively (Reference 7.15 as cited in Ref 7.1).

The movement of water at Millstone Point at flood tide is toward the west, but circulation is less clearly defined in upper Niantic Bay and Jordan Cove (Reference 7.8 as cited in Reference 7.1). With the ebb tide, currents flow eastward past Millstone Point. The mean tidal flow in Twotree Island Channel is approximately 120,000 cubic feet per second (Reference 7.8 as cited in Ref 7.1). Mean tidal exchange for Niantic Bay is approximately 100,000 cubic feet per second. Direction and magnitude of tidal flow vary considerably depending upon the stage of the tide. Signell et al. (Reference 7.16 as cited in Ref 7.1) describe tides, tidal currents, and circulation patterns in LIS, and consider ways in which these physical processes influence the characteristics and distribution of sea-floor sediments.

Salinity in LIS in the area of MPS ranges from 26 to 32 parts per thousand and averages around 29 parts per thousand, slightly less than the salinity of open ocean, which is normally around 35 parts per thousand (Reference 7.17 as cited in Reference 7.1). Surface water temperatures in the area of the MPS intake range from 31ºF in January-February to around 75ºF in August-September. Based on vertical salinity and temperature profiles taken in Twotree Island Channel and Niantic Bay, this portion of LIS is “very thoroughly mixed” by wind and currents, with no indication of stratification beyond some minor warming of surface waters (Reference 7.17 as cited in Reference 7.1).

7.2.1.3 Key Aquatic Species Populations Near MPS

Several specific aquatic species and aquatic communities of specific habitats located in the vicinity of MPS have been the major focus of long-term annual

studies. The basis for the studies is the NPDES permit (Ref 7.18). Information on these studies can be found in the Environmental Report – Operating License Renewal Stage (Reference 7.1) and in the 2006 Annual Report (Reference 7.13).

7.2.2 MPS3 Cooling Water Systems

MPS3 uses a once-through cooling water system with intakes on Niantic Bay and surface discharges to the old quarry. Water from the quarry flows back into Long Island Sound. Figure 7-.1 shows the locations of the intake and discharge structures.

As discussed below, the SPU will have no effect on the circulating water flow rate. The SPU will increase the total BTU's in the thermal discharge of MPS3 by approximately 7%, but discharges will remain within existing NPDES permit limits.

The site NPDES permit (References 7-18, 7-19) limits MPS3 circulating water discharge to the quarry (Discharge Serial No. 001-C) to a maximum temperature of 98°F and a maximum increase from the Niantic Bay intake to discharge to the quarry to 24°F. In addition, the site NPDES permit limits the maximum temperature of the discharge to Long Island Sound at the quarry cut (Discharge Serial No. 001-1) to 105°F and limits the maximum temperature increase at the quarry cut discharge to 32°F above the Niantic Bay intake. For unusual conditions, the NPDES permit limits the maximum differential temperature increase at the quarry cut above the intake water temperature to 44°F for a period not exceeding 24 hours.

The MPS3 circulating water system design flow is 912,000 gpm, however, during normal operation, the circulating water system provides a nominal flow of approximately 840,000 gpm to the condenser. This is adequate to remove the increased heat rejected by the steam cycle at SPU as shown by the SPU heat balances that predict the expected plant electric power output at the SPU NSSS power level of 3666 MWt. As discussed in LR Section 2.5.8.1, Circulating Water System, no physical changes are required in the circulating water system. Therefore, the current circulating water system flow rate is acceptable for SPU conditions.

The outlet temperature of the circulating water system is higher at SPU conditions due to the higher heat rejection from the condenser. The maximum temperature rise across the condenser under SPU conditions, is 19.5°F, which remains below the NPDES permit limit of 24°F. With the ocean temperature at its design maximum temperature of 75°F, the circulating water discharge temperature increases to a maximum of 94.5°F during normal 100% power operation, which remains below the NPDES discharge limit of 98°F.

During operation of the turbine bypass system, the CW outlet temperature is 101°F with a 26°F rise across the condenser. While the operation of the bypass is an abnormal discharge condition, the discharge temperatures during this mode of operation remain bounded by the NPDES discharge limits at the quarry cut. Under all SPU conditions, MPS will continue to operate in conformance with the existing permit conditions

Operating pressures and flow rates within the circulating water system do not change with implementation of SPU since the current flow rates are acceptable for SPU operation and the circulating water pumps continue to operate at the same flow and discharge head at SPU conditions. The design temperatures and pressures of the circulating water system piping and components are bounded by the circulating water system parameters under SPU conditions.

In summary, under SPU conditions, the plant will continue to operate within the existing plant flow and thermal discharge limits as defined in the currently authorized NPDES permit. With no changes in the currently permitted cooling system operating conditions at the site, the MPS3 SPU is not expected to have any significant adverse impact on aquatic resources of Niantic Bay or Long Island Sound.

7.2.3 Entrainment and Impingement Impacts

Plant cooling water flows will not be altered by the proposed SPU. The cooling water intake and discharge will continue to be operated in conformance with the current operational limitations specified in the NPDES permit.

No significant changes in existing zooplankton and phytoplankton entrainment as a result of the SPU are anticipated because existing flow rates will be unchanged. No significant changes in water velocities approaching the traveling water screens are anticipated because flow rates through the traveling water screens will be unchanged; thus the existing screen hydraulic conditions are preserved with respect to the proposed SPU conditions. Therefore no significant adverse changes in fish and shellfish impingement as a result of the SPU are expected.

7.2.4 Thermal Discharge Effects

The cooling water discharge temperature is bounded by the limits presented in the NPDES permit. Intake circulating water system flow rates are unchanged by the uprate.

As previously discussed, the NPDES permit limits the maximum temperature of the discharge to Long Island Sound at the quarry cut to 105°F and limits the maximum temperature increase at the quarry cut discharge to 32°F above the Niantic Bay intake. These limits will be unchanged by operation of MPS3 under SPU conditions.

The NPDES permit also sets the rise in the temperature of the Long Island Sound beyond an 8,000 foot radius from the quarry cut to no more than 4° F. In addition, the NPDES permit limits temperature beyond this mixing zone to 83° F. It is anticipated that the SPU will not result in any change to either of these limits.

In issuing the NPDES permit in 1992, the Connecticut Department of Environmental Protection (CTDEP) determined that thermal discharges from MPS were sufficiently protective of fish and wildlife communities of Niantic Bay and eastern Long Island Sound to allow alternative thermal effluent limitations under Section 316(a) of the CWA. This determination was based on numerous hydrothermal and biological studies over a 20-plus year period and on-going ecological monitoring programs.

Hydrothermal surveys were conducted at MPS with three-unit operation (MPS1, MPS2, and MPS3), and are described in detail in studies published in 1988 (Reference 7. 20 as cited in Reference 7.1). Thermal plume analysis was conducted in 2001 (Reference 7.21 as cited in Reference 7.13). These studies showed that the thermal plume was warmest in the immediate vicinity of the discharge point at the two quarry cuts during three unit operation. The plume was shown to cool to less than a 4° F ΔT within approximately 3600 feet of the discharge. Beyond this mixing zone, the plume was highly dynamic and varied with the tidal current. Since the current two unit cooling water operating limits on temperature of the discharge and cooling water flow will not be altered from the current NPDES permit, no incremental impact to aquatic resources is expected under the proposed SPU operating conditions.

7.2.5 Sensitive Aquatic Species

Ten marine species (two fish species, three species of whale and five species of sea turtle) listed by the United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) that are state- or federally-listed as threatened or endangered are known to occur, at least occasionally, in the vicinity of MPS (Table 7.2-1) or could occur in Long Island Sound in the vicinity of Millstone Point.

Two protected anadromous fish species, the shortnose sturgeon (*Acipenser brevirostrum*) and the Atlantic sturgeon (*Acipenser oxyrhynchus*), are found in the Connecticut River, in the vicinity of Millstone Point and parts of Long Island Sound. The shortnose sturgeon is federally and state-listed in Connecticut as

endangered. An estimated 1,200 to 1,500 shortnose sturgeon are found in freshwater and estuarine portions of the Connecticut River and are presumed to range into adjacent areas of Long Island Sound. No shortnose sturgeon has been captured in more than 30 years of sampling at MPS. Atlantic sturgeon, state-listed as threatened in Connecticut fresh waters, occur in the lower reaches of the Connecticut River and certain areas of Long Island Sound. One Atlantic sturgeon was captured in a trawl sample near MPS in 1980, and was released unharmed by Millstone Environmental Laboratory biologists.

The right whale (*Balaena glacialis*), finback whale (*Balaenoptera physalus*), and humpback whale (*Megaptera novaeangliae*), all federally listed as endangered, pass south of Long Island during seasonal migrations and are occasionally observed in Long Island Sound. DNC is not aware of any observations of whales in the waters off MPS.

Five species of sea turtle occur along the mid-Atlantic coast (Table 2-1) (Reference 7.1), but sightings are uncommon and limited for the most part to sub-adult “wanderers”. Young sea turtles occasionally enter Long Island Sound and are sometimes stranded on the north shore of Long Island. MPS personnel have rarely observed sea turtles in the waters off MPS, and none are known to have been stranded at MPS. In 2006, a dead sea turtle was impinged on the MPS2 trash racks.

As discussed in Sections 7.2.3 there are no proposed changes in station cooling water flow from the proposed uprate. As a result, the proposed uprate is not expected to alter present entrainment and impingement rates of MPS3. As discussed in Section 7.2.4, the plant will continue to operate within the existing thermal limits of the currently authorized NPDES permit, so no thermal related impacts are anticipated as a result of the proposed SPU. In addition, ten sensitive species discussed above have not been found in impingement and entrainment sampling conducted at the site over many decades of operation of MPS. (The sea turtle mentioned in the previous paragraph was dead prior to impinging upon the MPS2 racks.) Only the Atlantic sturgeon was captured, and only on one occasion, during regular adult fish sampling associated with the MPS3 Aquatic Monitoring Program. Therefore it is concluded that implementation of the proposed SPU at MPS3 will not affect any threatened or endangered species identified in Table 7.2-1.

7.2.6 NPDES Permit Renewal

The NPDES permit is currently before the CTDEP for renewal. The proposed renewal is unrelated to the SPU. The CTDEP has proposed requiring installation of variable condenser cooling water flow technology. Installation of this technology, which would further mitigate entrainment and impingement, is

unrelated to the uprate. As previously discussed, the uprate will not result in any change to intake flow.

In August 2006, the Commissioner of the CTDEP issued notice of the Department's tentative determination to renew MPS' NPDES permit. With respect to Section 316(a) of the Clean Water Act, the draft permit contains a determination that:

> The existing once-through system utilized by the applicant for the control of the thermal component of the applicant's discharge, is sufficient to assure the protection and propagation of a balanced indigenous population of shellfish, fish and wildlife in and on the receiving waters. The Commissioner has also determined that the thermal component of the discharge is consistent with the Water Quality Standard adopted pursuant to Section 22a-426 of the Connecticut General Statutes as amended and approved by the U.S. Environmental Protection Agency on December 17, 2002. In the view of this finding, the Commissioner has herein established effluent limitations that do not require the use of cooling systems (such as closed cycle cooling) at the Millstone Power Station, Units 2 and 3, consistent with the provisions of Section 316(a) of the Clean Water Act.
>
> The Commissioner has also determined that additional evidence based upon actual operating experience of Millstone Power Station, Units 2 and 3 would be desirable in order to corroborate the Commissioner's findings. The Commissioner expressly reserves the right to impose more stringent effluent limitations with respect to the thermal component of the Company's discharge, including limitations that require the use of cooling systems such as closed cycle cooling pursuant to Section 22a-430 of Chapter 446k, Connecticut General Statutes should further investigation fail to corroborate the Commissioner's determination that the effluent limitations established herein are consistent with all provisions of Section 316(a) of the Clean Water Act.

Subsequently, in February 2007, DNC advised the CTDEP of the need to revise the proposed differential temperature ("ΔT") limit at the Quarry Cut (DSN001-1). The request is not related to the uprate but rather was made to accurately reflect operating conditions during periods of significantly reduced cooling water flow that will occur after the variable condenser cooling water flow technology is installed as required by the Draft Permit. DNC requested that the 35°F limit at DSN001-1 set forth in the Draft Permit be revised to a ΔT limit of 41°F when operating at reduced flow during the "winter flounder larval entrainment season"

as that term is defined in the Draft NPDES Permit. This request remains under review with the CTDEP.

With respect to Section 316(b), the CTDEP's tentative determination also concluded that:

> The Department has tentatively determined that the location, design, construction and capacity of the existing cooling water intake structures including the operation of aquatic organism screening and return systems, plus installation of new technology and operational controls for Units 2 and 3 represents the Best Technology Available for minimizing adverse environmental impact from impingement and entrainment pursuant to Section 316(b).

In June 2007, MPS' NPDES permit renewal proceeding was suspended until August 20, 2007 to allow CTDEP staff to consider the impact of the decision of the United States Court of Appeals for the Second Circuit in Riverkeeper v. EPA, 475 F.3d 83 (2007) on its tentative determination and draft NPDES permit for MPS. As a result, DNC's NPDES permit renewal application remains under review with the CTDEP, and the current NPDES permit and 316(a) and (b) determinations remain in effect until the State ultimately acts on DNC's application for renewal of the NPDES permit. Accordingly, the NPDES permit issued by CTDEP for MPS in December 1992 and transferred to DNC on March 31, 2001 constitutes the current CWA Section 316(a) and (b) determinations for MPS.

7.3 References

7.1 Dominion Nuclear Connecticut, Inc. 2004. Applicant's Environmental Report – Operating License Renewal Stage. Millstone Power Station Units 2 and 3; Dominion Nuclear Connecticut, Docket No. 50-336, License No. DPR-65; Docket No. 50-423, License No. NPF-49, January 2004.

7.2 U.S. Nuclear Regulatory Commission. July 2005. Generic Environmental Impact Statement for License Renewal of Nuclear Plants. Supplement 22 - Millstone Power Station, Units 2 and 3 Final Report. Office of Nuclear Reactor Regulation. NUREG 1437. Washington, DC.

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7.4 Harper, M.G., J. Martman-Brodur, B. Jones, and B. Clouette. 1998. Report: Town-wide Archeological Assessment Survey – Waterford. Public Archeology Survey Team, Inc. Manuscript in the possession of Robert Nye, Waterford Town Historian, Waterford, Connecticut.

7.5 U.S. Fish and Wildlife Service. 1999. Title 50, Wildlife and Fisheries, Part 17, Endangered and Threatened Wildlife and Plants, SubpartB Lists. U.S. Fish and Wildlife Service, December 21, 1999.

7.6 Connecticut Department of Environmental Protection. 2004. http:fldep.state.ct.us/bumatr/wildlifelteam/esfact.htm (accessed April 27, 2004).

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and Marine Geology Program, Woods Hole, MA. Available at http://woodshole.er.usgs.gov/projectpages/longislandsound/. Last updated May 10, 2002.

7.15 Dominion Resources Services. 2003. Monitoring the Marine Environment of Long Island Sound at Millstone Power Station, Waterford, Connecticut, Annual Report 2002.

7.16 Signell, R. P., J. H. List, and A. S. Farris. 2000. Bottom Currents and Sediment Transport in Long Island Sound: A Modeling Study. Journal of Coastal Research 16(3): 551-566. On-line version available at http://smig.usgs.gov/SMIG/features_0900/li_sound_inline.html. Last updated August 28, 2000.

7.17 U.S. Nuclear Regulatory Commission. 1984. Final Environmental Statement related to operation of Millstone Nuclear Power Station, Unit No. 3. Docket No. 50-423. Office of Nuclear Reactor Regulation. NUREG-1064. Washington, DC. December 1984.

7.18 NPDES permit ID Number CT0003263. Issued by Connecticut Department of Environmental Protection, Robert E. Moore on December 14, 1992.

7.19 Emergency Authorization ID Number EA0100176. Issued by Connecticut Department of Environmental Protection, Commissioner Arthur J. LaRocque, Jr. on October 13, 2000.

7.20 Northeast Utilities Services Company. 1988. Hydrothermal Studies. Pages 323-354 in Monitoring the Marine Environment of Long Island Sound at Millstone Power Station, Waterford, Connecticut. Annual Report 1988.

7.21 Adams, E.E., 2001. Thermal Plume Analysis for Millstone Power Station, Units 2-3, Massachusetts Institute of Technology, Cambridge, Massachusetts. 13 pp + 12 Figures.

Table 7.1-1
Terrestrial Species Listed as Endangered or Threatened by the State of Connecticut, the FWS, or NOAA Fisheries or that are Known to Occur or Potentially Occur Within Millstone Site and Within the ROW of the Associated Transmission Line

Scientific Name	Common Name	Federal Status [(a.)]	State Status [(b.)]
INSECTS			
Cicindela puritana	Puritan Tiger Beetle	Threatened	Endangered
BIRDS			
Accipiter striatus	sharp-shinned hawk	Not listed	Endangered
Ardea alba	great egret	Not listed	Threatened
Charadrius melodus	piping plover	Threatened	Threatened
Circus cyaneus	northern harrier	Not listed	Endangered
Egretta thula	Snowy egret	Not listed	Threatened
Falco peregrinus	peregrine falcon	Not listed	Endangered
Haliaeetus leucocephalus	bald eagle	Not listed	Endangered
Icteria virens	yellow-breasted chat	Not listed	Endangered
Pooecetes gramineus	vesper sparrow	Not listed	Endangered
Podilymbus podiceps	pied-billed grebe	Not listed	Endangered
Sterna antillarum	least tern	Not listed	Threatened
Sterna dougallii	roseate tern	Endangered	Endangered
MAMMALS			
Sylvilagus transitionalis	New England cottontail rabbit	Candidate	Not listed
PLANTS			
Isotria medeoloides	small whorled pogonia	Threatened	Endangered
Scleria triglomerata	tall nut sedge	Endangered	Endangered

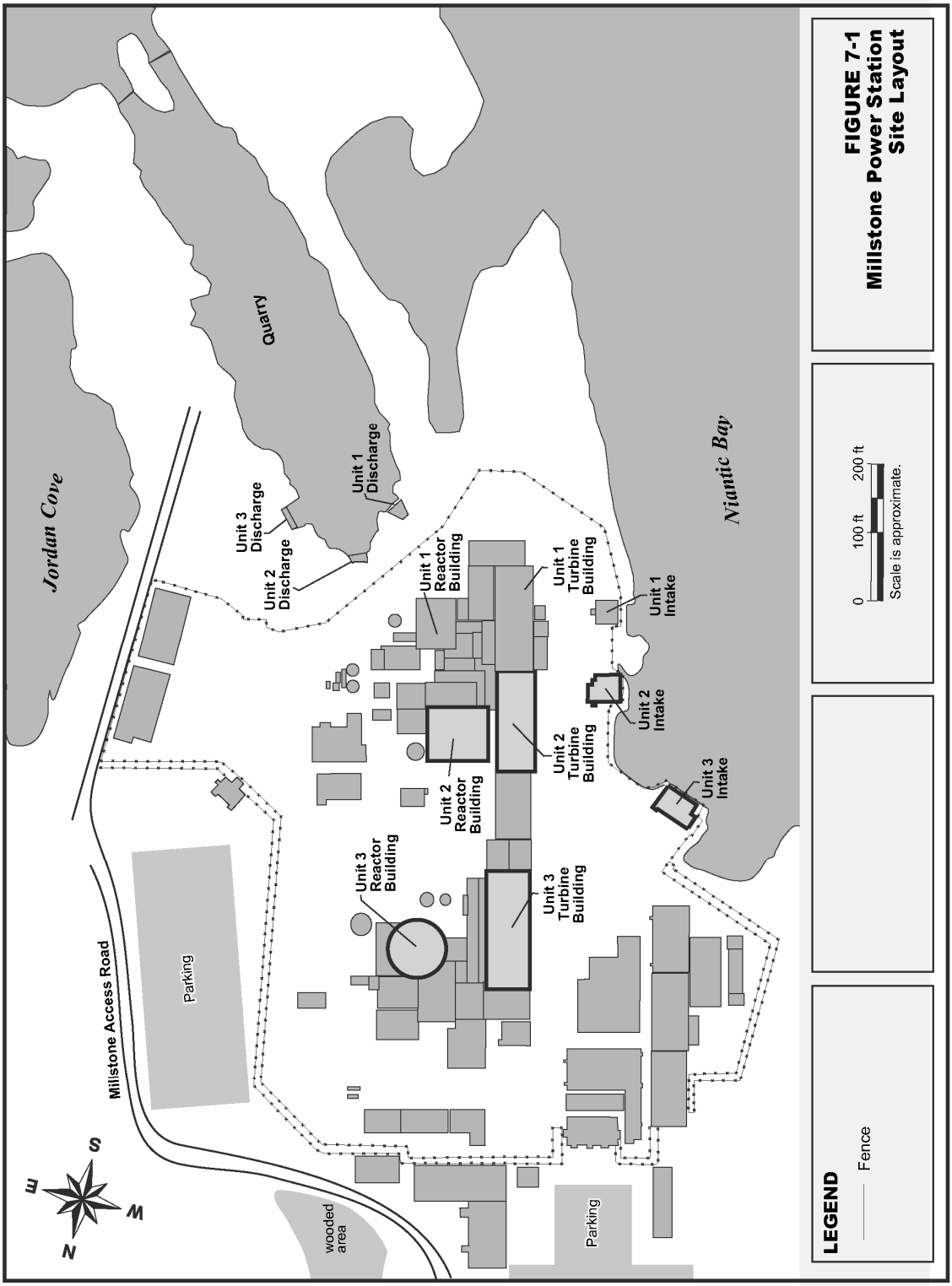
(a) Reference 7.5 as cited in Reference 7.2.
(b) Reference 7.6 as cited in Reference 7.2

Table 7.2-1
Aquatic Species Listed as Endangered or Threatened by the State of Connecticut, the FWS, or NOAA Fisheries or that are Known to Occur or Potentially Occur Within Millstone Site and in Long Island Sound

Scientific Name	Common Name	Federal Status	State Status
FISH			
Acipenser brevirostrum	Shortnose sturgeon	Endangered	Endangered
Acipenser oxyrhynchus	Atlantic sturgeon	Not Listed	Threatened
REPTILES			
Caretta caretta	Loggerhead sea turtle	Threatened	Threatened
Chelonia mydas	Green sea turtle	Threatened	Threatened
Dermochelys coriacea	Leatherback sea turtle	Endangered	Endangered
Eretmochelys imbricata	Hawksbill sea turtle	Endangered	Not listed
Lepidochelys kempii	Kemp's (Atlantic) ridley sea turtle	Endangered	Endangered
MAMMALS			
Balaena glacialis	Right whale	Endangered	Not listed
Balaenoptera physalus	Finback whale	Endangered	Not Listed
Megaptera novaeangliae	Humpback whale	Endangered	Not Listed

(a) Reference 7.5 as cited in Reference 7.2.
(b) Reference 7.6 as cited in Reference 7.2

Figure 7-1
Millstone Power Station Site Layout



8.0 Radiological Environmental Impacts

8.1 Radiological Waste Streams

The radioactive waste systems at MPS3 are designed to collect, process, and dispose of radioactive wastes in a controlled and safe manner. The design basis for these systems during normal operations is to limit discharges in accordance with 10 CFR 50, Appendix I. Adherence to these limits and objectives would continue under the proposed SPU.

Operation at the proposed SPU conditions would not result in any physical changes to the solid waste, liquid waste, or gaseous waste systems. The safety and reliability of these radioactive waste systems would be unaffected by the proposed SPU. Also, the proposed action would not affect the environmental monitoring of any of these waste streams or the radiological monitoring requirements of the MPS3 Radiation Protection Program. Under normal operating conditions, the proposed action would not introduce any new or different radiological release pathways and would not increase the probability of an operator error or equipment malfunction that would result in an uncontrolled radioactive release from the radioactive waste streams. LR Section 2.5.6, "Waste Management Systems" provides a detailed evaluation of effects that the proposed SPU may have on the solid, liquid and gaseous radioactive waste systems. The following subsections summarize the conclusions of these sections and compare the results against the impacts of the radiological waste system documented in the USNRC FES related to the operation of MPS3 (Reference 8.1) and the USNRC GEIS for License Renewal for MPS2 and MPS3 (Reference 8.2).

8.1.1 Solid Waste

Solid radioactive wastes include solids recovered from the reactor-coolant systems, solids in contact with the reactor process system liquids or gases, and solids used in the reactor-coolant system operation. Licensing Report Section 2.5.6.3, "Solid Waste Management System" provides a detailed evaluation of effects the proposed SPU may have on the solid waste management system. The largest volume of solid radioactive waste at MPS3 is low-level radioactive waste (LLRW). The types of LLRW at MPS3 include sludge, oily waste, bead resin, spent filters, and dry active waste (DAW) from outages and routine maintenance. DAW includes paper, plastic, wood, rubber, glass, floor sweepings, cloth, metal, and other types of waste routinely generated during routine maintenance and outages. Table 8-1 presents the average annual volume and activity of LLRW generated at MPS3 for the most recent five-year period.

The 5-year average annual amount of low-level waste generation during a non-outage year was 2,800 cubic feet, whereas during an outage year, it was

approximately 8,500 cubic feet with the number of contained Curies in both cases approximately the same as the average presented in Table 8-1.

The results of the evaluation presented in LR Section 2.5.6.3 indicate that the proposed SPU would have no significant effect on the generation of solid waste volume from the primary and secondary side systems since the systems functions are not changing and the volume inputs remain the same.

The proposed SPU would result in a small increase in the equilibrium radioactivity in the reactor coolant which in turn would impact the concentrations of radioactive nuclides in the waste disposal systems. Thus, it is expected that the activity levels for most of the solid waste would increase proportionately to the increase in long half-life coolant activity bounded by a 9.1% maximum increase based on current operation at licensed power level of 3411 MWt and SPU operation at the analyzed power level of 3723 MWt (this estimate includes a 2% margin for power uncertainty). The activity contained in the waste following uprate is estimated to be bounded by an increase of 10.22%, i.e., 9.1% /0.8902 (average capacity factor for years 2001 – 2005). The increase in the overall volume of waste generation resulting from SPU is expected to be minor. As noted in Table 8-1 and discussed above, the activity contained in the solid waste is well below the 9100 Curies identified in Table 5-21 of the USNRC FES (Reference 8.1), and comparable to the volume (8580 ft^3) and activity (75.6 Ci) identified in Section 2.1.4.3 of the USNRC GEIS (Reference 8.2) related to the operation of MPS3.

Section 8.2 addresses the impact of the increase in activity on dose.

8.1.2 Liquid Waste

Liquid radioactive wastes include liquids from the reactor process systems and liquids that have become contaminated with process system liquids. Table 8-2 presents liquid releases from MPS3 for the most recent five-year period. As noted in Table 8-2, approximately 1.74 million gallons and 145 millicuries of fission and activation products were released in an average year. MPS3 assumes the volume to be representative for future normal operations, because, as indicated in LR Section 2.5.6.2, "Liquid Waste Management System", the proposed SPU implementation would not significantly increase the inventory of liquid normally processed by the liquid waste management system. This conclusion is based on the fact that system functions are not changing and the volume inputs remain the same.

The proposed SPU would result in a small increase (approximately 9.1%) in the equilibrium radioactivity in the reactor coolant which in turn would impact the concentrations of radioactive nuclides in the waste disposal systems. However, the releases (excluding Tritium) would remain bounded by Table D-

4a of the USNRC FES, which estimated liquid effluent releases, excluding tritium, of about 0.56 curies per year. Table D-4a of the FES estimated about 250 curies of tritium per year would be released from MPS3 which is less than that presented in Table 8-2. This difference was due to the high fraction of processed liquid waste recycled within the Station for the FES. As documented in Table D-1a of the FES, for this high recycle case, the tritium was analyzed to be discharged as an airborne effluent (1200 Curies/year) in the gaseous waste. Section 2.1.4.1 of the USNRC GEIS reported a value for annual liquid effluents for non-tritiated effluents of 0.149 Ci and for tritium 1330 Ci.

The NPDES permit contains discharge limits for radiological discharge sources DSN001-C2 and DSN001-C3. Batch discharges from the Radiation Waste Tank (source DSN001-C2) and the Low Level Radiation Waste Drain Tank (source DSN001-C3) must be within prescribed Boric Acid limits as per the NPDES permit. The NPDES permit also contains a limit for Total Suspended Solids at the Low Level Radiation Waste Drain Tank discharge. SPU operations will not alter the current use of the Radiation Waste Tank and Low Level Radiation Waste Tank. Therefore discharge concentrations of Boric Acid and Total Suspended Solids from these tanks will not exceed NPDES limits.

Section 8.2 addresses the impact of increase activity on dose.

8.1.3 Gaseous Waste

Gaseous radioactive wastes are principally activation gases and fission product radioactive noble gases resulting from process operations including continuous degasification, gases used for tank cover gas, gases collected during venting, and gases generated in the radiochemistry laboratory. Table 8-3 presents gaseous releases from MPS3 for the most recent five-year period (2001 – 2005). The evaluation presented in LR Section 2.5.6.1, "Gaseous Waste Management Systems" indicates that implementation of the proposed SPU does not significantly increase the inventory of carrier gases normally processed in the gaseous waste management system since plant system functions are not changing and the volume inputs remain the same.

The proposed SPU would result in a small increase (approximately 9.5% for noble gases, and 9.1% for particulates, iodines and tritium) in the equilibrium radioactivity in the reactor coolant, which in turn increases the activity in the waste disposal systems and the activity released from the Station. For gaseous effluents, Table D-1a of the USNRC FES estimated average annual releases of 560 Ci for Noble Gases, 0.21 Ci for Particulates, 0.19 Ci for Iodines and 1200 Ci for Tritium. As noted in Section 8.1.2, the elevated gaseous tritium release was based on a high liquid waste recycle. Section 2.1.4.2 of the USNRC GEIS reported noble gas releases of 2.45 Ci, iodine-131 releases of

1.52E-06 Ci, particulate releases of 6.08E-05 Ci and tritium releases of 47.3 Ci.

Section 8.2 addresses the offsite radiation dose consequences of these effluent releases.

8.2 Radiation Levels and Offsite Dose

8.2.1 Operating and Shutdown In-Plant Levels

In-plant radiation levels and associated doses are controlled by the MPS3 Radiation Protection Program to ensure that internal and external radiation exposures to station personnel, contractor personnel, and the general population will be as low as reasonably achievable (ALARA), as required by 10 CFR 20. MPS3 has a policy of maintaining occupational dose equivalents to the individual and the sum of dose equivalents received by all exposed workers to ALARA levels.

LR Section 2.10.1.2.1, "Normal Operation Radiation Levels and Shielding Adequacy" provides an analysis of the impact of the proposed SPU on radiation levels and shielding adequacy and the resulting occupational dose. The analysis considered the impact of increasing the core power level on neutron flux and gamma flux in and around the core, fission product and actinide activity inventory in the core and spent fuels, N-16 source in the reactor coolant, neutron activation source in the vicinity of the reactor core, and fission/corrosion products activity in the reactor coolant and downstream systems. The results indicate that in-plant radiation sources are anticipated to increase approximately linear with the increase in core power level. Shielding is used throughout the plant to protect personnel against radiation emanating from the reactor and their auxiliary systems, and to limit radiation damage to operating equipment. DNC has determined that the current shielding designs would be adequate for the increase in radiation levels that may occur after the proposed SPU. The increase is offset by:

- conservative analytical techniques typically used to establish shielding requirements,
- conservatism in the original "design basis" reactor coolant source terms used to establish the radiation zones, and
- MPS3 Technical Specifications Section 3/4.4.8, Reactor Coolant System Specific Activity, which limits the reactor coolant concentrations to levels below or equal to the original design basis source terms.

For the proposed SPU, and as discussed in LR Section 2.10.1.2.1, normal operation radiation levels would increase by no more than the percentage increase of the SPU. A possible exception is the area around the condensate polishing system where, as the operation time increases, the radiation levels may increase to a level slightly higher than the percentage of the SPU (see LR Section 2.10.1.2.1 for further detail). For conservatism, many aspects of the Plant were originally designed for higher-than-expected radiation sources. Thus, the increase in radiation levels would not affect radiation zoning or shielding in the various areas of the Plant because it is offset by conservatism in the original design, source terms used, and analytical techniques. Therefore, no new dose reduction programs are planned and the ALARA program would continue in its current form.

8.2.2 Offsite Doses at Power Uprate Conditions

LR Section 2.10.1.2.4, "Normal Operation Radwaste Effluents and Annual Dose to the Public," provides an analysis of the impact of the proposed SPU on offsite doses using scaling techniques based on NUREG-0017, Revision 1 methodology (NRC). This analysis conservatively projects maximum doses from normal operation under the proposed SPU conditions using the following:

- plant core power operating history during years 2001 through 2005,
- the reported gaseous and liquid effluent and dose data during that period,
- NUREG-0017 equations and assumptions, and
- conservative methodology.

Base case doses were calculated by taking the average five-year doses (organ and whole body) coupled with annual core power levels and extrapolating the doses to that equivalent to operation with a 100 percent capacity factor. To predict doses under the proposed SPU conditions, the analysis assumes that the maximum increase in radioactivity content of the liquid and gaseous releases is proportional to the percentage increase in the primary and secondary coolants over that of the base case.

Offsite doses from liquid effluents are summarized, adjusted and averaged for 2001 through 2005 (Table 8-4). For the five-year period, average annual whole body dose extrapolated to 100 percent power and 100 percent capacity factor was 2.39E-03 mrem and to the critical organ 1.15E-02 mrem. DNC predicts that under proposed SPU conditions, the maximum annual total body and organ doses (all pathways) from liquid effluent releases would increase approximately 9.1% - 2.61E-03 mrem (Whole Body) and 1.26E-02 mrem (Critical Organ), which are well below the regulatory standards contained in 10 CFR 50, Appendix I.

Doses to individuals from gaseous releases are summarized, adjusted and averaged for 2001 through 2005 (Table 8-5). For the five year period, the annual doses were extrapolated to 100 percent power and 100% capacity factor. The maximum extrapolated impact of SPU on these doses ranged from 9.5% for noble gases and 9.1% for particulates and iodines. These doses are significantly below the regulatory design objectives listed in 10 CFR 50, Appendix I.

Currently, the pre-uprate annual direct shine dose ranges from 0.12 mrem to 0.14 mrem during the 2 year period evaluated (methodology to calculate the direct shine dose was revised to incorporate a more conservative approach for the 2004 and 2005 reports used in this evaluation). The annual whole body dose from all pathways due to liquid releases, gaseous releases and direct shine, for the period evaluated, is estimated at 0.15 mrem.

As discussed in LR Section 2.10.1.2.4, the maximum annual average direct shine dose due to stored solid radwaste at MPS3 would be projected to increase by approximately 10.22% from the activity increase in the waste due to the SPU. This would occur as a) the current waste decays and its contribution decreases, b) stored radwaste is routinely moved offsite for disposal, and c) waste generated post SPU enters into storage. However, the direct shine dose is cumulative from wastes generated from all units onsite over the plants' lifetime, and stored onsite. Thus scaling the total direct shine dose by the 10.22% projected as the maximum average activity increase for the MPS3 solid radwaste due to the SPU is conservative. Based on the above, the whole body dose following the SPU is estimated at 0.17 mrem. This whole body dose is significantly below the regulatory limit of 25 mrem/yr established by 40CFR190. Additionally, it is noted that procedures and controls in the ODCM monitor and control this component of the off-site dose, and would limit, through administrative and storage controls, the offsite dose to ensure compliance with the 40CFR190 whole body dose limits.

8.3 References

8.1 NUREG-1064, December 1984, Final Environmental Statement related to operation of Millstone Nuclear Power Station, Unit No. 3

8.2 NUREG-1437, Supplement 22, July 2005, Generic Environmental Impact Statement for License Renewal of Nuclear Plants"

8.3 MPS3 2001 Annual Radioactive Effluent Release Report, dated April 30, 2002

8.4 MPS3 2002 Annual Radioactive Effluent Release Report, dated April 28, 2003

8.5 MPS3 2003 Annual Radioactive Effluent Release Report, dated April 29, 2004

8.6 MPS3 2004 Annual Radioactive Effluent Release Report, dated April 30, 2005

8.7 MPS3 2005 Annual Radioactive Effluent Release Report, dated April 27, 2006

Table 8-1
Average Annual Low-Level Radioactive Waste Generated at MPS3 During the 2001 – 2005 Time Period

	Cubic feet	Curies
Primary System Media	596.4	137.5
Dry Low-Level Waste	5436.0	1.821
Irradiated, Non-Fuel Reactor Components	0.021	0.033
Other Wastes	1333.0	0.324
Overall Five Year Average	**7366.0**	**139.7**

Table 8-2
Liquid Effluent Releases from MPS3, 2001 – 2005

Year	Volume Released (gallons)	Activity Released (Ci)	Tritium (Ci)
2001	2,330,000	2.58E-01	518
2002	1,800,000	1.49E-01	1330
2003	1,350,000	6.0E-02	654
2004	1,480,000	1.29E-01	1280
2005	1,750,000	1.27E-01	1720
Annual Average	**1,740,000**	**1.45E-01**	**1100**

References 8.3, 8.4, 8.5, 8.6 & 8.7

Table 8-3 Gaseous Effluent Releases from MPS3, 2001 – 2005			
Year	**Noble Gases (Ci)**	**Particulates and Iodines (Ci)**	**Tritium (Ci)**
2001	0.229	9.22E-04	52.9
2002	2.45	6.23E-05	47.3
2003	0.121	6.25E-05	59.6
2004	0.484	3.86E-04	78.3
2005	0.435	2.28E-04	65.3
Annual Average	**0.744**	**3.32E-04**	**60.7**
References 8.3, 8.4, 8.5, 8.6 & 8.7			

Table 8-4 Average Off-Site Dose Commitments from Liquid Effluents (MPS3)				
Type of Dose	**Appendix I Design Objectives**	**Base Case 2001 – 2005 Adjusted Doses**	**Scaled Post-SPU Annual Dose**	**Percentage of Appendix I Design Objectives for SPU Case**
Liquid Effluents				
Dose to total body from all pathways	3 mrem/yr	2.39E-03 mrem/yr	2.61E-03 mrem/yr	0.087%
Dose to any organ from all pathways	10 mrem/yr	1.15E-02 mrem/yr	1.26E-02 mrem/yr	0.126%

Table 8-5 Average Off-Site Dose Commitments from Gaseous Effluents (MPS3)				
Type of Dose	**Appendix I Design Objectives**	**Base Case 2001 – 2005 Adjusted Doses**	**Scaled Post-SPU Annual Dose**	**Percentage of Appendix I Design Objectives for SPU Case**
Gaseous Effluents				
Gamma Dose in Air	10 mrad/yr	2.04E-04 mrad/yr	2.23E-04 mrad/yr	2.23E-03%
Beta Dose in Air	20 mrad/yr	2.49E-04 mrad/yr	2.73E-04 mrad/yr	1.37E-03%
Dose to total body of an individual	5 mrem/yr	1.85E-02 mrem/yr	2.03E-02 mrem/yr	0.406%
Dose to skin of an individual	15 mrem/yr	1.93E-02 mrem/yr	2.11E-02 mrem/yr	0.141%
Radioiodines and Particulates Released to the Atmosphere				
Dose to any organ from all pathways	15 mrem/yr	1.88E-02 mrem/yr	2.05E-02 mrem/yr	0.137%

9.0 Environmental Effects of Uranium Fuel Cycle

NRC regulations 10 CFR 51.51 (Table S-3) provide the basis for evaluating the contribution of the environmental effects of the uranium fuel cycle to the environmental impacts of licensing a nuclear power plant. NRC regulations 10 CFR 51.52 (Table S-4) describe the environmental impacts of transporting nuclear fuel and radioactive wastes. The tables were developed in the 1970s. Since that time, most plants have increased both their uranium-235 enrichment and the fuel's burnup limits.

In 1988, NRC generically evaluated the impacts of extended burnup fuel and increased enrichment on the uranium fuel cycle, including transportation of nuclear fuel and wastes, to determine whether higher burnup and enrichment could result in environmental impacts greater than those derived in Tables S-3 and S-4. The environmental assessment and finding of no significant impact (53 FR 6040, February 29, 1988) concluded that burnup limits of up to 50,000 megawatt-days per metric ton of uranium (MWd/MTU) or higher (as long as the maximum rod average burnup level of any fuel rod is no greater than 60,000 MWd/MTU) and uranium-235 enrichment up to 5 weight percent would have no

significant adverse environmental effects on the uranium fuel cycle or the transport of nuclear fuel and wastes, and would not change the impacts presented in Tables S-3 and S-4.

In 1999, in connection with the Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants, NRC reviewed transporting higher enrichment and higher burnup fuel to a geologic repository (NRC 1999). The conclusion of that evaluation was that Table S-4 applies to spent fuel enriched up to 5 percent uranium-235 with average burnup for the peak rod to current levels approved by NRC up to 62,000 MWd/MTU, provided higher burnup fuel is cooled for at least 5 years before being shipped.

MPS3 is currently licensed to use uranium-dioxide fuel that has a maximum enrichment of 5.0 percent by weight of uranium-235. The typical average enrichment for a fuel reload has increased over the life of the station as cycle lengths have increased and is now approximately 4.8 percent.

For MPS3 under SPU condition, the burnup limit is unchanged (the upper exposure limit is bounded by maintaining fuel within the NRC-approved vendor specific exposure limits), and the U-235 enrichment limit of 5% is not exceeded; therefore, the MPS3 fuel cycles continue to remain bounded by the impacts listed in Tables S-3 and S-4 of 10 CFR Part 51.

Increasing the electrical output at MPS3 is accomplished primarily by generating higher steam flow in the steam generators and supplying it to the turbine generator. The higher steam flow is achieved by increasing the reactor power level and feedwater flow to the steam generators. The additional reactor energy requirements for SPU are met by increasing the reload fuel batch size. The SPU does not require any changes to fuel design limits.

For the proposed action, there is no change to the fuel rod or assembly design. However, under SPU conditions, hot leg temperature will increase resulting in an increased likelihood of experiencing an axial offset anomaly. This condition, Crud Induced Power Shift (CIPS), has potential to result in deposition of crud on the fuel rods, which could in turn become a source for localized boiling. The deposition of crud could potentially continue through the cycle and could increase, as the fuel assemblies are re-used in subsequent reloads. To offset this condition, ultrasonic cleaning of the fuel rods and assemblies may be utilized to remove crud deposits.

MPS3 typically replaces about 76 of the fuel assemblies in the reactor core at approximately 18-month intervals. The refueling schedule would remain the same following implementation of the SPU. During the Fall 2008 refueling outage, current plans for the new core for the uprate will include approximately 84 new assemblies. The average fuel assembly discharge burnup would be

approximately 52,000 MWd/MTU with no fuel pins exceeding the maximum fuel rod limit of 62,000 MWd/MTU. Reload design goals would maintain the MPS3 fuel cycles within the limits bounded by the impacts analyzed in Tables S-3 and S-4 of 10 CFR Part 51. Therefore, DNC concludes that impacts to the uranium cycle and transport of nuclear fuel from the proposed action would be insignificant and not require mitigation.

9.1 References

9.1 Nuclear Regulatory Commission. 1999. Generic Environmental Impact Statement for License Renewal of Nuclear Plants (NUREG-1437, Vol. 1, Addendum 1). Division of Regulatory Improvement Programs, Office of Nuclear Reactor Regulation, August 1999.

10.0 Effects of Decommissioning

Environmental impacts from the activities associated with the decommissioning of any nuclear power reactor before or at the end of an initial or renewed license period are evaluated in the Generic Environmental Impact Statement for Decommissioning of Nuclear Facilities, NUREG-0586, Original and Supplement 1 (Ref 1 and 2). The conclusions of this report are that environmental impacts of decommissioning are generally small and that only two environmental issues would require site specific evaluation, threatened and endangered species and environmental justice. In addition, the costs of decommissioning of MPS are captured in the FES (Ref 3 – NRC, 1984). The NRC procedures for all phases of decommissioning are described in NRC regulations (Title 10 of the Code of Federal Regulations, part 20 subpart E, and parts 50.75, 50.82, 51.53, and 51.95).

The incremental environmental impacts associated with decommissioning activities resulting from continued plant operation during the renewal term are evaluated in the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS), NUREG-1437, Volumes 1 and 2 (U. S. Nuclear Regulatory Commission [NRC] 1996; 1999.(a); The evaluation in NUREG-1437 includes a determination of whether the analysis of the environmental issue could be applied to all plants and whether additional mitigation measures would be warranted. Supplement 22 (Ref 4 - NRC, 2005) discusses in Chapter 7, the effects of the later decommissioning on the local Millstone environment.

Prior to any decommissioning activity at MPS3, DNC would submit a post shutdown decommissioning activities report to describe planned decommissioning activities, any environmental impacts of those activities, a schedule, and estimated costs. Implementation of an SPU does not affect DNC's

ability to maintain financial reserves for decommissioning nor does the SPU alter the decommissioning process.

The potential environmental impacts on decommissioning associated with the proposed SPU would be due to the increased neutron fluence. As a result, the amount of activated corrosion products could increase, and consequently, the post-shutdown radiation levels could increase. MPS3 expects the increases in radiation levels as a result of operations under the proposed SPU conditions to be insignificant,

10.1 References

10.1 Nuclear Regulatory Commission. 1988. Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities issued in 1988 (NUREG-0586).

10.2 Nuclear Regulatory Commission. 2002. NUREG-0586 - Generic Environmental Impact on Decommissioning of Nuclear Reactors. Supplement 1. Regarding the Decommissioning of Nuclear Power Reactors. Main Report, Appendices A through M. Final Report. November 2002.

10.3 Nuclear Regulatory Commission. 1984. Final Environmental Statement related to the Operation of Millstone Nuclear Power Station Unit No. 3 (Docket No. 5—423). December 1984.

10.4 Nuclear Regulatory Commission. 2005. Generic Environmental Impact Assessment for License Renewal of Nuclear Plants. Supplement 22. Regarding Millstone Power Station, Units 2 and 3. Final report. Division of Regulatory Improvement Programs. July 2005.