Comprehensive Assessment and Report
Part II

Environmental Resources and Energy Infrastructure of Long Island Sound

Prepared by the

Task Force on Long Island Sound

Pursuant to

Public Act No. 02-95 and Executive Order No. 26

June 3, 2003

At Eastern Connecticut State University

Institute for Sustainable Energy
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INTRODUCTION

Executive Order No. 26, issued April 12, 2002, and Public Act No. 02-95, signed into law on June 3, 2002, established a Task Force to examine and evaluate the state's processes for balancing energy reliability and the need for transmission expansion projects, both for Connecticut and for the region, with enhanced protection of the natural resources of Long Island Sound.

Long Island Sound, occupying approximately 800,000 acres, is one of the largest estuaries in the U.S., where the tidal, sheltered waters support unique communities of plants and animals. Birds, mammals, fish, shellfish, and other wildlife depend on estuarine habitats as places to live, feed and reproduce. Numerous marine organisms, including many of the commercially valuable fish and shellfish species, depend on the Long Island Sound estuary at some point in their development. Long Island Sound is also economically important to the Connecticut-New York region for a variety of commercial and recreational purposes.

Long Island Sound presently provides a route between Connecticut and Long Island for two electric transmission cables, one natural gas pipeline, and two telecommunications lines, which have been installed on or beneath the seafloor during the last 35 years. In addition, there are various cables and infrastructure that connect offshore islands with the mainland.

Executive Order No. 26 was issued and Public Act No. 02-95 was enacted when there were a number of new or replacement energy infrastructure projects proposed within Long Island Sound. However, today, the only active projects are: the Connecticut Light & Power/Long Island Power Authority (CL&P/LIPA) 1385 Line Cable Replacement Project, the Islander East Pipeline Company, L.L.C. project, and the Cross-Sound Cable Company, L.L.C. project.

Despite substantial efforts to reduce energy use through conservation programs, the demand for energy in Connecticut and New York continues to grow. Since the New York and New England generation markets, excluding Vermont, were deregulated and the electric utilities began divesting their generation assets in the late 1990s, the region has experienced construction of new generation facilities, predominantly natural gas-fired. Connecticut alone has seen the addition of nearly 1,500 MW of new gas-fired generation since 1998. Construction of new generation facilities has been facilitated by technological and cost improvements, the availability of new natural gas supplies from Atlantic Canada, and the expansion of existing gas pipelines serving New England.

However, energy in New England and New York is not uniformly accessible to all areas in the region. For example, the Independent System Operator - New England (ISO-NE) has designated southwest Connecticut (SWCT) as a deficient load pocket due to constraints of the electric transmission system. The North American Electric Reliability

Council (NERC) concluded in its 2003 summer assessment that SWCT, New York City, and Long Island are "areas of concern" and susceptible to reliability problems. Deficient load pockets require the operation of more expensive local electric generation to meet both peak and normal load requirements because less expensive electric generation outside of the load pocket cannot be imported. ISO-NE has estimated such congestion costs in New England could range from $50 to $300 million in 2003, with most of those costs attributable to SWCT.

Historically, Connecticut has been a net importer of electric energy from New York; this may change soon as the region's fleet of new generation comes on line. New England, including Connecticut, has maintained important transmission interconnections with neighboring control areas. The transmission circuits between neighboring control areas help maintain grid reliability and voltage stability, and also provide an opportunity for market participants in other regions to purchase or sell power when it is economic to do so.

Like Connecticut, Long Island is a net importer of energy, with demand expected to grow at the rate of 100 MW per year through 2011. As an island with virtually no indigenous energy supply, Long Island must import nearly all of its energy by cable, pipeline, barge, or truck. Fuels such as landfill gas, refuse, wind, and solar power furnish only a few percent of Long Island's energy needs. Long Island has historically been underserved by the interstate gas pipelines, and has relied more extensively on fuel oil for home heating and electric generation than nearly any other area of the U.S. Expanding the gas pipeline capacity to Long Island would reduce Long Island's dependence on fuel oil for electric generation and home heating, and would offer other environmental benefits. Pipeline projects (both new lines and reinforcements to existing lines) have all been proposed with an expectation of serving residential, commercial, and industrial loads, including new on-island gas-fired power plant projects.

To meet the charge under Public Act No. 02-95, the Task Force conducted a comprehensive environmental assessment of Long Island Sound's natural resources and reviewed certain relevant information regarding energy and telecommunications infrastructure and regional energy needs. The assessment includes:

- An inventory and review of the natural resources of Long Island Sound, including information regarding the natural and man-made effects on such resources;
- A review of the existing regulatory framework for protecting Long Island Sound;
- A review of regional energy needs and infrastructure;
- A status update of existing and proposed energy and telecommunications infrastructure projects within Long Island Sound, including an assessment of the environmental impacts of existing infrastructure; and

- A review of the potential environmental and ecological impacts of energy and telecommunications infrastructure projects within Long Island Sound, including a discussion of marine construction and operation.

To better ensure energy reliability and provide for regional energy needs while enhancing the protection of the natural resources of Long Island Sound, the Task Force offers the following conclusions and recommendations:

TASK FORCE CONCLUSIONS

Inventory and Mapping of Existing Environmental Data on the Natural Resources of Long Island Sound (PA No. 02-95 Section 3(A))

An inventory of the available natural resource information required under PA No. 02-95 has been summarized. Much of the data presented was developed by state and federal agencies, and is useful in generally identifying the resources of Long Island Sound. However, substantially more detailed and timely resource information is required for comprehensive planning, and for making project-specific assessments and site-specific determinations of resource delineation, environmental impact, and engineering constructability.

Data gathered to facilitate the work of the Task Force have been developed as part of a Geographic Information System (GIS). The availability of GIS greatly facilitates the analysis, exchange, and use of information. Substantial valuable Long Island Sound resource data have not been digitized and thus are not available in a GIS format. Such data are nonetheless important and should not be ignored.

Evaluation of the Relative Importance and Uniqueness of the Natural Resources and Identification of the Most Ecologically Sensitive Natural Resources Of Long Island Sound (PA No. 02-95 Section 3(B))

Resources discussed in Section 2.1 of the Summary of Background Information of this study and as identified by existing resource protection programs provide information related to the interrelationships, unique characteristics, and ecological sensitivity of natural resources of Long Island Sound. However, the Task Force cautions that this information is not and cannot be used as a substitute for site-specific reconnaissance for project-specific permitting, where the specific environment, users, timing, and project can be used to evaluate the relative importance, uniqueness and sensitivity of natural resources.

Assessment of the Present Status, Future Potential and Environmental Impacts on Long Island Sound of Meeting the Region's Energy Needs that Do Not Require the Laying of a Power Line or Cable within Long Island Sound (Section 3(C)) And an Evaluation of the Methods to Minimize the numbers and Impacts of Power Line Crossings, Gas Pipeline Crossings, and Telecommunications Crossings within Long Island Sound, Including an Evaluation of the Individual and Cumulative Environmental Impacts of any such Proposed Crossings (PA No. 02-95 Section 3(D))

Pursuant to PA No. 02-95 Sections 3(C) and 3(D), the Task Force is required to examine alternatives for avoiding or minimizing construction of energy and telecommunications infrastructure across Long Island Sound. Section 3(C) focuses on alternatives to constructing power lines or cables across the Sound; Section 3(D) focuses on methods to minimize numbers and impacts of crossings.[1] For convenience and completeness, Sections 3(C) and 3(D) have been combined to offer an evaluation of the status, potential, and environmental impact of each of the alternatives identified in Section 2.8. Evaluations of alternatives to constructing energy and telecommunications infrastructure projects across Long Island Sound can be grouped under the following categories:

- Alternative routes for gas pipelines that do not cross Long Island Sound;
- Alternative routes for electric cables that do not cross Long Island Sound;
- Measures to expand, reinforce, or upgrade existing generation and transmission assets in Connecticut and Long Island that do not require cables crossing Long Island Sound;
- Alternative fuels and energy sources that do not require Long Island Sound crossings;
- Measures that reduce the demand for gas and electricity through conservation, load management, and demand response programs; and
- Alternative telecommunications technologies that do not require laying of a cable across Long Island Sound.

Inventory of Current Crossings of Long Island Sound and an Evaluation of the Current Environmental Status of those Areas that have Crossings (PA No. 02-95 Section 3(E))

[1] The Task Force notes that an evaluation of the potential impacts for specific proposed crossings would be and/or has been performed and set forth in the project specific environmental impact statements and associated state regulatory reviews.

This inventory focuses on the five energy and telecommunications facilities that cross the Sound between Connecticut and Long Island. These facilities are separated both spatially (none of the five facilities are located in close proximity to one another) and temporally (none of the five facilities were constructed within the same time frame).

- Two electric transmission cable systems:
  - The 1385 Line cable system, alternating current (AC), which is jointly owned by CL&P and LIPA and consists of seven cables that link Norwalk and Northport, Long Island; and
  - Cross-Sound Cable's 24-mile system, direct current (DC), consisting of a bundle of two solid dielectric cables and a fiber optic telecommunications cable, which traverses between New Haven and Brookhaven, Long Island (1,800 feet of cable has not been installed to depths required by permits.)
- One natural gas pipeline, the Iroquois Gas Transmission System (Iroquois) pipeline, which extends across Long Island Sound from Milford, Connecticut to Northport, Long Island.
- Two telecommunications cables:
  - AT&T's fiber optic cable, which traverses from East Haven to Shoreham, Long Island; and
  - MCI's fiber optic cable, which extends from Madison to Rocky Point, Long Island.

Information for this section was drawn in part from project status reports that the Task Force requested from the owners of the crossings.[2,3,4,5,6] Other data were compiled from presentations made by project proponents and regulators to the Task Force. In addition, reports, permits, and regulatory decision-making documents relevant to the five crossings were reviewed.

[2] Iroquois Gas Transmission System, L. P., Existing Pipeline "Project Status Update", received February 28, 2003.
[3] Cross-Sound Cable Company, LLC, Letter to Joel Rinebold from Jeffrey A. Donahue dated February 5, 2003.
[4] Islander East Pipeline Company. Letter to Joel Rinebold from Gene H. Muhlherr dated July 24, 2002.
[5] Northeast Utilities System Company (NUSCo). Letter to Joel Rinebold from Paula M. Taupier dated February 5, 2003.
[6] The Task Force requested information from AT&T and MCI, but did not get a response and was unable to acquire information other than that contained in the DEP permits, issued for these two projects.

Evaluation Of The Reliability And Operational Impacts To The State And The Region Of Proposed Crossings Of Long Island Sound And An Evaluation Of The Impact On Reliability By Recommended Limitations On Such Crossings (PA No. 02-95 Section 3(F))

Reliability issues associated with meeting the region's energy needs are complicated and dynamic. They involve interrelationships among a number of national, regional, state, and local entities. The Task Force recognizes the complexity of a number of interrelated tasks, the completion of which will help ensure the delivery of reliable energy to Connecticut consumers. These include predicting the interrelationship between natural gas supplies and reliable power generation; consideration of regional transmission system interconnections; minimizing vulnerability to terrorism; and avoiding the potential over dependence on one fuel source. The Task Force also recognizes that modern planning techniques using statistical modeling and simulation techniques require substantial investments.

Selecting alternatives that ensure reliable power and natural gas delivery must be a goal of a transparent regional energy planning process that uses preferential environmental standards for the protection of Long Island Sound. The Task Force anticipates that this process would include the Federal Energy Regulatory Commission (FERC), the Independent System Operator for New England (ISO-NE), the New York Independent System Operator (NYISO), state agencies (e.g., Connecticut Energy Advisory Board (CEAB), the Department of Public Utility Control (DPUC), and the Connecticut Energy Coordinating Authority (CECA)), and the public.

The integrated use of new, well-planned, and environmentally preferred infrastructure projects to provide market access to clean energy supply will reduce air emissions associated with obsolete and emergency generating facilities, which could possibly reduce costs to consumers. The certification and permit proceedings for facilities proposed to cross Long Island Sound should consider alternatives to ensure that both state and regional reliability needs are met with the least adverse impact on the environment.

Recommendations for Providing For Regional Energy Needs While Protecting Long Island Sound to the Maximum Extent Possible (PA No. 02-95 Section 3(G))

The Task Force's recommendations to ensure energy reliability and provide for regional energy needs, while protecting Long Island Sound, are listed in the Recommendations section below.

Recommendations on Natural Resource Performance Bond Levels to Insure and Reimburse the State In The Event That Future Electric Power Line Crossings, Gas Pipeline Crossings or Telecommunications Crossings Substantially Damage the Public Trust in the Natural Resources of Long Island Sound (PA No. 02-95 Section 3(H))

- The Task Force's recommendations regarding natural resource performance bond levels are listed in the Recommendations section below.

TASK FORCE RECOMMENDATIONS

The Task Force makes the following recommendations in no particular order:

Interstate Coordination and Integrated Resource Management

Expanded Role of the Connecticut Energy Coordinating Authority (CECA)

- Expand the role of the CECA to coordinate and facilitate communication with counterparts in New York and Rhode Island that share an interest in interstate energy and telecommunications infrastructure projects.[7] The CECA and its counterparts in neighboring states may consider mechanisms for coordination, including but not limited to, undertaking a Memorandum of Understanding (MOU) that seeks: consistent and compatible standards to determine public need and environmental preference standards for the protection of Long Island Sound; consideration of benefits and alternative solutions for energy reliability and energy facilities of regional significance; to set goals and encourage the collection of marine and coastal resource data; and to interact with the FERC and other agencies.

[7] A possible counterpart for New York could be the New York State Energy Research and Development Authority (NYSERDA), which is currently responsible for developing New York's energy plan, or LIPA, which is currently developing an energy plan for Long Island.

Application of Environmental Preference Standards for the Protection of Marine and Coastal Resources

- The CECA should incorporate environmental preferences when reviewing and evaluating the environmental impacts of a project; the concepts of avoidance, minimization, mitigation, and compensation should be taken in that respective order.

Potential Planning Mechanisms for Long Island Sound

- Connecticut should continue to work toward completing detailed resource data sets and mapping for Long Island Sound. With completion of detailed resource data sets and mapping for Long Island Sound, which is an essential step and requires a significant level of additional financial, personnel and time commitment, the legislature can then evaluate and, as appropriate, implement, or otherwise further the implementation of, specific planning mechanisms for Long Island Sound. Such resource protection based mechanisms may include the designation of marine protected areas, and/or the adoption of marine zoning.

Natural Resource Performance Bond Levels

- Regulatory agencies should continue the practice of requiring performance bonds for projects that may affect Long Island Sound. Performance bond levels are presently and should continue to be based on a site-specific and project-specific estimation of potential damage, remediation, and monitoring.

Other Legislative and Administrative Changes to the Siting Process

Application Guide for Electric and Fuel Transmission Line Facilities for Marine Projects

- The Siting Council should adopt the revised Application Siting Guide for Electric and Fuel Transmission Line Facilities for Marine Projects, as a guidance document for applicants.

Certification Criteria: Need versus Benefit Standard

- Revise CGS Section 16-50p to replace “benefit” with “need” for the regulation of electric transmission lines that are substantially underwater,[8] including in Long Island Sound and adjacent estuaries.

[8] For purposes of this recommendation, underwater is defined as coastal, nearshore, and offshore waters; estuarine embayments; wetlands and watercourses including both tidal and freshwater; intertidal flats; and floodplains.

Project Scoping Process

- Enhance the scoping process during the pre-application consultation period to ensure that the project proponent is fully informed regarding the concerns of the public, the CECA, and individual resource agencies.

Independent Study

- Relevant issues that are not adequately addressed should be studied and analyzed by resource experts, or independent consultants, commissioned by the Siting Council, to further the development of reliable data.

- The Siting Council should develop mechanisms to better communicate to the public the existing process and provisions for the independent study of issues.

Public Availability of Siting Council Documents

- Establish and maintain docket records readily accessible to the public through the Siting Council's web site. At a minimum, the web site should contain a docket management system that allows information to be searched by docket number, date, and keyword. Require the electronic filing of specified materials from the applicant, parties, and intervenors.

Other Legislative and Administrative Changes

Centralized Data Repository for Energy and Environmental Data within Long Island Sound

- Designate the Long Island Sound Resource Center at the University of Connecticut, Avery Point and/or the Map and Geographic Information Center (MAGIC) at the Homer Babbidge Library, University of Connecticut, Storrs as the repository for the Task Force's GIS (energy and environment) database, and other Long Island Sound information as developed.

Submerged Lands Leasing Program

- The Connecticut legislature should investigate the viability of and structure for a comprehensive and expanded submerged lands leasing program.

ACKNOWLEDGEMENTS

The Institute for Sustainable Energy at Eastern Connecticut State University, the Working Group, and the Task Force would like to thank each of the technical specialists who came before the collaborative sessions and provided valuable expertise and insights: Commissioner Donald W. Downes, DPUC; Commissioner Arthur J. Rocque, Jr., DEP; Joel M. Rinebold, Executive Director, ISE; Jerry Shaw, Connecticut Fund for the Environment (CFE); Tom Kiley, New England Gas Association; Craig Kazin, ISO-NE; Betsey Wingfield, DEP; John Volk, Department of Agriculture; John Curtis, Department of Agriculture; Mike Ludwig, National Marine Fisheries Service; Milan Bull, Connecticut Audubon; Rick Jacobson, DEP; Senator Donald Williams; Representative Jessie Stratton; Representative Patricia M. Widlitz; Richard Blumenthal, Attorney General; Mary Healey, Consumer Counsel; Harold W. Borden, PSEG Power; Chris James, DEP; Joel Gordes, Solar Design Service; Dan Sosland, Environment Northeast; Charlotte Pyle, PhD., Natural Resources Conservation Service; David Small, Massachusetts Metropolitan District Commission; Dr. Mark Mitchell, Connecticut Environmental Justice Coalition; Cynthia Jennings, Attorney at Law; David Brown, ScD., Environment & Human Health Inc.; Cindy Jacobs, DPUC; Rich Kowalski, ISO–NE; Richard Soderman, CL&P; Bruce Blakey, CL&P; S. Derek Phelps, Connecticut Siting Council; Randy Mathura, the FERC; Eric Johnson, ISO-NE; Walter Zenger, Electric Power Research Institute; John Engelhardt, USI; Greg Sullivan, NStar; John Miller, TransEnergie U.S.; Mike McCarthy, American Superconductor; Dave Warman, Iroquois Gas Transmission System; Roger Zaklukiewicz, CL&P; Michael Smalec, Southern Connecticut Gas; John Troccioli, UTC Fuel Cells; Jim Watts, Ingersoll-Rand; Janet Besser, Lexecon; John Mutchler, CL&P; Joseph Hebert, United Illuminating; Devang Patel, NXEGEN; Dave Ljungquist, NXEGEN; David Simpson, DEP; Mark Johnson, DEP; Dr. Frank Bohlen, University of Connecticut; Scott Miller, FERC; Robert Carberry, CL&P; Robert Jontos, Land-Tech Consultants; Robert Duke, The Surety Association of America; David Schlissel, Synapse Energy Economics Inc.; Paul Peterson, Synapse Energy Economics Inc.; Susan Tierney, Lexecon; Paul DeCotis, New York State Energy Research and Development Authority; Thomas Kirk, Wisvest; David Damer, Wisvest; Gabriel Stern, Connecticut Municipal Electrical Energy Cooperative; Dr. Gary Ginsberg, Department of Public Health; Dr. Ellen Cool, Levitan and Associates Inc.; Mark DeCaprio, DEP; Marika Tatsutani, Northeast States for Coordinated Air Use Management (NESCAUM); David Blatt, DEP; Ralph Lewis, State Geologist; Edward Gonzales, Duke Energy; Joseph Reinemann, Islander East; Dr. Mathew Cordaro, Long Island University; Thomas Michelman, Xenergy; Larry Williams, shellfisherman; Robert Granfield, fisherman; John Plunkett, Optimal Energy, Inc.; Robert Forrester, Woodland Coalition; Dr. Richard Stein, Committee for Responsible Energy; Joe Wyzik, El Paso; Patricia Sesto, CFE; Joseph Petrowski, Five Town Representative; Larry Rossi, Five Town Representative; James Dedes, Normandeau Associates, Inc.; Dan Zaweski, Long Island Power Authority; David Manning, KeySpan Energy; Ann Rodney, U.S. Environmental Protection Agency; Richard Kay, University of Connecticut School of Law; David Hopp, shellfisherman; First Selectman Anthony DaRos, Town of Branford; Leah Lopez, Save the Sound; and Kent Sanders, New York State Department of Environmental Conservation.

The Institute for Sustainable Energy at Eastern Connecticut State University, the Working Group, and the Task Force would like to thank everyone for their assistance, including, but not limited to, the staff at the DPUC, DEP, and the Legislative Office Building. Also, several individuals who were not named to the Task Force, but participated with it include: Hubert Harrell and Todd White of Iroquois Gas, Philip Small and Michael Kozlik, representing Iroquois Gas (Brown Rudnick Berlack Israels LLP), Edward Keith, representing NRG Energy, Inc., Raul Debrigard, representing Northeast Utilities Service Company, and Kathleen Shanley, representing United Illuminating Company.

The Institute for Sustainable Energy at Eastern Connecticut State University is funded and supported by The Connecticut Conservation and Load Management Fund through the Energy Conservation Management Board, and The Connecticut Clean Energy Fund.

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1 INTRODUCTION

1.1 REGULATORY BACKGROUND

Executive Order No. 26, issued April 12, 2002 (Appendix A), and Public Act No. 02-95 (PA No. 02-95), signed into law on June 3, 2002 (Appendix B) established a Task Force to examine and evaluate the state's processes for balancing energy reliability and the need for transmission expansion projects, both for Connecticut and for the region, with enhanced protection of the natural resources of Long Island Sound. In the months leading up to passage of PA No. 02-95, a considerable number of proposals for both electric transmission cables and natural gas pipelines crossing Long Island Sound were placed before the Connecticut Siting Council (Siting Council) and the Department of Environmental Protection (DEP). PA No. 02-95 placed a one year moratorium preventing any state agency from considering or rendering a final decision on any application relating to electric, gas, or telecommunications crossings of Long Island Sound. The moratorium does not apply to the project involving replacing the existing electric transmission cables between Norwalk, Connecticut and Northport, New York, and activities relating solely to the maintenance, repair, or replacement necessary for repair of electrical power lines, gas pipelines, or telecommunications facilities that currently serve islands or peninsulas off the Connecticut coast or harbors, embayments, tidal rivers, streams or creeks. Since passage of PA No. 02-95, many of the Long Island Sound crossing proposals have been cancelled or placed on hold.

Executive Order No. 26 and PA No. 02-95 also established a Working Group, specifically charged with evaluating issues associated with electric reliability in southwest Connecticut (SWCT), an area that has historically experienced electric congestion problems. The Working Group evaluated the economic considerations and environmental preferences associated with installing electric transmission lines underground or overhead, and examined the technical and economic feasibility of alternatives to expanding the regional high voltage transmission system into SWCT. The Working Group considered these alternatives with respect to a Connecticut Light and Power Company (CL&P) proposal to construct a 345 kilovolts (kV) transmission line from Bethel to Norwalk, Connecticut.

Concurrently, the Task Force initiated its mission, focused on identifying and protecting the resources of Long Island Sound. The Task Force was similarly charged by statute to evaluate the necessity and benefit of electric, gas, and telecommunications infrastructure crossings of Long Island Sound, the individual and cumulative environmental impacts of such infrastructure crossings, and the contribution of such lines to the reliability and operation of the state's and the region's energy and telecommunications infrastructure. Section 3 of PA No. 02-95 sets forth eight specific matters to be addressed by the Task Force in an assessment and plan:

(A) a comprehensive inventory and mapping of all existing environmental data on the natural resources of Long Island Sound, including, but not limited to: All coastal resources, as defined in

section 22a-93 of the general statutes, all points of public access and public use, locations of rare and endangered species including the breeding and nesting areas for such rare and endangered species, locations of historically productive fishing grounds and locations of unusual and important submerged vegetation;

(B) an evaluation of the relative importance and uniqueness of the natural resources and an identification of the most ecologically sensitive natural resources of Long Island Sound;

(C) an assessment of the present status, future potential and environmental impacts on Long Island Sound of meeting the region's energy needs that do not require the laying of a power line or cable within Long Island Sound;

(D) an evaluation of methods to minimize the numbers and impacts of electric power line crossings, gas pipeline crossings and telecommunications crossings within Long Island Sound, including an evaluation of the individual and cumulative impacts of any such proposed crossings;

(E) an inventory of current crossings of Long Island Sound and an evaluation of the current environmental status of those areas that have crossings;

(F) an evaluation of the reliability and operational impacts to the state and region of proposed crossings of Long Island Sound and an evaluation of the impact on reliability by recommended limitations on such crossings;

(G) recommendations for providing for regional energy needs while protecting Long Island Sound to the maximum extent possible; and

(H) recommendations on natural resource performance bond levels to insure and reimburse the state in the event that future electric power line crossings, gas pipeline crossings or telecommunications crossings substantially damage the public trust in the natural resources of Long Island Sound.

In addition, the Task Force's assessment and plan was to include, but not be limited to, a review and analysis of those criteria set forth in the Executive Order:

(a) An evaluation of methods to minimize the numbers and impacts of energy crossings within Long Island Sound;

(b) Recommendations for providing for regional energy needs while protecting Long Island Sound;

(c) An assessment of the present status, future potential, and environmental impacts of proposed methods for laying of a power line, pipeline or cable; and

(d) An identification of possible measures that may be taken to mitigate environmental impacts and maintain the aesthetic integrity of regions in Connecticut where it has been determined transmission must be sited.

The broader scope encompassed by the elements of PA No. 02-95 Section 3 generally subsume the criteria included in Executive Order No. 26, as indicated in Table 1.

Table 1 – Correspondence Between Executive Order No. 26 and PA No. 02-95

Executive Order Criteria	PA No. 02-95 Section 3 Elements
(a)	(D)
(b)	(G)
(c)	(C), (D), (E)
(d)	(C), (D)

1.2 Task Force Participants

The Task Force has met on a regular basis since July 2002 in a series of collaborative meetings. PA No. 02-95 named the Institute for Sustainable Energy at Eastern Connecticut State University (ISE) as the Chair for the Task Force meetings. The member organizations of the Task Force are prescribed by Executive Order No. 26 and PA No. 02-95 and are identified in Table 2.

Table 2 – Task Force Concerning the Protection of Long Island Sound

Organization	Participating representative
Institute for Sustainable Energy at Eastern Connecticut State University	Joel M. Rinebold, Executive Director (*Chair)*
Department of Public Utility Control	Cindy Jacobs, Principal Financial Specialist Michael Chowaniec Robert Luysterborghs
Department of Environmental Protection	Betsey C. Wingfield, Director, Planning and Standards Division, Bureau of Water Management
Connecticut Siting Council	Philip Ashton S. Derek Phelps, Executive Director
Office of Policy and Management	Marc Ryan, Secretary of the Office of Policy and Management

Organization	Participating representative
ISO-NE	Eric Johnson, External Affairs Representative
Federal Energy Regulatory Commission	Randy Mathura William Zoller
DEP Bureau of Fisheries	Rick Jacobson, Assistant Director, Inland Fisheries Division
Department of Agriculture, Bureau of Aquaculture	John Volk, (Director – retired) David Carey, Director
Department of Agriculture	Bruce Gresczyk, Commissioner Melanie Attwater (alternate)
Department of Transportation, Coastline Port Authority, Bureau of Aviation and Ports	Alan Stevens
Connecticut Seafood Council	Barbara Gordon, Executive Director
Long Island Soundkeeper	James Murkette
Save the Sound, Inc.	Leah Lopez, Staff Attorney
Connecticut Fund for the Environment	Penny Anthopolos, Staff Attorney Jerry Shaw
Connecticut Geological and Natural History Survey	Ralph Lewis, State Geologist - retired
TransEnergie U.S.	Rita L. Bowlby, Vice President Connecticut Government Affairs
SBC/SNET	Gregory J. Zupkus, Director, External Affairs
Connecticut Natural Gas and Southern Connecticut Gas	Tim Kelley Mike Smalec (alternate) Eileen Sheehan (alternate)
Yankee Gas Company	Patricia McCullough, Director of Environmental Management, Northeast Utilities System Company Paula Taupier (Manager of Transmission Regulatory Planning, Northeast Utilities System Company, alternate)
Connecticut Light and Power	Elizabeth Barton (Day Berry & Howard) Harold Blinderman (Day, Berry & Howard, alternate) Charles Nicol (Northeast Utilities System Company, alternate)
United Illuminating Company	Michael Coretto, Director – Regulatory Strategy and Retail Access
Atlantic States Marine Fisheries	Ernest Beckwith, Director – retired, Marine Fisheries Division Eric Smith, Assistant Director, Marine Fisheries Division
Representative from an applicant for a gas pipeline	Louise Mango

The Task Force members called upon the resources of a diverse group of technical specialists who delivered valuable presentations at the collaborative sessions. A list of all technical presenters is included in Appendix G. The Institute for Sustainable Energy at Eastern Connecticut State University engaged Levitan & Associates, Inc. (LAI), and its subcontractor, Normandeau Associates, Inc. (NAI), to support the Task Force by providing technical and market information regarding the region's energy infrastructure and environmental resources. LAI was also charged with facilitating some of the collaborative meetings and preparing this report. Meeting agendas, minutes, presentation materials, and other documents utilized by the Task Force have been collated under DPUC Docket 02-04-23.[9]

1.3 Comprehensive Assessment and Report – Part I and Part II

Until the Working Group's mission was completed on January 1, 2003, the Task Force and the Working Group held numerous joint meetings and informational sessions covering issues common to both the Working Group and the Task Force. The Working Group and Task Force both contributed to developing a framework intended to facilitate the comparison of alternative energy strategies and competing solutions that appropriately balances the need for cost-effective and reliable energy resources with Connecticut's commitment to protect its environmental resources. The Comprehensive Assessment and Report – Part I: Energy Resources and Infrastructure of Southwest Connecticut (Assessment Report Part I) issued on January 1, 2003, contains these joint recommendations, as well as conclusions and recommendations specific to the Working Group's mission.

Since January 1, 2003, the Task Force has continued to develop its assessment and plan for protection of Long Island Sound. This document, the Comprehensive Assessment and Report – Part II (Assessment Report Part II) is intended to comply with the requirements of PA No. 02-95 and Executive Order No. 26. Section 2 of this report presents a summary of the background information provided during the collaborative sessions by technical specialists, including many Task Force members. Section 3 and Section 4 of this report presents the conclusions and recommendations, respectively, of the Task Force. In this Assessment Report – Part II, the Task Force addresses the elements and criteria mandated by the both Executive Order No. 26 and PA No. 02-95.

[9] This can be viewed at http://www.state.ct.us/dpuc/database.htm.

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2 SUMMARY OF BACKGROUND INFORMATION

2.1 RESOURCES OF LONG ISLAND SOUND

Connecticut is unique among all coastal states in the U.S. in that it is the only state whose entire coastal submerged land (Long Island Sound) is an estuary, a partially enclosed body of water formed where freshwater from rivers and streams flows into and mixes with ocean water. The tidal, sheltered waters of estuaries support unique communities of plants and animals. Estuarine environments are among the most diverse and productive on earth, creating more organic matter each year than comparably-sized areas of forest, grassland, or agricultural land.[10] Long Island Sound provides a unique habitat that is cool enough to support some northern species at their southern extent, and warm enough to support some southern species at their northern extent. The ecology of Long Island Sound is dynamic and can be significantly changed with only small changes in temperature. Birds, mammals, fish, and other wildlife depend on estuarine habitats as places to live, feed, and reproduce. Numerous marine organisms, including most commercially valuable fish and shellfish species, depend on estuaries at some point during their development.

Besides serving as the "nurseries of the sea" and an important habitat for wildlife, freshwater and tidal wetlands that fringe many estuaries also filter sediments and pollutants from water draining from upland rivers and streams. Wetland plants and soils also act as a natural buffer between the land and ocean, absorbing floodwaters and dissipating storm surges. Tidal wetland grasses and other estuarine plants also help prevent erosion and stabilize the shoreline. In addition to these functions, the sheltered environment of estuaries and Long Island Sound, in particular, create unique scenery, as well as cultural and recreational opportunities. Research commissioned by the Long Island Sound Study (LISS), a cooperative program initiated by the federal government, Connecticut, and New York in 1985, estimated that more than $5 billion is generated annually in the regional economy from boating, commercial and sport fishing, swimming, and beachgoing within and along Long Island Sound.

Long Island Sound and portions thereof have been bestowed with many honors, for example, Congress designated Long Island Sound as an "Estuary of National Significance" in 1987 under the National Estuary Program, The Nature Conservancy named the Lower Connecticut River Tidelands as one of the 40 Last Great Places, and former Environmental Protection Agency (EPA) Administrator Carol Browner stated that "Long Island Sound is a national treasure and one of the nation's most important waterways".[11] There have been numerous and varied efforts to protect and restore Long Island Sound, from bi-state undertakings like the LISS Comprehensive Conservation

[10] U.S. EPA National Estuary Project, http://www.epa.gov/owow/estuaries/about1.htm

[11] Long Island Sound Taskforce, "Signing on Long Island Sound Makes History," Save the Sound (Stamford: Long Island Sound Taskforce, 1994).

Management Plan[12] and the Long Island Sound Stewardship System,[13] to a multitude of academic, governmental, and public interest group endeavors.[14] Federally, a number of legislative initiatives have protected and provided funding for Long Island Sound research, protection, and restoration.[15] As custodian for half of Long Island Sound, Connecticut has an obligation to continue to protect and preserve this irreplaceable resource.

2.1.1 Overview of Long Island Sound

Long Island Sound is 110 miles long and 21 miles across at its widest point, with a total area of 1,300 square miles and a volume of 2.19 trillion cubic feet. Major rivers in its drainage basin include the Housatonic, Quinnipiac, Connecticut, and Thames. Its 16,000 square mile drainage basin includes much of New England, as well as Long Island. More than 21 million people live within 50 miles of the Long Island Sound, and more than eight million people live within its watershed, with the coastal areas being among the most populated.[16]

Long Island Sound can be divided into three major basins: eastern, central, and western. The eastern basin is the deepest (depths up to 300 feet) and narrowest, influenced by exchange with ocean water of Block Island Sound (Appendix C, Figure C-6). The central basin is the widest, with depths gradually increasing from the Connecticut shore to 100 to 130 feet. Reefs and islands are common along the Connecticut shoreline in both the central and western basins (Appendix C, Figure C-5). The Stratford shoal, a shallow area located mid-Sound, limits water circulation between the central and western basins. The western basin has typically shallower depths, and a predominantly mud substrate. Farthest west is an area called the Narrows, which is bisected by the Hempstead Sill, a shallow submerged bedrock ridge.

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[12] The CCMP was designed to protect and improve the health of Long Island Sound while ensuring compatible human uses within Long Island Sound's ecosystem. It prioritized some problems affecting Long Island Sound (hypoxia, toxic contamination, pathogen contamination, floatable debris, health of living resources, and land use and development) while also making recommendations "to improve water quality, protect habitat and living resources, educate and involve the public, improve the long-term understanding of how to manage Long Island Sound, monitor progress, and redirect management efforts." http://www.epa.gov/region01/eco/lis/ccmp/intro.html.

[13] A network of exemplary areas that encompass Long Island Sound's most significant ecological, open space and/or public access values. (Save the Sound, Regional Plan Association and Audubon NY in conjunction with USFWS).

[14] See Appendix I.

[15] Examples include the Estuaries and Clean Waters Act (1987): (CT & NY directed in 1985 by Congress to establish the LISS, and Long Island Sound was one of the six original estuaries designated); the Estuaries and Clean Waters Act of 2000 (S.835); the Water Resources Development Act – amended in 2000; and the Ambro Amendment to the Ocean Dumping Act (Marine Protection, Research and Sanctuaries Act).

[16] http://www.epa.gov/nep/kids/visit/lis3.htm and http://www.epa.gov/nep/programs/lis.htm.

2.1.2 Geology and Geological History

The Long Island Sound estuary began to take on its present shape approximately 26,000 years ago during the late Wisconsin age glaciation. As the last glacier entered the area of Connecticut, Connecticut's bedrock uplands and the coastal plain sediments, which had eroded from the bedrock, were smoothed and modified by the moving ice. A terminal moraine of assorted glacial debris accumulated along the front of the ice. As the glacier melted, it periodically slowed or stopped its retreat. During one such pause between about 21,500 and 17,500 years ago, the Orient Point-Fishers Island moraine was deposited as a dam of glacial till across the east end of the lowland. Glacial meltwater collected behind the moraine, and freshwater Glacial Lake Connecticut formed. Sea level was 300 feet lower than it is today. Between 17,500 and 15,500 years ago, the glacier continued to melt, and Glacial Lake Connecticut drained away through the eroded moraines. The remaining moraine became Long Island. Thick, glacial lake-clay deposits, which today underlie portions of Long Island Sound, were exposed in the lowland between the moraine and the mainland by the time Connecticut was nearly ice-free. Glacial melting was accompanied by a rise in sea level. Between 15,500 and 5,000 years ago, rising ocean waters entered the lowland from the east and the Long Island Sound estuary began to evolve. Over the last few thousand years, tidal marshes and beaches have developed, as Long Island Sound assumed its present features. The rivers that drain much of New England continue to discharge sediments into Long Island Sound, and these recent sediments overlie the older glacial deposits.

Surficial Sediment Distribution

The distribution of surficial sediments in Long Island Sound reflects the original depositional history of the coastal plain, glacial, and recent sediments, and the reworking and redistribution of these sediments due to the effect of the circulation pattern of tides and currents. The circulation patterns in Long Island Sound create a succession of sedimentary environments (Appendix C, Figure C-22). Circulation in Long Island Sound is controlled by an east-to-west weakening of tidal-current speeds coupled with the westward-directed estuarine bottom drift. As a result, the succession begins with erosion or nondeposition at the narrow eastern entrance to Long Island Sound and changes to an extensive area of coarse-grained bedload transport in the east-central Long Island Sound. Consequently, gravelly sediments are dominant in easternmost Long Island Sound, where tidal currents are strong. In the east-central portion of Long Island Sound where the estuary noticeably widens, is a contiguous band of sediment sorting characterized by sand deposits. These areas transition into broad areas of fine-grained deposition on the flat basin floor in the central and western Long Island Sound. Silty, sand, and sand-silt-clay mark the transitions within the Long Island Sound from higher to lower energy environments, such as on the flanks of bathymetric highs. Clayey silt and silty clay are predominant in low-energy environments, such as on the floors of the central and western basins (Appendix C, Figure C-20).

Contaminant Distribution and Accumulation in Sediments

Trace metal contamination of sediments from land-based activities is found throughout Long Island Sound and its watershed. The distribution of these contaminants is controlled not only by the locations of sediment discharge, such as outfalls and surficial runoff, but also by the reworking of sediments by tides and currents. Water currents tend to rework fine-grained sediments and the contaminants associated with them and transport them to low energy, depositional areas. The U.S. Geological Survey (USGS) collected samples of surface sediments in 1996 to measure amounts and locations of metal contaminants and to establish a baseline for identifying changing conditions.[17] The concentration distributions of these elements correlates with the sedimentary environment, the sediment texture, the organic carbon content, and the abundance of *Clostridium perfringens*, a bacterium used as a sewage tracer. Among the observations, average concentrations of silver and copper in Long Island Sound were four to five times greater than naturally-occurring background values. Zinc, lead, and manganese concentrations were enriched 1.5 to 2 times greater than natural background levels. Consistent with the sedimentary environments, the greatest enrichment of metals is found in the depositional environments and muddy sediments of the central and western basins, due to both proximity to pollutant sources and the natural movement of sediments and contaminants within Long Island Sound. Total Organic Carbon concentrations, at least partially indicative of pollutant additions, also vary across Long Island Sound, with higher concentrations towards the western end of the basin (Appendix C, Figure C-23).

The USGS also collected sediment cores throughout Long Island Sound. Because recently deposited sediments overlie older sediments, such cores provide a means of investigating historical conditions. Measurements of mercury and of *Clostridium perfringens* in cores show the onset of anthropogenic contamination two centuries ago and the effects of the increase in a regional human population since then. Concentrations of metal contaminants have decreased in recent decades, but *Clostridium perfringens* has not.

2.1.3 Water Quality

The water quality of Long Island Sound is a function of the exchange of saline water from the offshore waters of the New York Bight[18] and the inflow of freshwater from the uplands and shorelands surrounding Long Island Sound. Unlike most other estuaries, Long Island Sound has two connections with the sea. Lower salinity waters enter the western Long Island Sound from New York Harbor through the East River and the Harlem River, and higher salinity waters enter the eastern end through Block Island Sound and The Race.[19] The highly convoluted shoreline and complex bottom topography

[17] Buchholtz ten Brink, M.R., Knebel, H., Poppe, L., Casso, M., and Varekamp, J.C., 1996, Contaminant distribution in Long Island Sound sediments [abs.]: U.S. Geological Survey Field Studies, Long Island Sound Research Conference, Program with Abstracts, Avery Point, Conn., October 1996.

[18] Area of Long Island Sound located between Long Island and the New Jersey coast, including the Hudson River outer harbor.

[19] Area of Long Island Sound, which is a channel between Fishers Island and Long Island.

(Appendix C, Figure C-6) combined with the unique inflow patterns of Long Island Sound create complex tides and currents. Roughly 90% of the freshwater inflow to Long Island Sound comes from three Connecticut rivers: the Thames, the Housatonic, and the Connecticut.

Direct and indirect sources of pollution to Long Island Sound include sewage treatment plants, industrial discharges, and nonpoint sources (urban and agricultural runoff, atmospheric deposition). Non-point and point sources of pollution may be carried to Long Island Sound from distant locations including Massachusetts, Vermont, and New Hampshire. Coastal activities including port and marina operations and boating may also result in contributions of pollutants, the effects of which can be felt locally within poorly mixed tidal estuaries, or they can be problematic across large areas of Long Island Sound. The sources and causes of degradation are varied and complex.

The Long Island Sound Comprehensive Conservation and Management Plan (CCMP) developed in 1994 as part of the LISS identifies low dissolved oxygen (DO), or hypoxia, as the most serious water quality impairment in Long Island Sound**.** As defined by the LISS, hypoxia exists when DO drops below a concentration of 3 milligrams per liter (mg/L), although ongoing national research suggests that there may be adverse effects to organisms even above this level. Warming temperatures in combination with thermal stratification of the water column can lead to hypoxia and anoxia (dissolved oxygen less than 0.2 mg/l). While low oxygen levels can occur naturally in estuaries during the summer, when still weather conditions prevent the mixing of the water column that replenishes bottom water oxygen during the rest of the year, studies for Long Island Sound suggest that summer oxygen depletion in western Long Island Sound is significant. DO levels follow seasonal patterns with a decrease in bottom water DO over the course of the summer. Hypoxic conditions during the summer are mainly confined to the Narrows and western Basin of Long Island Sound.[20] Those areas comprise the section of Long Island Sound west of a line from Stratford to Port Jefferson, Long Island. The maximum extent of the hypoxic condition typically occurs in early August and affects 472 square kilometers (km^2) (189 square miles) on average.[21] The primary cause of this hypoxia is consumption of oxygen due to the death and decay of phytoplankton, which are stimulated to excessive growth by nutrient additions (especially nitrogen) from anthropogenic sources.

To address this problem, the LISS is implementing a phased approach to reducing nitrogen loads to Long Island Sound from sewage treatment plants, industrial discharges, and nonpoint sources. These phased nitrogen reductions, however, may not raise dissolved oxygen to levels necessary to support all life stages of marine organisms in Long Island Sound. Additional measures will likely be required to achieve the state's water quality standards for dissolved oxygen. These measures may include advanced treatment at sewage treatment plants and reductions in atmospheric nitrogen loadings, the primary sources of which are emissions generated by various combustion processes that use fossil fuels (e.g., electric generation, fueling of motor vehicles and other machinery).

[20] DEP Water Quality Monitoring Page: http://dep.state.ct.us/wtr/lis/monitoring/lis_page.htm.
[21] DEP Monitors Long Island Sound page: http://dep.state.ct.us/wtr/lis/monitoring/monsum.htm.

The U.S. Environmental Protection Agency (EPA) recently approved (April 2001) the total maximum daily load (TMDL), submitted by DEP and the New York State Department of Environmental Conservation (NYSDEC) for Long Island Sound,[22] which allocates responsibility for reducing nitrogen loads among all nitrogen sources. The TMDL is consistent with the LISS bi-state agreement that establishes a 58.5% reduction in nitrogen loads by 2014.

The water quality and ecology of Long Island Sound are affected by a variety of human activities that result in nitrogen pollution, sediment contamination, habitat degradation and loss, and effects to the health and abundance of living resources. The LISS recently released its first comprehensive public report on the health of Long Island Sound in April 2001.[23,24] Among the improvements pointed to:

- Upgrades to sewage treatment plants have decreased their discharge of nitrogen to Long Island Sound by 19% since 1990.
- Severity of hypoxia (lack of oxygen) has decreased in Long Island Sound since the late 1980s.
- Levels of copper, nickel, lead, and zinc as well as many organic compounds have declined in the monitored harbors of Long Island Sound.
- Toxic industrial chemical releases in Long Island Sound's watershed have declined 83.5% between 1988 and 1998.
- In the past two years, 33.4 river miles have been opened to anadromous fish and 593 acres of coastal habitat have been restored.

Among the concerns highlighted in the report are:

- A die-off of lobsters over the last two years, most severely in the western Long Island Sound, has greatly reduced the harvest.
- Since 1997, two parasitic diseases, MSX and Dermo, have decimated the oyster industry.
- Bluefish, winter flounder, and tautog stocks are below the long-term average and have not yet responded to more stringent management measures that were recently implemented.

[22] Letter to Arthur J. Rocque, Commissioner, DEP dated April 3, 2001 from Ira Leighton, Action Regional Administrator EPA New England and William J Muszynski, Acting Regional Administrator, EPA Region 2. http://www.epa.gov/region01/eco/lis/pdf/Tmdl.approval.pdf.
[23] Sound Health 2001: Status and Trends in the Health of Long Island Sound. News Release March 5, 2001. Mark Tedesco, EPA Long Island Sound Office, U.S. Environmental Protection Agency.
[24] http://www.epa.gov/region01/eco/lis/facts/fact15.pdf.

- Colonial bird populations, such as the piping plover and least tern, are still threatened by human intrusion into nesting areas, loss of habitat, and predators.

2.1.4 Ecology

The ecological diversity and habitat types within Long Island Sound are a result of the local geology and sedimentology, bathymetry, currents and tidal regime, coastal morphology, freshwater inflow, and human activities and impacts. The purpose of this section is to describe the breadth of resources in Long Island Sound, as well as their scarcity, sensitivity, and importance, as directed by PA No. 02-95 Section 3(B).

Vegetation

Vegetation in Long Island Sound includes vascular plants in brackish and tidal wetlands, and submerged aquatic vegetation in the form of seagrasses including eelgrass, and algae.

Tidal wetlands Shoreline habitats along Long Island Sound frequently contain coastal wetlands. (Appendix C, Figure C-2). These vegetated areas have unique types of vegetation, depending on the elevation and associated frequency and duration of tidal inundation, as well as the salinity. The most common vegetation type is saltwater cord grass (*Spartina alterniflora)*, which forms a band along the well-inundated intertidal areas of the marsh. Saltmeadow cordgrass (*Spartina patens*) occurs at higher elevations, frequently in association with spike grass (*Distichlis spicata*).

These areas are important in terms of buffering the coastline from erosion, and in filtering excessive nutrients and any associated contaminants. They are highly productive in terms of plant material, which allow the support of dense populations of macroinvertebrates. This productivity provides nursery areas for fish and shellfish, and habitats for birds, mammals, and invertebrates. Over the past 100 years, approximately 4,900 acres (30%) of Connecticut's tidal marshes have been lost or degraded due to development.[25] An additional 10% of Connecticut's tidal wetlands are impacted by causeways, bridges, and roadways that do not allow sufficient tidal flushing. Historic ditching for mosquito control led to deterioration of some natural tidal wetland communities. Vegetative diversity in marshes has been further compromised by the invasion of reedgrass (*Phragmites australis*) and to a lesser extent by the narrow-leafed cattail (*Typha angustifolia*). Reedgrass is becoming more prominent in the Connecticut River estuary, converting tidal wetland at the rate of 1 to 2% per year. In addition, rising sea level threatens to drown some tidal wetlands. Through comprehensive management, the DEP has restored over 1,600 acres of tidal wetlands.

Eelgrass Like meadows of grasses or forests of trees, seagrass beds are primary producers. Seagrass beds, including eelgrass beds are shallow and complex

[25] Fell, P.E., R.S. Warren, and W.A. Niering. 2001. Restoration of salt and brackish tidelands in Southern New England, p. 845-859, *in* M.A. Weinstein and D.A. Kreeger, eds., Concepts and Controversies in Tidal Marsh Ecology. New York: Kluwer Academic Press.

environments. Eelgrass (a type of seagrass) habitats are among the most productive ecosystems, providing functions that include food, refuge, and shelter for commercially, recreationally, and ecologically important species.[26] In Long Island Sound, the predominant species of eelgrass is *Zostera marina.* Eelgrass beds once occurred in shallow (generally less that 130 feet) protected waters throughout Long Island Sound, but now occur only along the eastern third of the Connecticut shore, from Clinton to the Rhode Island border.[27,28] (Appendix C, Figure C-11). The distribution of eelgrass is restricted to the photic zone, the depth where light penetrates. This depth is affected by factors such as water depth, tidal range, and level of eutrophication.

Nitrogen enrichment from wastewater treatment plants is suspected to have contributed to the long-term decline of eelgrass in Long Island Sound along with wasting disease, storms, swan consumption, eutrophication, and land-use changes.

<u>Macroalgae</u> Macroalgae, or seaweeds, a type of rootless plant, occur in hard substrate areas where available light allows plants to grow. Seaweeds are often the dominant organisms in rocky shallow waters, both intertidal (Appendix C, Figure C-1) and shallow subtidal (Appendix C, Figure C-5).

Rocky intertidal shoreline habitats are typified by macroalgae. These species form a habitat for other attached algae and macroinvertebrates. Common intertidal species include rockweeds such as *Fucus vesiculosus*, knotted wrack (*Ascophyllum nodosum)*, and Irish moss (*Chondrus crispus)*, which are distributed in distinct bands depending on tidal elevation. Rocky intertidal habitats are exposed to highly variable environmental conditions, including widely ranging salinity, temperature, and wave energy.

Hard substrate in shallow subtidal areas of Long Island Sound (Appendix C, Figure C-5) is colonized by attached algae, including taller canopy species such as kelps, which overlay lower understory species. The species composition depends largely on depth. Subtidal macroalgae are important for forming one of the most diverse and productive communities. Kelp beds provide habitat and refuge for species that include blue and horse mussels, juvenile lobsters, and larger macroinvertebrates. This community is sensitive to reductions in light transmission caused by increases in suspended solids.

<u>Invertebrates</u>

Invertebrates in Long Island Sound can be divided into planktonic, those organisms dwelling in the water column, and benthic, those that dwell on the bottom. The focus of this discussion is on benthic invertebrates, as they could potentially be affected by

[26] Thayer, G.W., W. J. Kenworthy, and M.S. Fonseca. 1984. The ecology of eelgrass meadows of the Atlantic Coast: A Community Profile. U.S. Fish. Wildlife Service FWS/OBS-84/02.

[27] Koch, E.W. and S. Beers. 1996. Tide, light, and distribution of *Zostera marina* in Long Island Sound, USA. *Aquatic Botany* 53: 97-107.

[28] Ernst, L.M. and C.D. Stephan. State Regulation and Management of Submerged Aquatic Vegetation along the Atlantic Coast of the United States, in C.D. Stephan and T. Bigford, eds., Atlantic Coastal Submerged Aquatic Vegetation: A review of its ecological role, anthropogenic impacts, state regulation, and value to Atlantic Coastal Fish Stocks. ASMFC Habitat Management Series #1.

submarine construction and operation of energy and telecommunications infrastructure projects.

Substrate and depth are the predominant factors affecting invertebrate communities,[29] creating what is termed "benthoscapes".[30] Sediment grain size in particular affects the distribution of invertebrates, which in turn is the result of a combination of geologic and hydrologic processes. These factors include large-scale circulatory patterns, combined with meteorological disturbances, medium scale tidal flows, and riverine inputs.[31] Variable patterns in recruitment create additional variations in community structure. Soft sediments form the predominant substrate type in Long Island Sound (Appendix C, Figure C-20.). Depth zones include intertidal (i.e., mud flats), shallow subtidal (less than 15 feet) and deep (15 feet and greater). A 1983 Sound-wide survey found 15 different benthic communities, largely based on depth and sediment grain size.[32]

However, a "snapshot" such as this study does not take into account the temporal and smaller-scale spatial patterns typical of Long Island Sound. One viewpoint relies on principles of landscape ecology to explain small, medium, and large scale spatial and temporal variations in benthic community structure.[33]

Another viewpoint focuses on the role of disturbance in creating successional stages in benthic communities. The number and type of organisms change based on the degree of environmental disturbance or stress.[34] Communities typically progress from a Stage I or early successional stage, typified by an abundance surface dwelling, resilient or opportunistic species that are rapidly established, followed by a transitional Stage II community, that includes species such as the clams *Tellina agilis* and *Nucula annulata*. The final stage is a mature community typified by large, deep dwelling, subsurface deposit feeding species that include polychaete worms (*Nephtys incisa)* and razor clam (*Ensis directus).* The successional stage of the community becomes important when estimating the level and time frame for recovery from potential impacts. While useful to explain invertebrate communities in central Long Island Sound, this explanation may oversimplify Sound-wide invertebrate communities.[35] Commercially important benthic invertebrates are discussed below.

<u>*Crabs*</u>

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[29] Sanders, H.L. 1956. *Oceanography of Long Island Sound*. X. The biology of marine bottom communities. *Bull. Biog. Ocean. Coll*. 15: 245-258.

[30] Zajac, R.N., R.S. Lewis, L.J.Poppol, D.C. Twitchell, J. Vazarik, and J.L. DiGiacomo-Cohen. 2000. Relationships among sea-floor structure and benthic communities in Long Island Sound at Regional and Benthoscape Scales. *J. Coastal Research* 16(3): 627-640.

[31] *Ibid*.

[32] Pelligrino, P. and W. Hubbard. 1983. Baseline shellfish data for the assessment of potential environmental impacts associated with energy activities in Connecticut's coastal zone. Volumes I and II. Report to Connecticut Dept. of Agriculture, Aquaculture Division.

[33] Zajac *et al*. 2000.

[34] Rhoads, D.C., P.L. McCall, and J.Y. Yingst. 1978. Disturbance and production on the estuarine seafloor. *Am. Sci. 66*: 577-586.

[35] Zajac *et al*. 2000.

Recreational surveys indicate important crabs in Long Island Sound include spider, lady, rock, blue and flat claw hermit.[36] Most abundant are lady crab (most abundant in fall), followed by rock crab (most abundant in spring); the remainder are relatively uncommon. Lady crab catches show evidence of a recent decline, with 2001 catches the lowest since 1992. Spring spider crab and rock crab catches have also been decreasing since 1994-1996.

The horseshoe crab (*Limulus polyphemus*) is an arthropod in the class Merosomata, more closely related to spiders than crabs. They are second only to lobster in abundance in the DEP trawl surveys.[37] Mating occurs in deep waters, and eggs are laid in the intertidal zone in spring. Juveniles and some adults inhabit intertidal sand and mud flats. Many adults move to deeper water.

Fish, Including EFH Species

Finfish are commercially and recreationally important, as well as important components of the diverse food webs in Long Island Sound. Fish inhabit all of the various habitats of Long Island Sound, including tidal wetlands, intertidal mud flats and rocky habitats (at high tide), and all of the subtidal habitats. Because of their mobility and widely varying sensitivities to environmental factors, fish assemblages are highly variable in time and space throughout Long Island Sound.

Demersal (bottom dwelling) and pelagic (water column dwelling) marine fish and shallow water estuarine fish species are collected as part of the DEP Long Island Sound trawl surveys. Over 114 species of marine fish have been collected in the 17 years of Sound-wide surveys.[38] In general, total fish catch (catch per unit effort, or CPUE) has been lowest in eastern Long Island Sound, especially over sandy substrate (Appendix C, Figure C-28). The finfish species assemblage has been observed to vary between a cold-water demersal assemblage and warm water migrants.[39] The cold-water assemblage was dominated by windowpane and winter flounder and little skate. Occasionally, the pelagic oceanic Atlantic herring was captured in large numbers. Warming waters caused these cold-water species to move to deeper waters, with warm water migrants such as bluefish, butterfish, weakfish and scup moving into Long Island Sound. The highest number of fish species occurred in a shallow area of the central basin off the Housatonic River, which is characterized by variable sediments. The fish assemblage was also diverse in an area in the central basin with deep water and mud substrate. The fewest fish species captured were in shallow sandy areas along the eastern Connecticut shoreline, where large volumes of fresh water from the Connecticut River limit the number of species that occur. Eastern Long Island Sound also contains a deep, sandy area that is oceanic in character with low numbers of fish species taken in the DEP survey.

[36] DEP. 2002. A study of marine recreational fisheries in Connecticut.
[37] DEP. 2002. A study of marine recreational fisheries in Connecticut.
[38] DEP. A study of marine recreational fisheries in Connecticut.
[39] Gottschall, K.F., M.W. Johnson, and D.G. Simpson. 2000. The Distribution and Size Composition of Finfish, American Lobster, and Long-finned Squid in Long Island Sound based on the Connecticut Fisheries Division Bottom Trawl Survey. 1984-1994. NOAA Tech. Rep. NMFS 148. 195 pp.

Commercial and recreational fisheries in Long Island Sound are valued at over one billion dollars.[40] In 2001, over 325,000 Connecticut anglers made over 1.7 million fishing trips, catching nearly 6.5 million fish. Four species, bluefish, striped bass, scup, and summer flounder, composed over 90% of the catch. Tautog and winter flounder were once important recreational species, but catches have been low in recent years.[41] Management efforts are causing only modest increases. Bluefish and striped bass are highly mobile, migratory species whose habitat requirements are unrelated to specific environmental conditions in Long Island Sound. However, to the extent that specific environmental conditions affect the abundance of their prey or forage fish, they could be affected.

Shallow estuarine areas along the shoreline are important as areas for forage fish (i.e., short-lived, inshore species that are food for larger fish) and nursery areas for commercial species such as winter flounder. DEP estuarine fish surveys found forage fish catches varied widely among years. For various reasons, young-of-the-year (YOY) winter flounder have shown general declines since 1988, with minor rebounds in 1992, 1994 and 1996.[42] Estuarine winter flounder catches have been correlated with Age 2 fish catches in Long Island Sound, indicating these nursery areas are supporting the adult population.

Fish species show varying sensitivity to impaired water quality. Dissolved oxygen is essential to finfish and shellfish survival. Simpson *et al*. developed an index of habitat impairment, which was based on the level of dissolved oxygen, the oxygen tolerances of 16 species of fish and shellfish and resulting reduction in biomass.[43] This index provides a simplified means of determining the areas of Long Island Sound that are most highly stressed by low oxygen events.

In 1976, the Magnuson-Stevens Fishery Conservation and Management Act (the Magnuson Act) established a management system for marine fisheries (shellfish and finfish) resources of the United States. This included the establishment of regional management councils that develop fishery management plans for conservation and management of fishery resources. The 1986 and 1996 amendments to the Magnuson Act, renamed the Sustainable Fisheries Act, included evaluation of habitat loss and protection of critical habitat. Specifically, Congress charged the National Marine Fisheries Service (NMFS) and the fishery management councils, along with other federal and state agencies and the fishing community, to identify habitats essential to managed species, which include marine, estuarine, and anadromous finfish, mollusks and crustaceans. The habitat is identified as "essential fish habitat" (EFH) and is defined to include "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (Magnuson-Stevens Act, 16 USC. Section 1801, *et seq*.).

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[40] *Ibid*.
[41] Gottschall *et al*.
[42] *Ibid*.
[43] Simpson, D.G., K. Gottschall, and M. Johnson. 1995. Cooperative agency resource assessment (Job 5), in: A Study of Marine Recreational Fisheries in Connecticut, DEP Marine Fisheries Office, Box 719, Old Lyme, Connecticut 06371, pp. 87-135.

The Connecticut portion of Long Island Sound encompasses 13 EFH quadrants, each defined as 10 minute by 10 minute squares of latitude and longitude, that are designated as important habitat for 27 fish species, 1 mollusk, and 1 crustacean (American lobster). The EFH designations are based on research of habitat requirements for the individual life stages (generally eggs, larvae, juveniles, adults, and spawning adults). This information allows a specific determination providing sufficient data to determine the importance of specific areas in Long Island Sound to these species.[44] The assumption is that all areas within EFH are important for the listed species unless proven otherwise.

Turtles

Five marine turtle species could utilize Long Island Sound: the Atlantic Green Turtle, Atlantic Ridley Turtle, the Hawksbill Sea Turtle, the Leatherback Turtle, and the Loggerhead Turtle (Appendix C, Figure C-8). All are listed by the U.S. Fish and Wildlife Service (USFWS) as threatened or endangered. With the exception of the Hawksbill, all are also listed by Connecticut as threatened or endangered. These species have all been occasionally observed in Long Island Sound in the summer months. Their use of Long Island Sound is restricted to summer feeding activities. Nesting and breeding occur in the tropics.

Birds

Bird species that utilize Long Island Sound can be divided into several types based on life history. Colonial birds, such as the roseate tern and great egret, use offshore islands for nesting (Appendix C, Figure C-16). Several of these are listed as threatened or endangered by the state or federal government, and are described more fully below. Shorebirds, such as willets, sandpipers, and plovers, are species that rely upon beaches and tidal flats for breeding and feeding. Wading birds, such as egrets and herons, are those that feed in inundated areas (marshes) such as egrets and herons. Recreationally important waterfowl, such as ducks and geese, use bays and open water. Many sea ducks overwinter in Long Island Sound. Others, such as the American Black Duck, reside near coastal marshes in winter. Because of their dependence on specific habitat types (offshore islands, coastal wetlands, open protected waters) during their life cycle, impacts are related to time of year and habitat type.

Marine Mammals

Marine mammals are protected by the Marine Mammals Protection Act of 1972 (MMPA 16 USC Section 1361, *et seq*.), which ensures that these species are maintained or restored to healthy population levels. According to the MMPA, no marine mammals are allowed to be "taken", defined as "harass, hunt, capture, or kill." Eleven species, including four in the dolphin family, four seals, and three whales, occasionally occur in Long Island Sound (Appendix C, Figure C-9). Islands and exposed areas at low tide provide seal haul-out sites, especially during the winter months. Results of a 1999 census

[44] ENSR. 2001. Essential fish habitat summaries for important Long Island Sound species.

indicated a population of more than 6,000 seals within Long Island Sound waters (which includes both Connecticut and New York), the highest number in two decades. Over 2,000 seals were observed on Great Gull Island, near Plum Island, New York. Harbor porpoises have been occasionally observed in Long Island Sound. Humpback whales have been occasionally noted in the eastern Long Island Sound. Other whales species are rarely observed.

Table 3 – List of Marine Mammals That Can Occur In Long Island Sound

Species: (Common Name)	(Scientific Name)
Atlantic white sided dolphin	*Lagenorhyncus acutus*
Saddle backed dolphin	*Dolphinus delphis*
Harbor Porpoise	*Phocoena phocoena*
Harp seal	*Pagophilus groenlandicus*
Harbor seal[45]	*Phoca vitulina*
Gray seal	*Halichoerus grypus*
Hooded seal	*Cystophora cirstata*
Fin whale	*Balaenoptera physalus*
Humpback whale	*Megaptera novaeanglicae*
Minke whale	*Balaenoptera physalus*

<u>*Commercially and Recreationally Important Species*</u>

In addition to finfish discussed above, commercially and recreationally important species include shellfish and lobster.

<u>Shellfish</u> Commercially harvested shellfish species include hard clam (*Mercenaria mercenaria*) and the eastern oyster (*Crassostrea virginica* (Appendix C, Figure C-10)). The oyster is an economically, as well as ecologically, important shellfish in Connecticut. Oyster harvests peaked in the early 1990s but have since declined dramatically, primarily as a result of disease. Oyster harvest decreased from 525,809 bushels in 1996 (worth $29 million) to approximately 35,000 bushels in 2002 (worth $2.0 million).[46] Oysters are distributed from intertidal to shallow subtidal depths, where water salinity ranges between 5 and 30 parts per thousand (ppt). They can grow on both mud and rocky substrate; however, hard substrate, such as oyster shells or cultch, is preferred.[47] Commercial oyster areas include seed beds, grow-out areas, and fattening grounds. Seed areas are bottom areas spread with cultch, which provides a hard substrate for larvae to attach and grow. Clean cultch is essential to growth and survival of juvenile oysters. Oysters in seed areas are transplanted to growing areas, characterized by adequate food

[45] Species of Special Concern in New York.
[46] http://www.state.ct.us/doag/business/aquac/oystrhar.htm.
[47] Sellers, M.A. and J.G. Stanley. 1984. Species profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates: American Oyster. FWS/OBS-82/11.23 TR EL-82-4.

supply and good circulation. Oysters remain in these areas for one to three years before they are moved to "fattening" grounds, shallow, well-protected areas.

Hard clams or quahogs, (*Mercenaria mercenaria)*, occur in intertidal and subtidal areas of estuaries, with salinities from 10 to 35 ppt. They occur mainly on clean sand substrates with good water circulation.[48] Harvesting relies on power dredges and rakes. The hard clam industry has been steadily increasing from the mid-1990s to over 286,000 bushels with a value of almost $9.2 million in 2002.[49]

Lobsters The American lobster, (*Homarus americanus*) is one of the most valuable commercial fishery species in Long Island Sound. Annual landings prior to 1999 ranged from 2.5 million pounds in 1995 to 3.7 million pounds in 1998, worth approximately $10 dollars.[50] Approximately 25-30% of the landings were made in western Long Island Sound, largely west of Stratford (Appendix C, Figure C-13; Figure C-14). Preliminary indications are that sediment type and the sedimentary environment are the primary factors for explaining the abundance and distribution of lobster with temperature, water depth, and dissolved oxygen concentrations of secondary importance.[51] Lobster catches have been reduced by 90% due to lobster "die-off" events (unusually high incidence of natural mortality) in 1998 and 2002. The cause of the decline in lobster catches is unknown at this time, but research is being undertaken to determine the reason including an evaluation of factors such as disease, in combination with abnormally high water temperatures, and pesticides. Connecticut licensed 441 lobsterman in 1998 and 344 in 2002, a decline of 22%.[52] Moreover, many license holders have not actively fished in recent years due to the die-off. During this period, the number of active Connecticut lobstermen is estimated to have decreased from 350 to 70.[53] This highly exploited species is considered overfished by NMFS.

Threatened and Endangered Species

Federal and state-listed species associated with Connecticut's coastal and marine environment are summarized below. Connecticut, through its Natural Heritage Program, is the central repository for information on the biology, population status and threats to the elements of natural diversity in Connecticut. The Natural Diversity Data Base (NDDB) contains information on the status of more than 1,000 species of plant and

[48] Stanley, J.G. and R. DeWitt. 1983. Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (North Atlantic). U.S. Fish. Wildlife Service, FWS/OBS-82/11.
[49] Connecticut Department of Agriculture, Bureau of Aquaculture - personal communication from David Carey, Director, on May 27, 2003www.state.ct.us/doag/business/aquac/oystrhar.htm.
[50] Connecticut Department of Environmental Protection. 2002. A study of marine recreational fisheries in Connecticut.
[51] Howell, P., C. Giannini, K. Gottschall, D. Pacileao, J. Holly, J. Burton, and J. Benway. 2002. Semi-annual Performance Report, Assessment and Monitoring of the American Lobster Resource and Fishery in Long Island Sound.
[52] Personal communication with DEP Marine Fisheries (DEP Licensing Statistics).
[53] Nick Crismale, Connecticut Lobstermen's Association, personal communication. May 5, 2003.

animals, including invertebrates, and 45 significant natural communities, which includes the Endangered, Threatened or Special Concern species listed in Connecticut.

Federally Listed Species The Endangered Species Act of 1973 (ESA, 16 USC Sections 1531-1543) protects federally listed endangered species. Section 7 of the ESA requires that every federal action be reviewed in order to ensure that actions do not jeopardize the continued existence of a federally listed endangered or threatened species or result in the destruction or adverse modification of the designated critical habitat.[54]

Eight federally listed species could occur in Long Island Sound (Table 4). Five species of marine turtles that are listed as either threatened or endangered occasionally occur in Long Island Sound (Appendix C, Figure C-8). Their occasional occurrence in Long Island Sound is solely for feeding purposes during the warmer months (June-November). Breeding and nesting activities do not occur in northeast waters. No areas are designated as critical habitats in Long Island Sound.

One federally listed fish species, the shortnose sturgeon, can occur in Long Island Sound (Appendix C, Figure C-16). This anadromous species is generally restricted to freshwater and brackish waters of the Connecticut River, but could make an occasional foray into Long Island Sound.

Two federally listed bird species, the roseate tern and piping plover, occur in Long Island Sound. The roseate tern uses offshore islands for breeding. Piping plover nest on beaches.

State-Listed Endangered Species Fourteen Connecticut state-listed species could occur in Long Island Sound, plus two from the New York list (Table 4). State-listed marine mammal species include the harbor seal (in New York and Connecticut) and harbor porpoise, in New York only. These species are discussed under the marine mammals section. Five species of turtle, described above, could occur in Long Island Sound. DEP has reported to the Task Force that the majority of research and data regarding threatened and endangered species has been directed to terrestrial species. Consequently, the list of marine species may be incomplete, due to the lack of comprehensive research to identify threatened and endangered species in Long Island Sound, and potentially misleading in that the lists do not identify habitat, and associated habitat of the near coastal environment, which is an important ecological component to support the species of Long Island Sound.

[54] Critical habitat is defined as "(i) specific areas within the geographic area occupied by the species…on which are found those physical or biological features (I) essential to the conservation of the species, (II) which may require special management considerations or protection, and (ii) specific areas outside the geographical areas outside the geographical area occupied by the species that are…essential for the conservation of the species."

Table 4 – Federal and State-listed Threatened and Endangered Marine Species Potentially Occurring in Long Island Sound

Species	Scientific Name	Federal Status	State Status	Potential Use of Long Island Sound [55]
Atlantic green turtle	*Chelonia mydas*	T	T	Feeding in submerged aquatic vegetation, macroalgae in summer
Atlantic Ridley turtle	*Lepidochelys kempsii*	E	E	Juvenile and adults found in Connecticut in summer, foraging for crabs.
Hawksbill sea turtle	*Eremochelys imbricata*	E		Very rare, occasional summer foraging
Leatherback turtle	*Dermochelys coriacea*	E	E	Observed off Stonington and in Block Island Sound and juvenile. Adult forage on jellyfish and comb jellies
Loggerhead turtle	*Caretta caretta*	T	T	Rarely seen in Connecticut. Reported on north shore of Long Island. Summer feeding on crabs in coastal bays.
Piping plover	*Charadrius melodus*	T	T	Uses sandy beaches for breeding, nesting.
Least tern	*Sterna antillarum*		T	Uses sandy beaches for breeding, nesting.
Roseate tern	*Sterna dougallii dougallii*	E	E	Colonial nesting on beaches or rocky offshore islands, including Falkner, Madison, and Duck.
Snowy egret	*Egretta thula*		T	Uses coastal wetlands and marshes for feeding and nesting.
Great egret	*Ardea albus*		T	Nests on uninhabited offshore islands; feeds in coastal marshes.
Least bittern	*Ixobrychus exilis*		T	Uses coastal brackish marshes for feeding.

[55] Turtle information from USFWS 1997. Significant habitats and habitat complexes of the New York Bight Watershed. USFWS, Coastal Estuaries Program. Charlestown, RI. Shortnose sturgeon information from NMFS 1998. Final recovery plan for the Shortnose Sturgeon (*Acipenser brevirostrum*). Prepared by the Shortnose Sturgeon recovery team for the National Marine Fisheries Service.

Species	Scientific Name	Federal Status	State Status	Potential Use of Long Island Sound [55]
Black rail	*Laterallus jamaicensis*		E	Nests at edge of high coastal marshes.
Willet	*Catoptropphorus semipalmatus*		SC	Uses coastal islands and marshes for nesting and feeding.
Shortnose sturgeon	*Acipenser brevirostrum*	E	E	Resident of freshwater portions of the Connecticut River, with possible forays into nearshore marine habitats.
Atlantic sturgeon	*Acipenser oxyrinchus*		T	Uses Long Island Sound for feeding or resting in transit to spawning in Hudson River.
Harbor seal	*Phoca vituina*		NY-SC CT Listed	Increasing use of Long Island Sound waters; islands and exposed areas provide important haul-out sites, especially in winter.
Harbor porpoise	*Phocoena phocoena*		NY-SC	Occasional use of Long Island Sound waters.

T = Threatened
E = Endangered
SC = Special Concern

Eight state-listed bird species occur in coastal Long Island Sound. Two species, roseate tern (also federally listed) and great egret, use offshore, uninhabited islands for breeding. Three species rely on beach habitats for nesting: piping plover (also a federally listed species), least tern, and the roseate tern. The remaining species utilize coastal marshes (in part or exclusively) as feeding and nesting habitat. These include the willet, least bittern, snowy egret and black rail. One fish, the Atlantic sturgeon, is listed as threatened by the state. Long Island Sound may be an important feeding and resting area on the way to or from spawning activities in the Hudson River.

There are no threatened/endangered marine plant species in Long Island Sound. However, the Natural Heritage Program lists a number of threatened/endangered plants that occur along the coast (Appendix C, Figure C-15).

2.1.5 Socio-economic and Cultural Resources

Long Island Sound plays a critical role in the economies of both Connecticut and New York. Bordered by 78 coastal cities, towns, and villages in Connecticut and New York, Long Island Sound is located in the midst of the most densely populated region of the United States (Appendix C, Figure C-24; Figure C-25). More than 8 million people live within Long Island Sound's watershed, and more than 21 million people reside within a 50-mile radius of Long Island Sound. Each year, millions visit the Long Island Sound area for recreational purposes.

Historically, Long Island Sound was important to the cultural and economic growth of both Connecticut and New York, with many initial settlements located along the coast and oriented around the maritime industry and waterborne transportation. Today, Long Island Sound remains a significant component of the regional economy, generating approximately $5.5 billion annually as a result of activities such as boating, tourism, commercial and sport fishing, swimming, and beach going. Long Island Sound's natural resources and aesthetic attributes also enhance shoreline property values, and provide an impetus for tourism. Further, the regional economy benefits from other valuable uses of Long Island Sound, including cargo shipping, ferry transportation, and power generation.[56]

In Connecticut, Long Island Sound's key socioeconomic and cultural attributes include:

Commercial and Recreational Fishing

- Commercial and recreational fishing, including shellfish and commercial aquaculture, are important components of Connecticut's economy and are particularly significant to some coastal municipalities. One estimate of the annual economic benefit to regional economy of these fisheries (including oysters, scallops, blue crabs, flounder, striped bass, and bluefish) is more than $1.2 billion.[57]

- Connecticut's fisheries include both recreational fishing in Long Island Sound and commercial fishing in the Atlantic Ocean. According to 2000 data, there were approximately 500 commercial fishermen licensed in Connecticut. In 1996, the dockside value of commercial seafood landings in Connecticut was reported as $48 million. Marine recreational angling also is important; although current data are not available, in 1991, saltwater recreational fishing in Connecticut reportedly supported almost 4,000 jobs and accounted for more than $100 million in income.[58,59]

- Long Island Sound's naturally occurring, as well as cultivated (aquacultured), resources also are important to the regional economy.[60] Approximately 56,000

[56] EPA, LISS, Introduction to Management Plan, http://www.epa.gov/region01/eco/lis/intro.html.
[57] Save the Sound http://www.savethesound.org/mb_habitat.htm.
[58] Stedman, Susan-Marie and Jeanne Hanson, 1996, Habitat Connections: Wetlands, Fisheries & Economics in the New England Coastal States.
[59] Connecticut Office of Policy & Management, October 31, 2001, Food Production. http://www.opm.state.ct.us/pdpd3/physical/c&dplan-rec/Food.htm.
[60] Economic Benefit of Connecticut's Oyster Farming Industry. Connecticut Department of Agriculture http://www.state.ct.us/doag/business/aquac/oysecono.htm.

acres are presently under active cultivation for shellfish production (oysters and clams), and an additional 392,000 acres of Connecticut waters are identified as potential shellfish areas in Long Island Sound.[61]

- The Department of Agriculture, Bureau of Aquaculture estimates that the shellfish industry accounts for about 600 jobs and the annual harvest of oysters exceeded 35,000 bushels in 2002, with an approximate wholesale value of $2 million. The hard clam harvest totaled 286,000 bushels in 2002, with an approximate wholesale value of $9.2 million. Connecticut oyster farmers produce high value oysters.[62]

- The economic importance of Connecticut's lobster industry has declined significantly since 1998 due to the lobster die-off believed to be caused, at least in part, by a parasitic protozoan known as *Paramoeba*. DEP subsequently determined that approximately 70% of the lobster fishers surveyed in western Long Island Sound lost 100% of their total income and the remainder lost 30% to 90% of total income. Fish trawl data from western Long Island Sound indicated a significant reduction in the lobster population Sound-wide, which could result in a failure of the commercial lobster fishery.[63] On January 26, 2000, based in part on evidence collected by DEP, US Department of Commerce Secretary William M. Daley declared a commercial lobster fishery failure in Long Island Sound. The economic losses to the lobster industry prompted Governor Rowland to seek Federal Disaster relief.

Waterborne Commerce

- In 2000, Connecticut's three deepwater ports (Bridgeport, New Haven, and New London) handled about 17 million tons of primary bulk commodities; this would equate to the addition of approximately 2,300 trucks each weekday on Connecticut highways (mainly Interstate 95) if waterborne access was not available. Primary freight at each port included:

  - The Port of New Haven handled almost two-thirds of the total waterborne freight in Connecticut (10.6 tons per day on average), with petroleum products accounting for about 80% of this volume. Other products include steel, sand and gravel, copper, cement, and non-metallic minerals.

  - The Port of Bridgeport handled 4.3 million tons per day on average, of which two-thirds was petroleum products. Bridgeport also is the primary site for tropical fruit imports, primarily bananas.

[61] LISS Fact Sheet #12.

[62] Department of Agriculture, Bureau of Aquaculture – personal communication with David Carey, Director, on May 22, 2003.

[63] Governor Rowland Requests $20 Million In Disaster Relief For Lobster Fishers - DEP Submits Lobster Report to Secretary Daley http://dep.state.ct.us/whatshap/press/2000/mf0210.htm.

  - The Port of New London handled about 2 million tons, including lumber, steel, petroleum, and coal lignite.[64,65]

- The operation of the three deepwater ports directly and indirectly accounts for approximately 3% of the state's total employment and 2.6% of the state's total output, and constitutes about 2.5% of total state and municipal tax revenues.

- The operation of the three deepwater ports directly and indirectly accounts for approximately 3% of the state's total employment and 2.6% of the state's total output, and constitutes about 2.5% of total state and municipal tax revenues.

- The Connecticut Port Authority (established in 1993) was created to promote the economic development of the state's three deepwater ports through, among other objectives, planning, coordinating and marketing in support of the entities operating the ports together with establishment of foreign-trade zones. The Authority's responsibilities have been expanded to include all ports, harbors, and navigable tidal rivers.

- The Connecticut Maritime Coalition (Coalition), a non-profit association of businesses and organizations gathers statistics on the role and importance of the Connecticut's maritime infrastructure.[66] According to the Coalition, in 1997, the maritime industry accounted for 349 businesses, 12,225 jobs, with aggregate sales of $2.61 billion.

- A 2000 survey of ferry operators determined that there were over 2.1 million passenger boardings and nearly 852,000 vehicle boardings for the four major ferries servicing Connecticut's ports.

Energy

- Long Island Sound serves as a major thoroughfare for fuel oil delivery for home heating oil, jet fuel, and for oil-fired electric generation.

- Energy related materials, including bulk commodities, are delivered to Connecticut from the Port of New York - New Jersey by barges transiting Long Island Sound and are then unloaded, sometimes as far upriver as Hartford.

- Long Island Sound provides cooling water for major electric power plants at Waterford, New Haven, Bridgeport, and Norwalk.

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[64] U.S. Army Corps of Engineers, 2000, Waterborne Commerce of the United States.
[65] Connecticut Center of Economic Analysis, November 10, 2002, Draft Background Paper on Water: Freight Overview.
[66] Connecticut Maritime Coalition http://www.ctmaritime.com/transportation.html.

- Cables and pipelines across the bottom of Long Island Sound transport energy between Long Island and Connecticut.

Tourism and Recreation

- Of the approximately $5.5 billion generated annually from sound-related activities, a large portion of the revenue is derived from boating, fishing, beachgoing, and swimming.

- The number of sunbathers, swimmers, and boaters using Long Island Sound on a summer weekend day is often greater than the combined populations of Delaware and Alaska.[67]

- Other primary recreation/tourism activities include camping, touring historic sites, and visiting coastal attractions, such as Mystic Seaport, Mystic Aquarium & Institute for Exploration, and the Maritime Aquarium at Norwalk.[68]

Parks and Conservation Areas

- State and local parks, state forests and conservation areas, as well as areas within the federally-designated Stewart B. McKinney National Wildlife Refuge, are scattered throughout Connecticut coastal communities (See Appendix C, Figure C-17). These areas add to the attraction of Connecticut coast for visitor and resident recreation. A number of these also provide direct access to coastal waters and are identified on Connecticut's Coastal Access Guide.

- Protection of coastal wetlands is a significant aspect of ongoing efforts to acquire coastal land for preservation. Today there are at least 26 different land trusts along the Connecticut coast and major river systems, which aid in wetland protection. DEP presently owns nearly 30% (1,956 hectares or 4,833 acres) of all tidal wetlands in the state, which reflects a long history of land acquisition for parks, forests and wildlife purposes. In 1992, the DEP initiated a tidal wetland restoration program.

- In Connecticut, the 160-mile Long Island Sound coastline represents a significant recreational resource. The Connecticut Coastal Access Guide provides detailed information on and identifies over 250 sites, such as beaches, campgrounds, parks, and boat launches, which the public can use to access Long Island Sound.[69]

[67] Estuaries on the Edge: The Vital Link Between Land and Sea, Chapter Six, Long Island Sound in Connecticut and New York, p. 143.
[68] www.tourism.state.ct.us/.
[69] *Connecticut Coastal Access Guide*, July 2001.

- According to DEP,[70] there are currently 58,000 trailerable boats registered in the state and 5,300 state and municipal parking spaces. At a ratio of 11 boats per space, current demand greatly exceeds availability. DEP anticipates that the approximate 50% increase in fishing access should be accommodated primarily through leases and permanent easements. The largest need for additional boating access to Long Island Sound exists in southwestern Connecticut.

Historic and Cultural Resources

- Long Island Sound and the surrounding coastal areas have a rich cultural heritage. According to the Connecticut Historical Commission (CHC) and the Office of the State Archaeologist, the historic record indicates that there are thousands of potential underwater archaeological sites, including shipwrecks, in Long Island Sound. However, given the size of Long Island Sound, only limited submarine archeological investigations have been conducted. Certain of the studies that have been performed were associated with permit applications for proposed developments in Long Island Sound. The results of such archaeological studies are maintained at the CHC and the Office of the State Archaeologist.

2.2 REGULATORY FRAMEWORK FOR PROJECTS IN LONG ISLAND SOUND

2.2.1 Reliability Overview

Over the last two decades, airlines, trucks, banks and telecommunications have been deregulated. The natural gas and electricity industries were the most recent American monopolies to transition to competitive market forces. Deregulation of Connecticut's natural gas and electricity industries has been well underway since the late 1980s when a series of orders issued by the Federal Energy Regulatory Commission (FERC) effectively deregulated interstate pipeline transportation across the U.S. By 1992, the FERC completed the transition to competition under Order No. 636, which required pipeline transportation and storage services to be available to all shippers on an unbundled, non-discriminatory basis. At the local level, natural gas transportation and distribution services continue to be regulated by state regulatory commissions throughout New England.

The FERC has jurisdiction over both the construction of interstate natural gas transmission projects and the transportation of natural gas in interstate commerce. The FERC has established criteria for determining need and assessing whether a natural gas project would serve the public interest. The FERC also regulates the transmission and

[70] The State Environmental Goals and Indicators Project (SEGIP) - State of Connecticut, Goals and Benchmarks, For the Year 2000 and Beyond. http://www.pepps.fsu.edu/segip/states/CT/stewend.html.

wholesale sales of electricity in interstate commerce, and tariffs associated with merchant transmission facilities.[71]

The North American Reliability Council (NERC), a New Jersey-based not-for-profit organization, was formed in 1968 in response to the 1965 power outage in the Northeast. NERC's mission "is to ensure that the bulk electric system in North America is reliable, adequate and secure."[72] NERC has conducted reliability assessments of the bulk electric systems of North America since 1970. NERC supports reliability standards that are mandatory, enforceable and fairly applied. NERC's *2003 Summer Assessment* concluded that, based upon data submitted as of April 30, 2003 and because of a slow North American economy, energy demand is expected to rise by only about 1 percent this summer. It did, however, identify SWCT, New York City and Long Island as "areas of concern." NERC concluded in its *2003 Summer Assessment* that "[l]locally tight resources compounded by transmission limitations into and within those areas make them particularly susceptible to reliability problems."

Congress passed the Energy Policy Act of 1992 to stimulate a workable competitive market for wholesale electricity. New England's bulk generation and transmission facilities had been operated by NEPOOL, a voluntary association of investor-owned and municipal utilities throughout New England, since 1971. NEPOOL had achieved significant cost savings and reliability improvements for its members.

In 1996, the FERC issued Order 888 to remove impediments to competition in the bulk power marketplace in order to lower costs for consumers. Also in 1996, the FERC issued Order 889. Each public utility (or its agent) that owns, controls, or operates facilities used for the transmission of electricity (generally above 69 kV) was required to create or participate in an Open Access Same-time Information System (OASIS) that describes available transmission capacity, prices, and other information that will enable transmission customers to obtain open non-discriminatory transmission service. In response, NEPOOL proposed that an independent system operator (ISO) be created to administer the deregulated wholesale power markets for NEPOOL membership. In July 1997, ISO-New England (ISO-NE) was created in large part through the transfer of staff and equipment from NEPOOL. ISO-NE has been given responsibility by the FERC for planning and operating New England's (including Connecticut's) electric transmission and generation system. A separate entity – NYISO – is responsible for the New York control area. Historically and presently, these ISOs coordinate operations and planning to ensure system reliability and market efficiency.

Toward assuring reliability in New England, ISO-NE plans and operates the New England bulk power system to criteria that address both adequacy of generating resources to meet projected demand and compliance with the transmission planning/operating criteria set forth in NEPOOL's planning procedures, which are based on NERC and the Northeast Power Coordinating Council criteria. Before a system can be considered "reliable", it must satisfy both generation and transmission criteria. ISO-NE's Regional

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[71] Federal Energy Regulatory Commission. www.ferc.gov.
[72] NERC, *2003 Summer Assessment*, May 2003.

Transmission Expansion Plan (RTEP) is based on the reliability criterion that the bulk power system should not fail to meet load more than once every ten years. The "one failure in ten year standard" (otherwise referred to as Loss Of Load Expectation (LOLE) is a NERC-mandated criterion and assumes an unconstrained transmission system within the region. Central to this reliability criterion is consideration of contingency events where critical resources are assumed to fail or be unavailable. ISO-NE plans for such events by having a robust system capable of withstanding severe and sudden changes with sufficient generation and transmission redundancy. The New England bulk power system must remain stable during and following the most severe contingencies.[73]

A failure to meet the bulk power reliability criteria would suggest a major system reliability issue. At the same time, however, satisfying this LOLE criterion alone does not guarantee a reliable system. Some regional sub-areas of the bulk power system may still be susceptible to transmission problems even where reliability bulk support criteria have been met. To assure reliability, the ISO-NE plans sufficient transmission and generation capability to serve load in the event of a generation and/or transmission contingency event. Most transmission lines are not loaded to their continuous capacity ratings. The transmission system must be designed to maintain current and voltage levels within the operating limits of each of the system components during normal operation as well as following a contingency event. For further discussion, please see Section 2.3 of the Assessment Report Part I.

2.2.2 Regulatory Overview

Connecticut and New York share a marine border approximately 95 miles long that runs longitudinally through the middle of Long Island Sound. Long Island Sound is considered an "historic bay,"[74] and consists almost entirely of Connecticut and New York submerged lands from shore to shore. Unlike most other coastal states in the U.S., there is no offshore federal jurisdictional zone beyond three miles of the shoreline. Nonetheless, the federal laws pertaining to security, commerce, environmental protection, and navigation apply to the waters of Long Island Sound. Thus, interstate energy and telecommunications infrastructure projects across Long Island Sound are subject to Connecticut, New York, and federal regulatory programs, and project developers must pursue permits and certificates from each state and federal agency with jurisdiction over the project.

Similarly, energy planning (including reliability assessments and need determinations) in Connecticut and in New York is performed by both federal and state entities. Although ISO-NE and NYISO coordinate operations and planning within their control areas, as well as at their interfaces, the siting and permitting of transmission and generation

[73] Reliability Standards for the NEPOOL, July 9, 1999.

[74] Historic Bay is defined as a "water area over which a coastal state has asserted sovereignty over a long period of time, with the acquiescence of foreign nations." Reed, Michael W., *Shore and Sea Boundaries*, NOAA Office of Coast Survey (2000).
See http://chartmaker.ncd.noaa.gov/hsd/shallow.htm.

facilities is not under the jurisdiction of the respective system operators. Each state siting commission applies its own need/benefit test to a proposed project.

The following provides an overview of the regulatory programs applicable to proposed projects in Long Island Sound, and then describes the specific federal and state agencies with regulatory authority over permit and certificate approvals for such projects.

A variety of established federal and state regulatory programs presently afford protection to Long Island Sound's natural resources. These include: the National Environmental Policy Act of 1969 (NEPA), the Marine Mammals Protection Act of 1972 (MMPA), the Coastal Zone Management Act of 1972 (CZMA), Marine Protection Research and Sanctuaries Act (1972), the Endangered Species Act of 1973 (ESA), the Clean Water Act of 1972 (CWA), Connecticut's Public Utility Environmental Standards Act of 1971 (PUESA), Connecticut's Tidal Wetland Act, Inland Wetlands and Watercourses Act (IWWA), and Coastal Management Act (CMA), the FERC environmental review process and certificate conditions, Section 404 Army Corps of Engineers (ACOE) regulations, the National Historic Preservation Act (NHPA) (Section 106 Review), the New York Public Service Law, and the New York Environmental Quality Review Act.

Although these environmental laws provide the basis for protection of Long Island Sound's resources, the regulatory processes applicable to cross-Sound projects vary, depending on the type of infrastructure development and the federal or state agencies with primary jurisdiction. However, the key elements of the current federal and state regulatory framework applicable to cross-Sound projects are as follows:

- For any cross-Sound project, the ACOE, which administers permits pertaining to work in waters of the U.S., serves as an overarching regulatory authority. An individual ACOE permit is required for any cross-Sound project. Other federal agencies (e.g., NMFS, USFWS, EPA) act as cooperating agencies, providing input to the ACOE permitting process. In addition, the ACOE coordinates directly with involved state agencies, such as DEP, NYSDEC, the New York Department of State (NYSDOS), and also the State Historic Preservation Officers (SHPO). Prior to issuance of an ACOE permit, federal authorizations or permits that are delegated to the states (e.g., coastal consistency certification, CWA Section 401 water quality certification) must be obtained.

- For interstate electric transmission cable crossings of Long Island Sound, separate certificates are required from both the Siting Council and the New York Public Service Commission (NYSPSC). Such approvals, which are in addition to authorizations and certificates from the ACOE, DEP, and NYSDOS, involve determinations of both project need/benefit and environmental compatibility.

- For interstate natural gas pipeline crossings of Long Island Sound, the FERC has primary jurisdiction for determining the public need for a project and for conducting federal environmental impact analyses. As part of its environmental review, the FERC requires project applicants to submit detailed environmental resource information and then prepares draft and final environmental impact statements (EISs). The FERC's regulatory review involves a defined public participation process, as well as coordination with other federal (e.g., ACOE, EPA, NMFS, USFWS), state (e.g., DEP, NYSDEC, SHPOs), and local regulatory agencies. Like the ACOE permit process, the FERC environmental approvals for a project are typically contingent upon the receipt of appropriate state regulatory approvals (e.g., coastal consistency certification, CWA Section 401 water quality certification). The Siting Council has a limited role with respect to interstate natural gas pipeline projects. In New York, natural gas projects are required to obtain permits and approvals from NYSDEC and NYSDOS; the NYSPSC process does not apply.

- For telecommunications infrastructure projects across Long Island Sound, the ACOE permit is the primary regulatory mechanism. Telecommunications cables are not subject to Siting Council jurisdiction.

Each permit and/or certificate for an energy or telecommunications infrastructure crossing of Long Island Sound typically includes numerous conditions that specify the mechanisms to be implemented to assure that adverse environmental impacts are avoided or minimized. Often, the resource agencies coordinate with respect to the development of such conditions. Permit/certificate conditions are tailored to the characteristics of both the project and the potentially affected resources; thus, mitigation conditions for construction through a coastal Connecticut area that may contain shellfish resources will differ substantially from conditions for construction of the same project through a coastal area on Long Island that is developed for industrial purposes and does not contain natural resources such as tidal wetlands, shellfish lease areas, or threatened and endangered species. Therefore, it is not surprising that the standards applicable to a cross-Sound infrastructure project may differ between New York and Connecticut.

2.2.3 Federal Jurisdiction

The Federal Energy Regulatory Commission

Under the federal Natural Gas Act (NGA) of 1938, the FERC regulates both the construction of natural gas pipeline facilities and the transportation of natural gas in interstate commerce. Companies providing services and constructing and operating pipelines must first obtain from the FERC a Certificate of Public Convenience and Necessity. In accordance with 15 U.S.C. Sec. 717f(e):

> "a certificate shall be issued to any qualified applicant therefore, authorizing the whole or any part of the operation, sale, service, construction, extension, or acquisition covered by the application, if it is found that the applicant is able and willing properly to do the acts and to perform the service proposed and to conform to the provisions of this chapter and the requirements, rules, and regulations of the Commission thereunder, and that the proposed service, sale, operation, construction,

> extension, or acquisition, to the extent authorized by the certificate, is or will be required by the present or future public convenience and necessity; otherwise such application shall be denied."

On September 15, 1999, the FERC issued a Policy Statement[75] providing guidance regarding how proposals for new pipeline construction would be reviewed. This statement established criteria for determining whether a project is needed and is in the public interest, and identified the FERC's objectives such as balancing public benefits against potential adverse consequences; giving appropriate consideration to the enhancement of competitive transportation alternatives; and avoiding unnecessary disturbance to the environment.[76] In addition, in a Policy Statement the FERC set forth guidance regarding state and local reviews and approvals of interstate pipeline facilities.[77]

The Federal Power Act of 1935 (16 U.S.C. §791(a)) gives the FERC jurisdiction over the transmission of electric energy in interstate commerce, wholesale energy transactions, and all facilities for such transmission. However, unlike federal authority over interstate pipelines, states reserve jurisdiction over the siting of electric transmission and generation facilities.

NEPA provides the primary framework for environmental review at the federal level. The FERC policy requires applicants to cooperate with state and local agencies with respect to their respective permitting requirements, but notes that such agencies may not prohibit or unreasonably delay a project that has been issued a certificate by the FERC.

The FERC environmental review process provides the opportunity for public review of and comment on a project, and is intended to incorporate the views of federal, state, and local agencies. In addition, for some projects, certain federal agencies act as cooperating agencies, assisting the FERC directly in the environmental review process and providing direct input to the preparation of the FERC's EIS on a project. Principal elements of the FERC regulatory process include:

- FERC Application. In a FERC application, a project proponent must include various exhibits, including gas flow calculations, rates, financing, and an environmental report (ER). In the ER, the project applicant details the location of the proposed route and alternatives, as well as route-specific environmental conditions, anticipated impacts, results of special studies (i.e., benthic resources) and proposed mitigation measures. The ER must conform to the FERC regulations regarding compliance with NEPA (18 CFR Section 2.82) and the FERC's "Guidelines for the Preparation of Applicant's ERs for Application Under Section 7(c) of the Natural Gas Act." An ER is typically prepared using the

[75] M & N Pipeline, 81 FERC Paragraph 61-166 (1997).
[76] The FERC, March 2002, Islander East Pipeline Project Draft Environmental Impact Statement, Docket No. CP01-384-000, Washington, D.C., p.1-1 and Certification of New Interstate Natural Gas Pipeline Facilities, Statement of Policy No. PL99-3-000,88 FERC Paragraph 61, 227 (September 15, 1999).
[77] Maritimes and Northeast Pipelines, 81 FERC Paragraph 61, 166 (1997)

individual "resource report" format, which has facilitated the FERC's reviews of projects since the late 1980s.

- FERC EIS. After receipt of the ER and detailed route maps, the FERC initiates the application and environmental review process, which includes the preparation of an EIS. The EIS can be prepared by the FERC staff, the FERC consultants, or third party consultants who are paid by the applicant but report to the FERC.

  The FERC prepares both a Draft and a Final EIS. A public scoping meeting typically is held at the initiation of the FERC EIS process to solicit public and agency comments on the project. The Draft EIS also is circulated for public and agency review, after which a public hearing is held. The Final EIS reflects the incorporation of responses to agency and public comments on the project, and includes a list of required mitigation measures, which subsequently become conditions in the FERC certificate. Prior to obtaining the FERC construction clearance, project applicants must identify how compliance with each of the mitigation measures will be accomplished.

  Typically, compliance with state-delegated 401 water quality requirements, coastal zone consistency certifications, and historic preservation legislation must be demonstrated before a federal agency can take an action, such as issuing a certificate. However, in the past, the FERC has issued certificates conditional on the applicant receiving such necessary permits and approvals.

- FERC Involvement During Construction/Restoration. Prior to construction, the FERC requires that project sponsors demonstrate the methods that will be used to inform construction contractors about environmental requirements and monitor the contractors' conformance to such measures. During construction, the FERC staff or its designees (i.e., a third party environmental consultant) routinely conduct field inspections and enforce compliance with certificate requirements. Special field inspections also may be performed if there are repeated problems with contractor compliance or concerns expressed by other agencies or the public.

Army Corps of Engineers

The principal federal permitting agency for cross-Sound electric cable and telecommunications projects is the ACOE. Other federal agencies, including the USFWS, NMFS, and EPA, comment on the ACOE permit review, on the FERC review (in the case of interstate natural gas pipelines), or both. An ACOE permit is required for FERC-regulated projects as well; however, in such cases, the FERC is the lead federal agency.

Two ACOE regions have jurisdiction over Long Island Sound: the New England District of the ACOE has jurisdiction over Connecticut, whereas the New York District of the ACOE has jurisdiction over New York. For interstate projects, the ACOE districts typically determine which will take the lead role; that district then coordinates the project review process and, as appropriate, a single permit is issued for the entire project. The ACOE typically coordinates project reviews closely with other involved resource agencies, such as DEP, NYSDEC, USFWS, NMFS, and EPA. Two EPA regions (Region 1 headquartered in Boston and Region 2 headquartered in New York City) also have jurisdiction over Long Island Sound.

For cross-Sound projects, ACOE permits are required under Section 10 of the Rivers and Harbors Act pertaining to construction in navigable waters and under Section 404 of the Federal Clean Water Act pertaining to the discharge of dredged or fill material into the waters of the United States. A single application is typically submitted for the Section 10/404 permits.

For projects involving activities in Long Island Sound, the ACOE typically requires the performance of detailed studies of the project area as part of the permit application process. Such studies may include, for example, benthic surveys, sediment sampling and analysis, sediment transport modeling, and marine cultural resource investigations, among others.

After receipt of a permit application, the ACOE issues a public notice stating the nature of the project, and requesting comments from other federal and state agencies and the public. After the ACOE has received input from the other reviewing agencies and the public, it decides on the need for a public hearing.

ACOE permits typically include a variety of project-specific permit conditions that are designed to minimize adverse environmental and navigational impacts through the imposition of measures such as construction timing restrictions, the use of particular construction and restoration methods, and environmental monitoring. The ACOE cannot issue a permit unless state coastal zone consistency and 401 water quality certifications are received from DEP and the appropriate New York agencies.

2.2.4 Connecticut Jurisdiction and Certification/Permit Criteria

Connecticut Siting Council

In 1971, the Connecticut General Assembly adopted PUESA. Prior to the effective date of this legislation, the Department of Public Utility Control (DPUC) had sole responsibility for reviewing the prudency and siting of utility proposals for transmission, generation, and other infrastructure projects. Under PUESA, however, Connecticut articulated its obligation to balance public need and benefit with environmental protection. PUESA delegated siting decisions to an independent body, the Siting Council, prescribed an adjudicatory procedure for project review, and established certification criteria.

PUESA prescribes the criteria that the Siting Council must consider in issuing a certificate. With respect to electric transmission lines substantially underground or underwater, the Siting Council shall not issue a certificate unless it finds and determines a "public benefit" for the facility and that this public benefit outweighs the adverse effects of the project, including cumulative effects.[78] A "public benefit" exists if the facility "is necessary for the reliability of the electric power supply of the state or for the development of a competitive market for electricity."[79]

With respect to gas pipelines, the Siting Council's role is limited. Additional information concerning the responsibilities of the Siting Council and the roles that other state agencies play in the Siting Council process is included in Section 2.7 of the Assessment Report Part 1.

Other Connecticut Regulatory Requirements

A number of state permits and certifications apply to proposed developments in Long Island Sound. State regulatory requirements are discussed in detail in Section 2.6.7 of the Assessment Report, Part I. The primary state authorizations relevant to projects in Long Island Sound are summarized as follows.

- Coastal Management Act - Connecticut's CMA establishes a statewide policy of planned coastal development and authorizes towns to administer local coastal management programs. This program is administered by the DEP Office of Long Island Sound Programs (OLISP). The CMA lists a number of criteria related to structures, dredging and fill that the OLISP must consider, including:

  - Requiring structures in tidal wetlands and coastal waters to be designed to minimize harm to coastal resources, circulation, sedimentation, water quality, flooding, and erosion;

  - Disallowing filling of tidal wetlands and near shore, offshore, and intertidal waters to create new land which is otherwise undevelopable;

  - Disallowing new dredging in tidal wetlands, except where no feasible alternative exists or where adverse impacts to coastal resources are minimal;

  - Requiring that access to public beaches below the mean high water mark not be unreasonably impaired by structures including jetties, groins, and breakwaters;

  - Encouraging the removal of illegal structures below mean high water that obstruct passage along the beach; and

[78] CGS Section 16-50p(c)(2).
[79] CGS Section 16-50p(c)(2).

– Maintaining, enhancing, or restoring natural water circulation patterns and fresh and saltwater exchange (CGS Section 22a-92).

When making a decision on a permit application, OLISP must also consider factors such as: the potential effect on the area's natural resources, including, but not limited to, plant and animal species, the prevention or alleviation of shore erosion and coastal flooding, the use and development of all adjoining lands, the improvement of coastal and inland navigation for all vessels, the interests of the state in such areas as pollution control, water quality, recreational use of public water, and management of coastal resources, and the rights and interests of all persons concerned with the proposed activity.

Pursuant to the federal Coastal Zone Management Act of 1972 (16 USC § 14-51, *et seq.*) and under its federally approved Coastal Zone Management Program, DEP has the responsibility to determine if the issuance of a federal permit or certificate (i.e., the FERC or ACOE authorizations) that would impact Connecticut's coastal zone is consistent with the state's coastal management program.

- <u>Structures/Dredging and Fill Permit</u> - Any project proposing to dredge, fill, obstruct, encroach, erect or maintain any structure or perform work incidental to such activities seaward of the high tide line in tidal, coastal, or navigable waters of the state must apply for a DEP permit (CGS Section 22a-361). The law requires DEP to consider the effect of proposed activities on: (1) indigenous aquatic life, fish, and wildlife, (2) preventing or alleviating shore erosion and coastal flooding, (3) the use and development of adjoining uplands, (4) improving coastal and inland navigation, (5) use and development of adjacent lands, and (6) the state's interests including water quality, recreational uses, and coastal resource management (CGS Section 22a-359).

- <u>Tidal Wetlands, Inland Wetlands and Watercourses</u> - Anyone proposing to conduct a regulated activity in a tidal wetland must apply for a permit from DEP (CGS Section 22a-28 *et seq.*). Regulated activities, as defined in CGS Section 22a-29(3), include draining, dredging, and excavation, directly or indirectly in a tidal wetland, and building structures, driving pilings, or placing obstructions. DEP may grant, deny, or limit the permit, based on a consideration of the effects of the proposed activity on the public health and welfare, marine fisheries, shellfisheries, wildlife, protection of life and property from floods, hurricanes, and other natural disasters, and other public policy considerations set out in the tidal wetland statutes (including, under CGS Section 22a-28, preservation of wetlands to protect marine commerce, fisheries, recreation, and aesthetic enjoyment). In addition to the statutory criteria for each permit, the law requires DEP to administer all coastal permitting programs in accordance with the goals and policies of the CMA. Regulated activities in inland wetlands and watercourses are subject to the provisions of CGS Section 22a-36 *et seq*.

- Section 401 of the Clean Water Act (State Water Quality Certification) - An applicant for a federal license or permit (i.e., an ACOE permit or FERC certificate) to conduct an activity that may result in a discharge into waters of the U.S. must obtain a state 401 water quality certification. Such activity or discharge must be consistent with the provisions of the federal Clean Water Act and with the Connecticut Water Quality Standards. In reviewing requests for water quality certification, DEP must consider the effects of proposed discharges on ground and surface water quality, and on existing and designated uses of the waters of the state.

- Cultural Resources Protection. NEPA requires an evaluation of the potential impacts of a proposed project on historic and archaeological resources, including submerged cultural sites. In addition, NHPA establishes a National Register of Historic Places (Historic Register) and requires that all federal agencies consider the effect of their action on properties eligible for listing in the Historic Register. This evaluation is the responsibility of the State Historic Preservation Officer (SHPO), which each state is required to have by NHPA. Thus, federal agency review processes, including those of the FERC and the ACOE, must incorporate cultural resource evaluation and protection measures, pursuant to the NHPA.

  The Connecticut Historical Commission (CHC) is responsible under state statute for overseeing the protection of the state's cultural resources. The CHC's Executive Director is the designated SHPO required under NHPA. The legislature created the CHC to, among other things, study, investigate, and encourage the preservation of historic resources, including archaeological sites (CGS Section 10-321). Under CGS Section 10-321(b)(13) the CHC may "review planned state and federal actions to determine their impact on historic structures and landmarks...." Historic structures and landmarks are defined to include "sacred sites and archaeological sites." Pursuant to PUESA, the CHC is among the Connecticut agencies designated to comment on all projects before the Siting Council.

2.2.5 New York Jurisdiction and Certification Criteria

New York Public Service Commission

Unlike Connecticut, New York has separate siting laws pertaining to electric generation facilities and to intrastate natural gas and electric transmission facilities.

The state laws applicable to electric transmission siting and electric generation facilities are Article VII and Article X of the New York Public Service Law, respectively. Article VII governs the siting of major utility transmission facilities,[80] and requires a project

[80] Generally defined as an electric transmission line of a design capacity of 125 kV or more extending a distance of one mile or more, or 100-125 kV and extending more than 10 miles (excluding certain

proponent to obtain a Certificate of Environmental Compatibility and Public Need from the New York Public Service Commission (NYSPSC) to construct such a facility. Article VII does not apply to any major utility transmission facility, such as an interstate gas pipeline, over which the FERC has exclusive jurisdiction.[81] However, the NYSPSC typically participates in the FERC regulatory review process.

Under Article VII, applications for major transmission facilities subject to the law are filed with the NYSPSC, which has sole jurisdiction for issuing certificates. Other New York and local agencies typically participate in the Article VII process, which is broadly similar to that of the Siting Council. By law, the NYSPSC may not issue a certificate unless it finds and determines:

(a) the basis of the need for the facility;

(b) the nature of the probable environmental impact;

(c) that the facility represents the minimum adverse environmental impact, considering the state of available technology and the nature and economics of the various alternatives, and other pertinent considerations including but not limited to, the effect on agricultural lands, wetlands, parklands and river corridors traversed;

(d) in the case of an electric transmission line, (1) what part, if any, of the line shall be located underground; (2) that such facility conforms to a long-range plan for expansion of the electric power grid of the electric systems serving this state and interconnected utility systems, which will serve the interests of electric system economy and reliability;

(e) in the case of a gas transmission line, that the location of the line will not pose an undue hazard to persons or property along the area traversed by the line;

(f) that the location of the facility, as proposed, conforms to applicable state and local laws and regulations issued thereunder, all of which shall be binding upon the commission, except that the commission may refuse to apply any local ordinance, law, resolution or other action or any regulation issued thereunder or any local standard or requirement which would be otherwise applicable if it finds that as applied to the proposed facility such is unreasonably restrictive in view of the existing technology, or of factors of cost or economics, or of the needs of consumers whether located inside or outside of such municipality; and

underground lines); or a fuel gas transmission line extending a distance of 1,000 feet or more to be used to transport fuel gas at pressures of 125 psi or greater (excluding underground lines less than one mile that replace existing lines).

[81] Public Service Law Article VII Section 121.4.

(g) that the facility will serve the public interest, convenience, and necessity.[82]

Additionally, with respect to an "electric transmission line to be constructed by the New York Power Authority (NYPA) and located in part under the waters of Long Island Sound and for the remaining part underground, the commission shall make only the findings and determinations required by paragraphs (b), (c) and (f)…." Under this exemption, NYPA projects beneath Long Island Sound are not required to meet the "needs" test. Merchant electric transmission projects are not explicitly afforded the same exemption.

Other New York Agencies with Jurisdiction Over Long Island Sound

In addition to the NYSPSC, several other state agencies administer regulatory programs that pertain to projects in Long Island Sound. These agencies are briefly identified below:

- NYSDEC. This agency administers the state's environmental regulatory programs, including those concerning tidal wetlands; Section 401 water quality certifications; and air, water, and biological resources. NYSDEC typically participates in the Article VII process for electric transmission facilities. However, unlike DEP, it does not have independent permitting authority over electric transmission facilities. For FERC-regulated interstate natural gas pipeline projects, which are not subject to NYSPSC jurisdiction, the NYSDEC is usually the lead state permitting agency. The NYSDEC also typically coordinates with the involved federal agencies, such as the FERC and the ACOE.

- NYSDOS. The NYSDOS is responsible for administering the state's coastal zone management program, including the review of coastal consistency applications.

- NYSHPO. The New York Office of Parks, Recreation and Historic Preservation acts as the NYSHPO and is responsible for overseeing the protection of the state's cultural resources. The SHPO in New York has the same functions as those described above for the SHPO in Connecticut.

2.2.6 Long Island Sound Management Programs

Long Island Sound's resources are directly influenced by land use patterns and management in nearby upland areas, such as discharges from sewage treatment plants, storm sewers, and non-point sources of pollution. The State of Connecticut has invested considerable effort in assessing and managing Long Island Sound. In addition, through implementation of the Connecticut Coastal Management Program, DEP strives to balance the protection of coastal resources with maintaining the state's economic investment in

[82] New York Consolidated Laws Public Service Article VII Sec. 126.

water dependent uses in the coastal area. Some areas addressed by the program include: public access, harbor management, coastal habitat restoration, coastal permitting, municipal development, urban waterfront revitalization, and protecting the public trust. As a result of the Coastal Management Program, over 13.9 miles of public access have been added and 1,600 acres of tidal wetland have been restored.

Other Long Island Sound management programs include the LISS and the CCMP referenced earlier. Active participants include federal, New York and Connecticut government officials, researchers, user groups and other concerned organizations and individuals. The partners recently signed the Long Island Sound 2003 Agreement pledging their continued commitment to goals of the CCMP and the conservation and management of Long Island Sound.

2.3 REGIONAL ENERGY NEEDS AND INFRASTRUCTURE

In general terms, PA No. 02-95 requires the Task Force to examine approaches for avoiding or minimizing construction of new energy and telecommunications infrastructure across Long Island Sound, and evaluating the reliability and operational impacts to the state and region attributable to such limitations on new cross-Sound infrastructure. To address these issues, it is imperative to first understand the energy needs and existing infrastructure within Connecticut and the region. In the context of protecting Long Island Sound, the "region" specifically includes both Connecticut and Long Island. As an island, nearly all of Long Island's fuel portfolio used for heating, transportation, industrial production, and electrical generation must be imported by tanker, barge, truck, or pipeline across the surrounding bodies of water. Long Island's indigenous energy supplies are at present, limited to solar power, solid waste and landfill gas, wind, and other potential renewable energy sources, which can meet only a small percentage of Long Island's energy requirements. Long Island also relies on electric cable interconnections with Connecticut and New York City across Long Island Sound and the East River, respectively. For these reasons, an evaluation of alternatives or limitations to new Long Island Sound energy infrastructure crossings must be based in part on an understanding of Long Island's energy demand, generation capacity, fuel sources, imports, and the electric and gas transmission infrastructure serving Long Island, and to a certain extent, the adjacent New York City boroughs of Queens and Brooklyn.

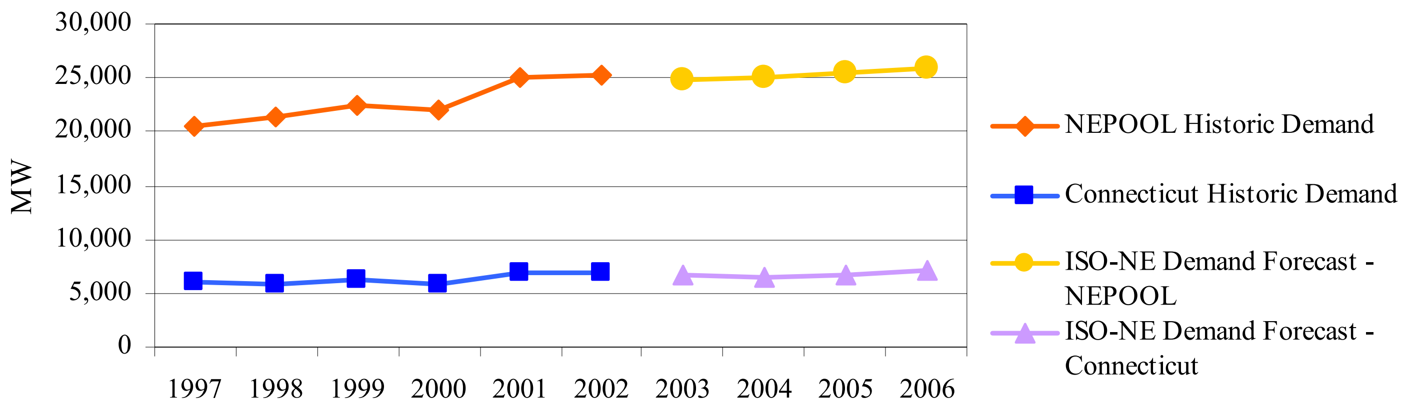
In the Assessment Report Part I, the energy infrastructure and reliability of SWCT was discussed in the context of the state's resources within the New England electric grid, operated by New England's Independent System Operator (ISO-NE). This section of the Assessment Report Part II, which summarizes the Connecticut information previously presented in Part I, presents equivalent information for Long Island, and focuses on the electric and gas interconnections between Connecticut and New York.

2.3.1 Electric Reliability in Connecticut

Electric Load

Connecticut comprises approximately 27% of the peak electric load and approximately 26% of the total electric consumption in New England. Figure 1 shows the growth in Connecticut's peak load as well as New England since 1997. While Connecticut's customer load has been increasing over time, unusually hot and humid weather during the summers of 2001 and 2002 contributed significantly to the accelerated peak load growth. In 2001, Connecticut's summer peak load was 6,799 MW, exceeding the prior year's record peak by 899 MW. The 2001 record peak load was eclipsed in 2002 when the new record of 6,884 MW was set on July 3, 2002. ISO-NE forecasts that the state's peak load will reach 7,023 MW by 2006 under normal weather conditions as the state's population and economy grow.[83]

Figure 1 – Historic Peak Load Growth in Connecticut and New England



Region-wide, the peak load in New England reached 25,348[84] MW during the summer of 2002, 1,148 MW greater than the peak demand of 24,200 MW forecasted by ISO-NE earlier in the year under normal weather conditions, but 152 MW less than the 25,500 MW peak demand forecasted by ISO-NE under extreme weather conditions. During this decade, ISO-NE expects regional peak load to grow at an annual rate of 1.6% from 2001 to 2011.[85]

Connecticut's utilities are required to forecast incremental total electricity consumption and provide such information annually to the Siting Council. According to the Siting

[83] ISO-NE *Technical Assessment of the Generating Resources Required to Reliably Operate Connecticut's Bulk Electric System 2003 and 2006*. Final Report. System Planning, January 29, 2003.
[84] ISO-New England.
[85] ISO-NE, *2002 Capacity Energy Load and Transmission (CELT) Report*, April 1, 2002.

Council Forecast of Loads and Resources, total electricity requirements in Connecticut are projected to grow at an annual average growth rate of 1.1%, to 36,064 GWh in 2011.[86]

Generation Resources

Connecticut's installed electric generating capacity currently totals 7,037 MW based on summer ratings.

Table 5 – Connecticut's Electric Generation Capacity[87]

Station Name (location)	Owner or Primary Contract Holder[88]	Summer Capability (MW)	Primary Energy Source	Alt Energy Source	Commercial Operation
AES Thames (Montville)	NU	181	Coal	DFO	12/1/1989
Branford 10 (Branford)	NRG	16	Jet Fuel		1/1/1969
Bridgeport Energy 1 (Bridgeport)	Duke Energy	448	Gas		8/1/1998
Bridgeport Harbor 2 (Bridgeport)	PSEG	34	RFO		8/1/1961
Bridgeport Harbor 3 (Bridgeport)	PSEG	372	Coal	RFO	8/1/1968
Bridgeport Harbor 4 (Bridgeport)	PSEG	10	Jet Fuel		10/1/1967
Bridgeport RESCO (Bridgeport)	UI	59	MSW		4/1/1988
Bristol Refuse (Bristol)	NU	13	MSW	DFO	5/1/1988
Bulls Bridge (New Milford)	Select Energy Inc.	8	Hydro		1/1/1903
CDECCA (Hartford)	El Paso Merchant Energy	55	Gas	DFO	11/1/1988
Cos Cob 10 (Greenwich)	NRG	18	Jet Fuel		9/1/1969
Cos Cob 11 (Greenwich)	NRG	18	Jet Fuel		1/1/1969
Cos Cob 12 (Greenwich)	NRG	16	Jet Fuel		1/1/1969
Derby Dam (Shelton)	NU	7	Hydro		3/1/1989
Devon 11 (Milford)	NRG	30	Gas	DFO	10/1/1996
Devon 12(Milford)	NRG	30	Gas	DFO	10/1/1996
Devon 13(Milford)	NRG	33	Gas	DFO	10/1/1996
Devon 14(Milford)	NRG	30	Gas	DFO	10/1/1996
Devon 7(Milford)	NRG .	107	RFO	NG	1/1/1956
Devon 8(Milford)	NRG	107	RFO	NG	1/1/1958
Dexter (Windsor Locks)	NU	38	Gas	DFO	5/1/1990
Exeter (Sterling)	NU	26	Tires	DFO	12/1/1991
Falls Village (Canaan)	Select Energy Inc.	10	Hydro		1/1/1914
Franklin Drive 10 (Torrington)	NRG	16	Jet Fuel		11/1/1968
Lake Road 1 (Killingly)	PG&E	223	Gas	DFO	7/1/2001
Lake Road 2 (Killingly)	PG&E	231	Gas	DFO	11/1/2001
Lake Road 3 (Killingly)	PG&E	237	Gas	DFO	5/1/2002

[86] Connecticut Siting Council, *Review of the Connecticut Electric Utilities' Ten-Year Forecasts of Loads and Resources, 2002*.

[87] ISO-NE, *2003 Capacity Energy Load and Transmission (CELT) Report*, April 2003 Does not include units less than 5 MW or units where all generation is used on-site by host.

[88] Primary Contract Holder is shown where the project owner is not a NEPOOL participant

Station Name (location)	Owner or Primary Contract Holder[88]	Summer Capability (MW)	Primary Energy Source	Alt Energy Source	Commercial Operation
Lisbon Resource Recovery (Lisbon)	NU	13	MSW		1/1/1996
Middletown 10 (Middletown)	NRG	17	Jet Fuel		1/1/1966
Middletown 2 (Middletown)	NRG	117	RFO	NG	1/1/1958
Middletown 3 (Middletown)	NRG	236	RFO	NG	1/1/1964
Middletown 4 (Middletown)	NRG	400	RFO		6/1/1973
Millstone Point 2 (Waterford)	Dominion Nuclear CT, Inc.	872	Nuclear		12/1/1975
Millstone Point 3 (Waterford)	Dominion Nuclear CT, Inc.	54	Nuclear		4/1/1986
Millstone Point 3 (Waterford)	Dominion Nuclear CT, Inc.	20	Nuclear		4/1/1986
Millstone Point 3 (Waterford)	Dominion Nuclear CT, Inc.	1057	Nuclear		4/1/1986
Montville 10 & 11 (Montville)	NRG	5	DFO		1/1/1967
Montville 5 (Montville)	NRG	81	RFO	NG	1/1/1954
Montville 6 (Montville)	NRG	407	RFO		7/1/1971
New Haven Harbor (New Haven)	PSEG	461	RFO	NG	8/1/1975
Norwalk Harbor 1 (Norwalk)	NRG	162	RFO		1/1/1960
Norwalk Harbor 2 (Norwalk)	NRG	168	RFO		1/1/1963
Norwich Jet (Norwich)	CMEEC	15	DFO		9/1/1972
Wallingford Unit 1	PPL	45	Gas		7/31/2001
Wallingford Unit 2	PPL	41	Gas		7/31/2001
Wallingford Unit 3	PPL	46	Gas		7/31/2001
Wallingford Unit 4	PPL	42	Gas		7/31/2001
Wallingford Unit 5	PPL	41	Gas		7/31/2001
Rainbow Windsor	NU	8	Hydro		1/1/1980
Rocky River (New Milford)	Select Energy Inc.	29	Hydro		1/1/1929
SCRRA-Preston	NU	16	MSW	DFO	1/1/1992
Shepaug (Southbury)	Select Energy Inc.	42	Hydro		1/1/1955
So. Meadow 11 (Hartford)	Select Energy Inc.	36	Jet Fuel		8/1/1970
So. Meadow 12 (Hartford)	Select Energy Inc.	38	Jet Fuel		8/1/1970
So. Meadow 13 (Hartford)	Select Energy Inc.	38	Jet Fuel		8/1/1970
So. Meadow 14 (Hartford)	Select Energy Inc.	37	Jet Fuel		8/1/1970
So. Meadow 5 (Hartford)	NU	26	MSW		11/1/1987
So. Meadow 6 (Hartford)	NU	27	MSW		11/1/1987
Stevenson (Monroe)	Select Energy Inc.	28	Hydro		1/1/1936
Torrington Terminal 10 (Torrington)	NRG	16	Jet Fuel		8/1/1967
Tunnel 10 (Preston)	Select Energy Inc.	17	Jet Fuel		1/1/1969
Wallingford Refuse (Wallingford)	NU	6	MSW	DFO	3/1/1989
Total		7,037			

The total installed capacity includes 1,042 MW from the new gas turbines at Wallingford (250 MW)[89] and the Lake Road facility in Killingly (792 MW), which began commercial operation in 2002. Although the Lake Road generation facility is physically located in Connecticut, electrically it is considered to be interconnected in Rhode Island. Several other projects are in development, but have not yet begun commercial operation, including:

- Milford Power, which consists of two gas-fired 268 MW (536 total MW) combined cycle turbine units (summer rating). Construction is nearly complete, but due to contractual and legal issues, commercial operation could be delayed to late 2003 or even beyond.

- Quinnipiac Energy intends to refurbish the formerly deactivated English Station in New Haven, and operate it as an oil-fired peaking facility consisting of two 35 MW steam turbine generators (70 MW total). Commercial operation is expected in 2003.

- Meriden Power, which consists of two gas fired 235 MW combined cycle turbine units (470 total MW). Construction at the Meriden project is inactive. The project is reportedly near bankruptcy, but has received an extension from the Siting Council.

- Oxford Power (also referred to as Towantic Energy), which consists of two combined cycle gas-fired combustion turbines totaling 536 MW. The Oxford project received Siting Council approval, but has not yet commenced construction due to litigation. Moreover, ISO-NE approval was rescinded in March 2003.

- Kleen Energy Systems, which consists of two gas-fired combined cycle turbines totaling 520 MW. This project was certificated by the Siting Council in November 2002. However, this unit has not received ISO-NE approval to start commercial operation.

At present, 67% of the installed electric generation capacity geographically located in Connecticut is derived from fossil fuels, approximately 28% is derived from Millstone #2 and #3 nuclear units, and approximately 5% is derived from hydropower and solid waste (Figure 2).

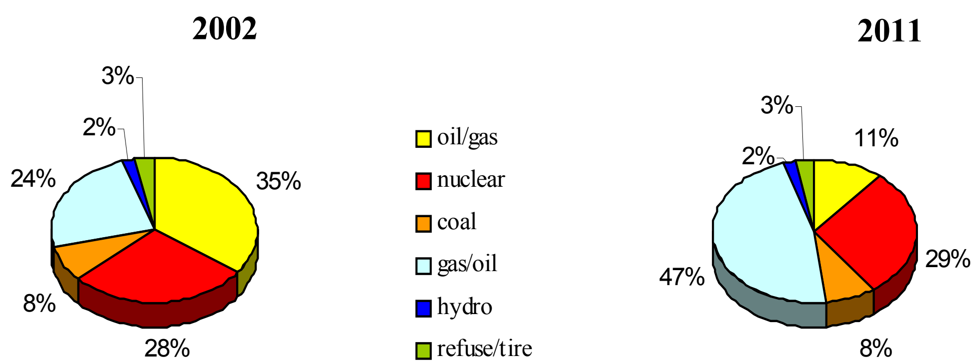
With the exception of Quinnipiac Energy's refurbishment of the old English Station, virtually all new generation capacity installed in Connecticut since 1999 or under construction is gas-fired. In addition, there is approximately 2,209 MW of oil- and gas-

[89] PPL Wallingford recently made filings with ISO-NE seeking to temporarily deactivate four (4) of the five (5) LM6000 simple cycle gas-fired generating units for a period of two (2) to four (4) years beginning on or before July 1, 2003.

fired quick-start generating units in New England[90] that are often forced to operate under uneconomic dispatch. For 2002, ISO-NE issued an RFP and developed 80 MW of temporary demand response capability for SWCT. In the spring of 2003, CL&P issued two RFPs seeking up to 80 MW of additional generation for SWCT for the summer 2003 peak load period.

In response to low cost natural gas in the second half of the 1990s, continued turbine technology improvements, new supply sources from Atlantic Canada, and increasingly stringent environmental emissions restrictions, natural gas has become the fuel of choice for new generation throughout New England. Upon commercialization of the remaining generation capacity that has received Siting Council approval, the new fleet of gas fired plants, with or without backup fuel oil capability, will become the predominant generation technology type in Connecticut (Figure 2).

Figure 2 – Connecticut's Electric Capacity Fuel Mix[91]



Transmission Infrastructure

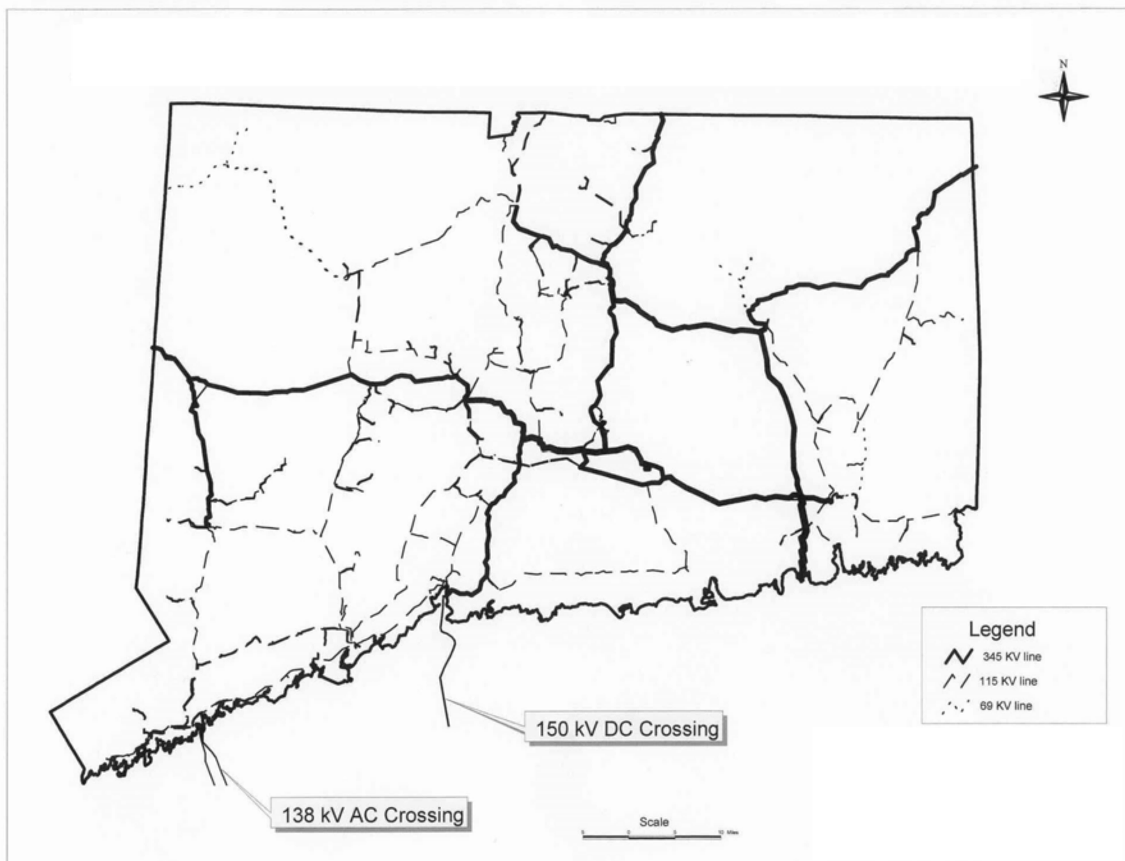
CL&P and United Illuminating (UI) own a total of 1,807 circuit miles of transmission lines within Connecticut. Connecticut's utility ownership of transmission lines is shown in Figure 3 and Table 6.

These lines are part of the NEPOOL high voltage transmission grid, consisting of over 8,225 miles of power lines rated 69 kilovolts (kV) and above. The 345 kV system is the backbone of the New England grid, extending from coastal Maine to south-central Connecticut. High-voltage east-west 345 kV segments also traverse central Connecticut, but do not extend into SWCT. As discussed in Part I, SWCT is served by 115 kV lines that interconnect with the 345 kV system in Bethel, Southington, and Watertown to the north and in New Haven to the east. In north-central Connecticut, the 345 kV system

[90] ISO-NE Seasonal Claimed Capability (SCC) Report as of 5/01/03 (summary information on p. 10) May 2003 Excel file at: http://www.iso-ne.com/seasonal_claim_capability_report/.
[91] Source: Connecticut Siting Council Forecast of Loads and Resources 2002.

interconnects the CL&P service territory to its affiliate utility, Western Massachusetts Electric Company, in Ludlow, Massachusetts. To the east, the 345 kV transmission system in Connecticut interconnects with the National Grid-owned portion of the NEPOOL grid in Rhode Island. Other 115 kV interconnections with Massachusetts and Rhode Island are also part of the NEPOOL grid.

Figure 3 – Connecticut Electric Transmission Map[92]



[92] Source: ISE, based on data submitted by CL&P to the Siting Council.

Table 6 – New England and Connecticut Electric Transmission Lines (miles)

Voltage Ratings	New England	CL&P	UI
HVDC line	192	0	0
345 kV	1,769	392.3	6.1
230 kV	481	0	0
69, 115 & 138 kV	5,909	1,296.4	113.0
Total	8,351	1,688.7	119.1

Most of New England's high voltage transmission lines are Pool Transmission Facilities (PTF), providing regional transmission and reliability services. The PTF are operated by ISO-NE, but are owned and maintained by the transmission owner members of NEPOOL. The costs of expanding and maintaining PTF assets are recovered by the transmission owners through regional network service transmission tariffs approved by FERC and administered by ISO-NE.

New England Interties

New England has historically maintained important transmission interconnections with surrounding control areas. The transmission circuits between neighboring control areas provide access to low cost energy while helping to maintain grid reliability and voltage stability. New England's interties consist of both AC interties with New York and New Brunswick, and DC high voltage connections with Hydro Quebec. The Phase II DC line with Hydro Quebec provides 1200 - 1500 MW of transfer capability into the 345 kV Sandy Pond Substation in Ayer, Massachusetts. Also to the north, there is a DC link to Vermont with Hydro Quebec rated at 225 MW and an AC link with New Brunswick Power rated at 700 MW.

A number of transmission connections allow for exports and imports between New England and New York. In west-central Connecticut, the New England grid is connected to the New York Power Pool grid by a 345 kV intertie at Long Mountain (NU Line 398). To the south, the two control areas are connected by a 138 kV AC cable across Long Island Sound between Norwalk Harbor and Northport, New York (1385 Line). The 1385 Line is jointly owned by NU and the Long Island Power Authority (LIPA).

Cross-Sound Cable is a 330 MW high voltage direct current (HVDC) merchant transmission line connecting the 345 kV system in New Haven with the 138 kV system on Long Island at Brookhaven, New York. As discussed in Section 2.6.1, this cable has not commenced commercial operation. In the short term, power on Cross-Sound Cable is expected to flow predominantly from ISO-NE to Long Island, subject to authorization. As a controllable DC cable, the power flow on the Cross-Sound Cable is bidirectional and controllable; therefore, during emergency and peak demand periods, Connecticut could import power from Long Island, if it were available.

Outside Connecticut, the New England grid is also connected to the New York control area by a 345 kV line from the Alps substation in New York to the Berkshire substation in western Massachusetts, a 230 kV line to Bear Swamp substation in Massachusetts, and three 115 kV lines from upstate New York to Vermont. The net transfer capability of all of the interconnections between New York and New England ranges from 1,400 MW to 1,700 MW in the summer and winter, respectively.[93] The transfer capability from New England to New York ranges from 1,000 MW to 1,675 MW in the summer and winter, respectively (Table 7).

Table 7 – Transfer Capability New England to New York (MW)

	NE to NY	NY to NE
Summer	1,000	1,400
Winter	1,675	1,700

From 1999 to 2001, New York has been a net exporter of power to New England.[94] In 2001, the net energy flow was into New England from New York, about 87% of the year. Power flows into New England generally reflect the availability of lower priced hydropower and coal-fired generation from upstate and western New York to higher value areas in New England. This percentage has slightly decreased since 1999 and may decrease further as new gas-fired generation capacity continues to come on-line throughout New England.

According to data compiled by NYISO, the interface flows on the interties from west-central Connecticut to New York (Line 398) and from Northport, Long Island to Norwalk Harbor (1385 Line) both have historically experienced bi-directional power flows.[95] The magnitude and direction of flow has varied significantly on a monthly basis. Over the period of record, power flowed from New York to New England on Line 398 for the majority of hours during 1998, 1999, and 2001. The opposite was true in 2000. Flow on the 1385 Line has historically been predominantly from Connecticut to Long Island, but there have been hours in nearly each month of record when power flowed from Long Island into Connecticut (Figure 4).

The 1385 Line is operated at lower power levels so that it can respond to a contingency on either side of the interconnection by allowing power to flow to where it is most needed. This line helps LIPA meet its peak load requirements and helps CL&P to maintain reliability in the SWCT[96] area. The transfer of electricity within New England

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93 ISO-NE RTEP02

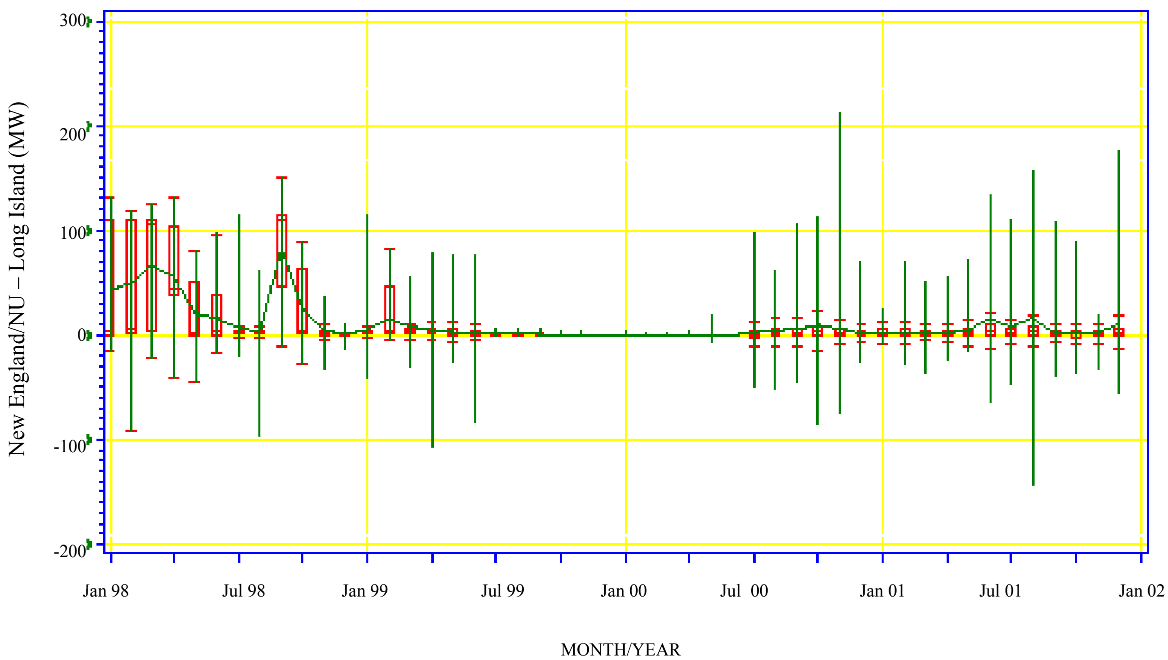
94 NYISO 2001 Transmission Performance Report, NYISO Operations and Engineering, April 2002. See http://www.nyiso.com/services/documents/studies/index.html#os

95 *Ibid*.

96 SWCT defined by ISO as: **(1) SWCT:** Southwestern Connecticut, an RTEP sub-area; (2) **SWCT (geographic):** SWCT consists of the following 52 towns and municipalities: Branford, Bridgeport, Darien, Easton, Fairfield, Greenwich, New Canaan, Norwalk, Redding, Ridgefield, Stamford, Weston, Westport, Wilton, Ansonia, Branford, Beacon Falls, Bethany, Bethel, Bridgewater, Brookfield, Cheshire, Danbury, Derby, East Haven, Hamden, Meriden, Middlebury, Milford, Monroe, Naugatuck, New

and to the other control areas has been based on market forces, and the need to meet reliability, voltage, and stability requirements.

Figure 4 – Historical Average Interface Flow Northport to Norwalk Harbor 1385 Line[97]



Resource Adequacy

The Siting Council provides a Forecast of Loads and Resources in Connecticut over a ten-year planning horizon. This inventory of resource availability includes installed capacity, anticipated capacity additions and retirements, transmission import capability, and load management actions. The Siting Council's forecast estimates reserve margins

Fairfield, New Milford, New Haven, Newtown, North Branford, North Haven, Orange, Oxford, Prospect, Roxbury, Seymour, Shelton, Southbury, Stratford, Trumbull, Wallingford, Waterbury, Watertown, West Haven, Woodbridge, and Woodbury; and (3) **SWCT (**electrical): The area served by the four 115 kV busses in Bethel, Watertown, Southington, and New Haven.

[97] NYISO Operations Engineering, 2001 Transmission Performance Report, April 2002. The y-axis of this "box and whiskers" plot represents MW transferred each month from New England to New York. A negative value signifies net transfer from New York to New England. The vertical lines (whiskers) represent the span between the maximum and minimum values for each month. The red bars represent the interquartile range, in which 50% of the data values lie. The bar in the middle of the box is the statistical median. The tick marks on the whiskers separate the extremes (1.5 times the interquartile range) from the remainder of the monthly data points.

of 45% and 31% for 2004 and 2011, respectively.[98] Based on the estimated reserve margins, the Siting Council report concludes that, "The State's supply resources are anticipated to be adequate to meet demand during the forecast period, provided all active generators committed to the ISO-NE remain available for continuing use. However, some subregions such as southwest Connecticut are threatened with supply deficiencies and voltage instability problems due to insufficient transmission and inadequate resources within the region."

The calculation of reserve margin for Connecticut alone obscures the fact that system reliability must be required by both generation resources as well as transmission capacity. Resource adequacy analysis and planning are conducted on a regional basis by ISO-NE. As discussed in the Assessment Report Part I and in Section 2.2.1 of this report, ISO-NE plans and operates the New England bulk power system to criteria that address both adequacy of generating resources to meet projected demand, and that comply with transmission planning/operating criteria set forth in NEPOOL's Planning Procedures. ISO-NE's transmission expansion plan is based on the reliability criterion that the bulk power system should not fail to meet load more than once every ten years.[99] This criterion is probabilistically calculated as a LOLE by simulating the operation of the bulk power system, reflecting scheduled maintenance and unscheduled (or forced) outages of both generation and transmission assets, as well as unusual customer demands.

In the 2002 Regional Transmission Expansion Plan Report (RTEP02 Report), ISO-NE transmission planners concluded that SWCT, and particularly the Norwalk-Stamford sub-area (NOR), will have severe reliability problems beginning in 2004 if the largest single generation source in the area, the Milford Power project, fails to achieve commercial operation. Even if the Milford Power project begins operating, SWCT and especially the NOR sub-area, will have reliability problems in later years if other generation or other transmission resources do not become available.

Under current operating conditions, ISO-NE has designated SWCT, including the NOR sub-area, as a deficient load pocket due to transmission constraints. Deficient load pockets require the operation of more expensive local generation to meet moderate and peak load requirements because less expensive electric generation outside of the load pocket can not be transported to serve local load. The additional costs to run more expensive generation "out of merit order" is paid by customers in the form of congestion charges. Under ISO-NE's Standard Market Design (SMD) rules, as of March 1, 2003, the congestion charges for SWCT including the Norwalk-Stamford sub-area will be paid for by Connecticut customers alone, and will no longer be socialized across all of New England. ISO-NE has estimated that the projected congestion costs in New England

[98] Connecticut Siting Council, Review of the Connecticut Electric Utilities' Ten-Year Forecasts of Loads and Resources, 2002. The reserve margin scenario calculation assumes that all units 40 years and older will be retired by 2011. Estimated state resources also include transmission import capability and demand response actions.

[99] This criterion refers to the bulk power system, comprised of generation and transmission assets, and does not include utility distribution systems.

under SMD could range from $50 to $300 million in 2003, with most of these costs attributable to SWCT.[100]

In addition to the RTEP02 Report, ISO-NE has prepared several recent studies focused on electric reliability in Connecticut. ISO-NE's recent assessment of the generating resources in Connecticut utilized the LOLE method in addition to other analytical tools to assess system reliability through 2006.[101] For planning purposes, this study does not include the Lake Road, Killingly, Connecticut generating facility among the generation resources available to directly serve Connecticut load, because it is electrically in the Rhode Island RTEP sub-area. In addition, ISO-NE also excluded one-third of the quick start peaking capacity in Connecticut, about 109 MW, based on ISO-NE's experience that this is the approximate amount of generation that has historically failed to start when called on in emergencies to operate. Based on this analysis, the available installed capacity in Connecticut is 6,138 MW (summer capacity).[102]

This report contained the following key conclusions:

- All existing generation in Connecticut is required to ensure reliability of service, unless new resources are added or transmission improvements are made.

- Additional new resources are needed in SWCT to ensure the reliability of service. These resources will provide the greatest value if placed in the NOR sub-area. Additional resources placed elsewhere in SWCT would also provide benefits, but to a lesser degree.

- To meet the 2003 high demand load periods and average forced outage scenario, about 300 MW of new resources are needed in SWCT to supplement the existing generation resources. Assuming both new Milford Power generating units achieve commercial operation and Devon units 7 and 8 are deactivated, 140 MW would still be needed under an average forced outage scenario.

- When the 2006 reference or high demand cases are considered, about 480 MW of new resources will be needed to supplement the existing system. With both Milford units operating by 2006, this shortfall is reduced to a range of 170 to 300 MW, depending on the demand and forced outage scenario considered.

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[100] RTEP02 Report

[101] ISO-NE, System Planning. January 29, 2003. Technical Assessment of the Generating Resources Required to Reliably Operate Connecticut's Bulk Electric System 2003 and 2006. Final Report.

[102] The resource inventory assumes that all plants will be able to comply with the requirements of Public Act No. 02-64, which imposes sulfur dioxide emission limits on older oil-fired generators by the end of 2004. Potentially 2,700 MW of generation in Milford, New Haven, Norwalk, Bridgeport, Montville, and Middletown are subject to these new rules.

2.3.2 Electric Reliability on Long Island and the New York Region

Long Island's electrical service is primarily provided by LIPA. LIPA is responsible for providing electric service to 1.1 million customers.[103] In 2001, 52% of normalized sales were to the approximately 103,000 industrial and commercial customers, while 46% were to the approximately 960,000 residential customers.[104]

LIPA was created by New York legislation enacted in 1986 to resolve the controversy over the Shoreham Nuclear Power Plant (Shoreham) and to seek lower utility rates for customers on Long Island. In May 1998, LIPA acquired the stock of the Long Island Lighting Company (LILCO), and thereby assumed LILCO's transmission and distribution system, its interest in Nine Mile Point 2 nuclear plant, and its Shoreham regulatory asset, and became responsible for serving electric customers on Long Island. LIPA's acquisition of LILCO resulted in average rate reductions of 20%[105]

At the same time, Brooklyn Union Gas merged with LILCO to form KeySpan. The merged company retained LILCO's natural gas distribution business on Long Island and the electric generation facilities in Nassau and Suffolk counties. LILCO also transferred its on-Island electric generation and gas system to operating subsidiaries wholly owned by KeySpan. Under KeySpan's holding company structure, KeySpan has since expanded by acquiring other gas distribution and generation assets throughout the Northeast, most notably Eastern Enterprises. KeySpan's electric services segment (KES) has subsidiaries that operate LIPA's electric transmission and distribution system, and supply LIPA with energy conversion and ancillary services that allow LIPA to provide electricity to its customers.
KeySpan's on-Island electric generation capacity is about 4,000 MW of electricity from five base-load plants and 42 gas turbines and diesel peaking units located in Nassau and Suffolk Counties and the Rockaway Peninsula in Queens. KeySpan also includes subsidiaries that own, lease and operate the 2,200 MW Ravenswood generation plant in Queens, New York.

Electric Load on Long Island

LIPA estimates that the annual demand for electricity on Long Island will grow at a rate of approximately 90 MW per year, as energy intensity increases and population grows, particularly in Suffolk County.[106] This estimate, however, is based on "normal"

[103] LIPA Draft Energy Plan, October 17, 2002, p. 8.
[104] LIPA Draft Energy Plan, October 17, 2002, p. 3-2.
[105] LIPA Draft Energy Plan, October 17, 2002, p. 1-5.
[106] The 2002 Long Island Population Survey estimates that as of January 1, 2002, the total population of the Nassau-Suffolk region was 2.78 million people – an increase of 16,877 persons (0.6%) over the number reported in LIPA's 2001 survey. Importantly, the survey also calculated an increase in household electric use from 615 kilowatt hours (kWh) per month in 1990 to 728 kWh per month in 2002 – a jump of 18.5% despite the fact that the average household size decreased by 1.4%.

weather.[107] During the summer of 2002, extremely hot weather caused an increase in peak load of more than 130 MW to 5,059 MW (excludes municipal load not supplied by NYPA, approximately 36 MW), representing a 2.7% increase over the prior year, exceeding the forecasted peak load of 4,775 MW.[108] In fact, many usage records were set during the summer of 2002. For the entire month of July 2002, the LIPA requirements were 2.289 million MWh, 17% higher than July 2001. During August 2002, a new weekend record of peak demand of 4,447 MW was set.[109]

According to the NYISO 2002 Gold Book, LIPA's peak load was expected to grow 1.85% from 2002 to 2003, assuming normal weather in both years, and 1.61% per year, on average, over the next 20 years. In January 2003, LIPA projected a demand growth of 1.9% for 2003 and 1.7% thereafter.[110] If heat and humidity are unlike that in a "normal" year, actual peak load growth could be higher or lower.

Generation Resources

As an island with limited transmission capability to import power, Long Island has had to rely heavily upon on-island generation resources. Generation facilities located on Long Island for 2002 had a maximum capacity of approximately 4,885 MW (summer rating). The majority of these facilities are aging fossil steam units and combustion turbines owned by KeySpan (Table 8). LIPA has the contractual right to the total capacity and output of the KeySpan units. In addition to the KeySpan generation, LIPA also owns an 18% share in Nine Mile Point 2 nuclear plant and has several power purchase agreements with NYPA and independent power producers on and off the Island. These power purchase resources total 784 MW (Table 8).

Between 1977 and 2001, approximately 650 MW of new electric generation capacity was brought on line on Long Island. These facilities include the 251 MW Wading River plant, NYPA's 145 MW Richard M. Flynn plant, and a range of smaller combined cycle and resource recovery (waste-to-energy) units. Over the same period, peak load grew by 1,674 MW.

To address growing customer demand, LIPA entered into agreements with Calpine, FPL Energy, KeySpan Energy Development and PPL Global to install 408 MW of new combustion turbines (LM6000s) on a fast-track basis in preparation for the summer 2002 peak. The total capability listed in Table 8 does not include 200 MW of portable flatbed truck-mounted emergency generators that were also installed on a temporary basis last summer. The emergency units were operated as part of LIPA's demand response

[107] Normal weather is generally calculated as the average heating and cooling requirements, determined as "degree days" over the prior 30-year period.
[108] LIPA Government Officials / Major Account Customer Briefing, Huntington Hilton, June 11, 2002.
[109] Updated information provided by LIPA.
[110] *Ibid*.

program, discussed in Section 2.8.5. These units were removed from service following the summer of 2002, but LIPA retains the ability to redeploy them based on need.[111]

Table 8 – Long Island Generation Resources[112]

Facility	Summer DMNC Rating	Fuel	Year of Commercial Operation
Steam Turbines			
E.F. Barrett 1, 2	389	Gas, Oil	1956, 1963
Far Rockaway 4	110	Gas	1953
Glenwood 4, 5	229	Gas	1952, 1954
Northport 1 – 4	1,520	Gas, Oil	1967 - 1977
Port Jefferson 3,4	386	Gas, Oil	1958, 1960
Subtotal	2,634		
Combustion Turbines			
E.F. Barrett 1-12	330	Gas, Oil	1970-1971
Wading River	251	Oil	1989
East Hampton 1	22	Oil	1970
Glenwood 1-3	121	Oil	1967-1972
Holtsville 1-10	570	Oil	1974-1975
Northport G-1	15	Oil	1967
Port Jefferson G-1	15	Oil	1966
Shoreham	65	Oil	1966, 1971
Southhampton 1	10	Oil	1963
Southhold 1	14	Oil	1964
West Babylon	48	Oil	1971
Fast Track LM6000s[113]	408	Gas	2002
Subtotal	1,869		
Internal Combustion			
East Hampton	6	Oil	1962
Montauk 2-4	6	Oil	1961
Subtotal	12		
Purchase Power Agreements[114]			
NYPA Flynn	145	Gas, Oil	1994

[111] LIPA Draft Energy Plan, Executive Summary at 4, October 17, 2002.
[112] LIPA Draft Energy Plan.
[113] Various locations.
[114] Various contract expiration dates. For example, the contract with NYPA for 124 MW (summer) from the FitzPatrick nuclear power plant expires at the end of 2003.

Facility	Summer DMNC Rating	Fuel	Year of Commercial Operation
Other On-Island (11)	225	Various, including Gas, MSW, and landfill gas	
NYPA Off-Island (2)	414	Hydro and nuclear	
Sub Total	784		
Total Resources	5,299		

LIPA recently announced new agreements with power developers to build, own, and operate peaking plants on Long Island by the summer of 2003 totaling 189 MW. These facilities include:

- A 79.9 MW facility developed by Calpine Corporation located on the Stony Brook campus of SUNY. LIPA will purchase any additional power not used by the campus under a separate agreement with Calpine.
- A 55 MW Pratt & Whitney Swift-Pac, simple cycle, low emission turbine generator to be constructed by Global Common within the Village of Greenport. The new unit will provide power to be sold to LIPA under the terms of a Power Purchase Agreement that LIPA has negotiated with Global Common. It is expected to be in service by summer 2003.
- A Pratt & Whitney simple-cycle, low-emission combustion turbine to be constructed by FPL Energy, which would generate 55 MW of electricity. Due to limitations in the natural gas supply line to the Rockaways, the turbine will operate on No. 2 fuel oil, but could use natural gas when supplies become available. The anticipated in-service date for this project is June 2003.

In addition, three new merchant power facilities have been proposed on Long Island for the 2005 time frame:

- KeySpan Energy submitted an application to the New York Board on Electric Generation Siting and the Environment (New York Siting Board) in January 2002 for a natural gas-fired 250 MW combined cycle plant referred to as the Spagnoli Road Energy Center in Huntington, Suffolk County, New York On May 6, 2003, the New York State Board on Electric Generation Siting and the Environment granted KeySpan a Certificate of Environmental Compatibility and Public Need (Article X) to construct and operate a 250-MW combined-cycle electric generating facility. This is the final approval required for the project. KeySpan expects that the new plant could be operational by 2005.[115]

[115] KeySpan Press Release, February 5 ,2003.

- ANP received certification from the Siting Board on August 14, 2002 for construction of a gas-fired 580 MW combined cycle plant in Brookhaven, Suffolk County, New York. ANP expects construction to begin in 2003 and take approximately two years to complete.

- In January 2002, PPL Global submitted an application to the Siting Board for a 300 MW simple cycle plant proposed for Kings Park, Smithtown, Suffolk County, New York. In January 2003, PPL Global announced that it would seek a buyer and not proceed with development of this project, citing low energy prices and the unavailability of a power contract. PPL Global subsequently transferred all development rights to Sterling Energy Associates. Pending the filing of amended application materials by a substitute applicant, the Siting Board has placed this application and the companion DEC permitting cases on hold.

Long Island's Transmission Infrastructure

LIPA owns 1,282 miles of transmission and sub-transmission lines that deliver power to 175 electric substations in its electric system. Table 9 breaks out these assets by voltage level.[116]

Table 9 – Long Island Transmission Assets

Voltage Level (kV)	Overhead Miles	Underground Miles	Total Miles	Circuit Capacity (MW)
345	0	8	8	660
138	237	110	347	383
69	570	76	646	104
33	92	3	95	26
23	138	48	186	22
Total	**1,037**	**245**	**1,282**	

Obtaining electricity from outside Nassau and Suffolk Counties is constrained by the limited electrical interconnections from New York City and from Connecticut. Long Island is connected to the remainder of the New York Power Pool grid via four transmission lines (Figure 5): a pair of 138 kV transmission lines from Con Edison's Jamaica Station in Queens to Long Island (Lines 901 and 903), and a pair of 345 kV lines from Westchester County, beneath the westernmost portion of Long Island Sound, to Long Island (Line Y-49 from Sprainbrook to East Garden City and Line Y-50 from Dunwoodie to Shore Road). The Y-49 and Y-50 transmission lines each have a normal rated capacity of approximately 600 MW. The Y-50 is a jointly owned cable between LIPA and Con Edison. Under contractual arrangement, Lines 901 and 903 are used to deliver Con Edison's portion of Y-50 to its Jamaica Station.

[116] LIPA Draft Energy Plan, at 3-5, updated by LIPA

Long Island is also interconnected with the ISO-NE grid via the 1385 Line from Norwalk Harbor, Connecticut to Northport, New York. This interconnection has a 286 MW normal capacity, but system conditions limit its import to 200 MW. The total transfer limit into Long Island from New York City and Connecticut is approximately 1,130 MW, excluding the Cross Sound Cable, which has yet to receive full approval to operate.[117] The transfer limit of transmission lines is less than the sum of the rated capacities of the lines, which does not adequately consider proper contingency-based operation. LIPA's import capacity is summarized in Table 10.

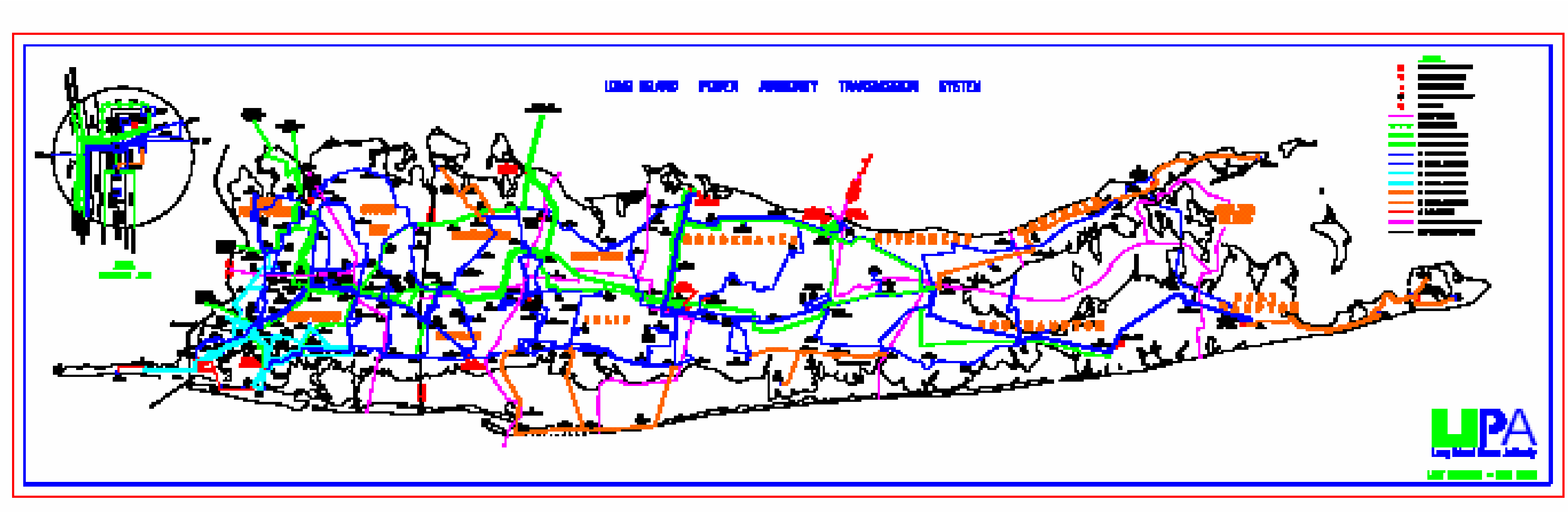
Table 10 – Long Island Transfer Limits

From	Transfer Limit (MW)
Con Edison / NYPA	930
Northeast Utilities (1385 Line)	200
Sub Total	1,130
Cross-Sound Cable (HVDC)	330[118]
Total	1,460

In the past 12 months, both the Y-49 and Y-50 cables were damaged in separate incidents. Not only were these cables limited in their carrying capacity, but the damage to these lines also reduced the ability of the 1385 Line to import electricity from Connecticut by an additional 100 MW. [119] In November 2002, the 1385 Line was also damaged by a survey vessel. Repair and replacement of the 1385 Line is discussed in Section 2.5.2.

[117] Update information provided by LIPA.
[118] Not in commercial operation.
[119] LIPA Press Release, June 18, 2002.

Figure 5 – Long Island Transmission System and Interconnections



In 2002, LIPA made significant investments in its transmission system. Twelve internal transmission line upgrades were completed, improving over 100 miles of transmission circuits. In addition, LIPA upgraded 28 substations and completed 110 minor upgrade projects. In total, LIPA invested $82 million to improve its transmission facilities, plus $113 million to tie new generation facilities into the transmission system and $36 million on distribution system improvements, upgrades, and maintenance. In 2003, LIPA continues to make investments in improving its transmission and distribution infrastructure.

Resource Adequacy

LIPA is subject to specific planning requirements established by the NYISO and other industry reliability standards. Consistent with other utilities in the state, LIPA is currently required to maintain an installed capacity reserve of at least 18% above its forecast annual peak demand.[120]

LIPA is also required to maintain on-island generation of at least 95% of projected peak load due to the limited capacity of Long Island's transmission links with neighboring electric systems.[121] At present, NYISO is proposing a modification to these capacity requirements in order to attract more generation resources to be developed.[122] This modification, however, will not eliminate LIPA's basic premise of local and total reserve margin requirements.

In its 2002 Draft Energy Plan, LIPA concluded that an additional 200 MW of supply-side or demand-side resources is necessary to meet Long Island's energy needs for 2003 consistent with NYISO guidelines. Even with the current demand-side management programs, LIPA also expects to need additional resources of approximately 100 MW per year through 2011 (Figure 6).

LIPA's Draft Energy Plan proposes to meet this requirement through a combination of conservation and load management, as well as new generation and transmission capacity. Committed and planned new capacity anticipated by the LIPA Draft Energy Plan to meet this shortfall include but are not limited to:

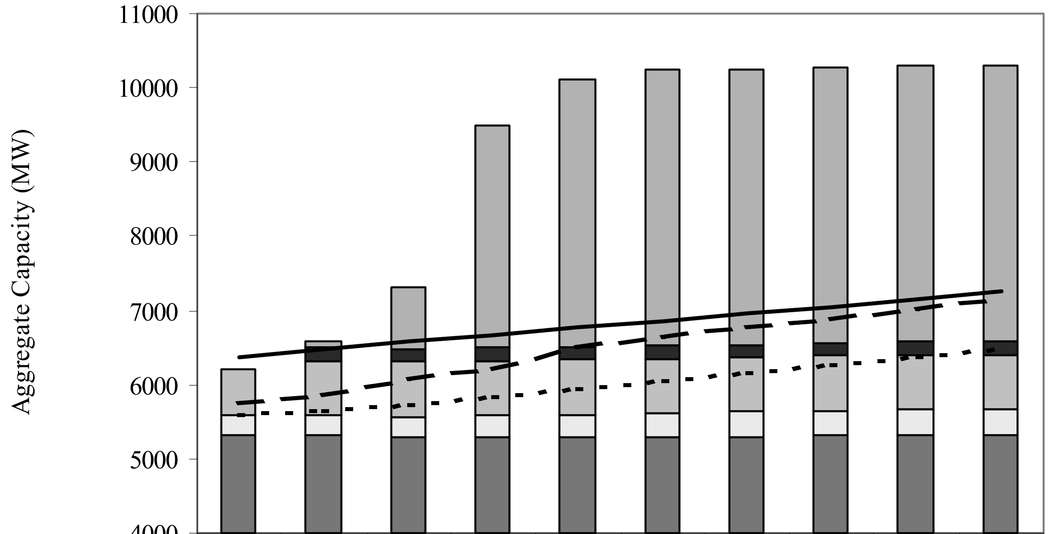
- The Brookhaven and Spagnoli Road gas-fired combined-cycle projects, expected to be in commercial operation by 2005 (830 MW);
- New, fast-tracked gas-fired peaking plants being developed by third parties under contract to LIPA, anticipated to be available for summer 2003 (189 MW);
- The Cross-Sound Cable, included among the 2003 resources (330 MW);

[120] LIPA Draft Energy Plan, p. 5-21.
[121] LIPA Draft Energy Plan, Executive Summary, pp. 13, 14.
[122] The NYISO Management Committee recently voted to institute a "demand curve" mechanism whereby more generators will be able to collect a capacity payment from load-serving entities such as LIPA.

- Repowering of Wading River Units 1-3, adding 116 MW by 2006; and
- Repowering of EF Barrett Unit 2, adding 279 MW by 2006.

Additional options, discussed in Sections 2.8.4 and 2.8.5, are under study. LIPA also hopes to attract new merchant generation projects to Long Island, but has stated that should those projects not materialize, LIPA would expect to enter into additional agreements with third party developers.

Figure 6 – Long Island Resource Requirements and Resource Plan[123]



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Under Study	0	94	822	3008	3597	3717	3717	3717	3717	3717
Planned	0	171	171	171	171	171	171	171	171	171
Committed	636	738	738	738	738	738	738	738	738	738
Demand Side Management	266	271	287	298	306	317	331	342	352	349
Existing Load Serving Capability	5313	5313	5285	5289	5294	5298	5302	5306	5311	5315
Operational Requirements	6370	6475	6575	6670	6763	6859	6955	7052	7152	7253
Probabilistic View	5740	5845	6077	6208	6498	6628	6760	6893	7006	7150
NYISO Minimum	5590	5648	5726	5832	5936	6042	6147	6255	6366	6481

[123] LIPA 2002 Draft Energy Plan.

2.4 REGIONAL NATURAL GAS PIPELINE SYSTEM

New England has no indigenous supply of natural gas. New York's gas supplies are sourced from Western Canada (41%), the U.S. Gulf Coast and Mid-continent producing regions (57%), and from production indigenous to western New York (2%). Historically, most of the natural gas consumed in New England and New York is derived from traditional supply sources in the Gulf Coast. In 2001, natural gas consumption in New England and New York amounted to 734 billion cubic feet (Bcf), and 1,171 Bcf, respectively.

In 1992, the Iroquois Pipeline began importing significant gas quantities from western Canada into the Northeast. Gas supplies for New England originate from Western Canada (27%), the U.S. producing fields in the Gulf Coast and Mid-continent (43%), and, since 1999, Sable Island off the coast of Nova Scotia (11%). The remaining 11% of the region's gas supplies are imported liquefied natural gas (LNG) delivered to the LNG terminal at Everett, Massachusetts, primarily from Trinidad and Algeria.

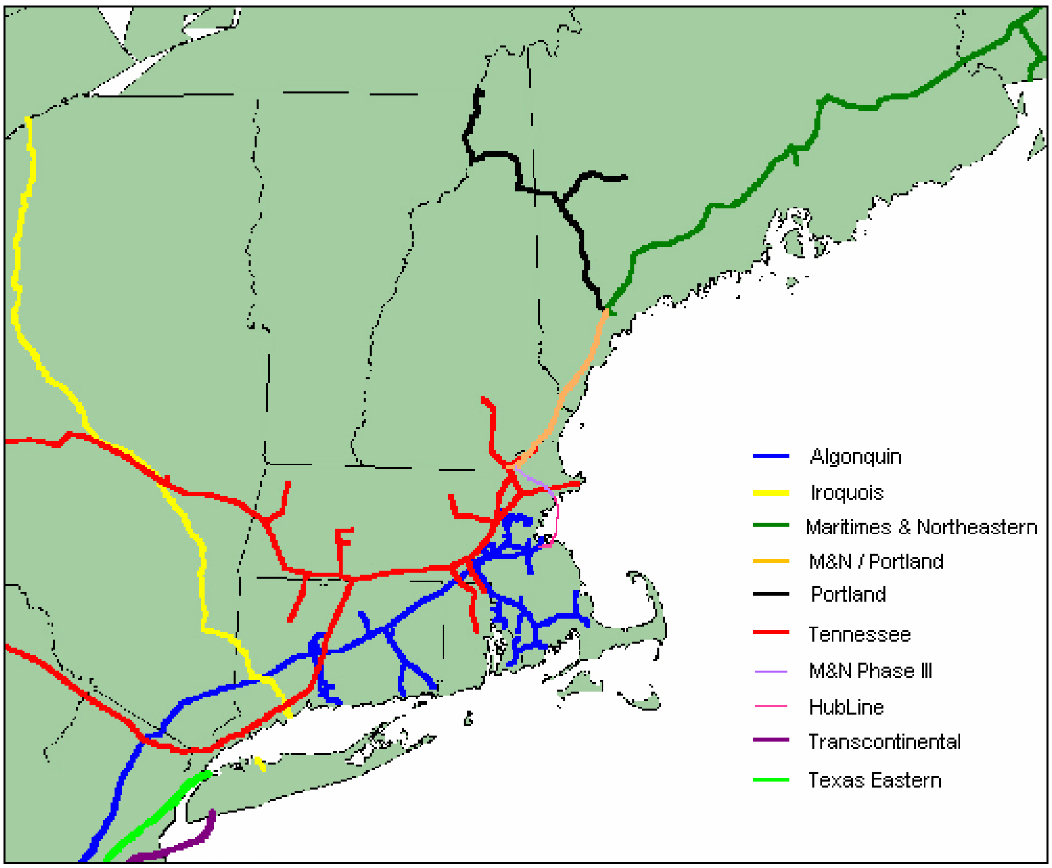
In addition to pipeline-transported natural gas from the Gulf Coast and Canada, natural gas utilities throughout the Northeast depend on conventional underground storage and LNG facilities to maintain adequate service during the winter. Vast storage facilities are located in western and central Pennsylvania, West Virginia, Southern Ontario, and upstate New York. Gas utilities arrange for gas to be injected during the summer so they can withdraw the gas and have the pipelines transport to their systems during the heating season. Utilities throughout New England, New York City, and Long Island also use LNG imported primarily from Trinidad or, in some instances, manufactured on site, to supplement pipeline supplies during the heating season. Most LNG is transported via supertankers to the large Distrigas terminal in Everett, outside of Boston, the only LNG receipt point in the Northeast. Distrigas has a storage capacity of 3.5 Bcf and a maximum daily sendout capability around 1.0 Bcf via pipeline, plus another 0.1 Bcf/d as liquid that is shipped via refrigerated trucks to satellite terminals in New England. Total LNG storage capacity in New York is about 3.4 Bcf. Total LNG storage capacity in New England is 15.1 Bcf on the gas utilities systems, in addition to the storage at Distrigas.[124] Most of the LNG facilities are satellite terminals that can store and vaporize the LNG; the others are full-service plants that can liquefy LNG as well. LNG facilities are generally located on the local gas utility system, and therefore do not require pipeline transportation. A 2.0 Bcf LNG storage/production facility is proposed in Waterbury, Connecticut by Yankee Gas Service Company. The project is before the Connecticut DPUC, with a decision expected in July 2003. Regulatory approvals are being obtained; local land use approvals have been issued. Ground breaking is projected in 2004 with a likely in-service date of 2007.

Gas supplies from the Gulf Coast are transported to New York and New England through several long-haul interstate pipelines: Transcontinental Gas Pipeline (Transco),

[124] Northeast Gas Association, 2003 Statistical Guide (May 2003 Preliminary Edition)

Tennessee Gas Pipeline Co. (Tennessee), Columbia Gas Transmission Company (Columbia), Texas Eastern Transmission Company (Texas Eastern), and Algonquin Gas Transmission Company (Algonquin) (Figure 7). The primary conduit from western Canada is TransCanada PipeLines, Ltd. (TransCanada), which serves the major market centers in Ontario and Quebec. TransCanada transports natural gas for redelivery through Tennessee and Iroquois from Niagara, New York and Waddington, New York, respectively. TransCanada, to a lesser extent, also transports natural gas for redelivery to New England.

Figure 7 – Interstate Gas Pipeline System Serving the Northeast



Algonquin and Tennessee have traditionally transported gas into New England, including Connecticut. Since commencing operation, Iroquois has fundamentally altered supply dynamics in the Northeast. By increasing its mainline delivery capability through a series of new compression stations, Iroquois has heightened competition among rival producers in competing supply basins. Iroquois provides New England with pressure and flow via Algonquin and Tennessee, and delivers about 0.2 Bcf/d to gas utilities and power producers in southern Connecticut. Iroquois extends across Long Island Sound and delivers additional volumes into the New York Facility System at the terminus of the pipeline at Commack, Long Island. Iroquois is nearing completion of its Eastchester pipeline from its mainline at Northport, Long Island, westward through Long Island Sound to serve power and other loads around New York City.

Until 1999, nearly all of the pipeline supplies serving gas utilities and power producers in Connecticut and the remainder of New England came from the Gulf Coast or from western Canada. About three years ago Duke Energy completed the Maritimes & Northeast Pipeline (M&N) to transport gas from the Atlantic Canada region off Nova Scotia southwest through Maine into eastern Massachusetts. With new supplies from Atlantic Canada, New England is no longer at the proverbial end of the pipeline. M&N has greatly shortened the “supply chain” from a major natural gas producing area to New England. Whereas conventional supplies from the Gulf Coast or western Canada are between 1,700 miles and 2,000 miles from New England’s borders, the new supply from Atlantic Canada is only 750 miles away. At present, all natural gas transported through M&N is consumed by gas utilities and power producers in New England. Total delivery capacity on M&N into New England is 0.43 Bcf/d. If incremental production is realized from Atlantic Canada, M&N will deliver those increased volumes through expanded M&N facilities for redelivery into Algonquin’s new HubLine project. The HubLine project is a marine lateral across Boston Harbor connecting M&N in Beverly to Algonquin in Weymouth, Massachusetts. The fourth phase of M&N’s market growth is slated to double M&N’s delivery capability within New England around 2005. Increased flow through HubLine into the easternmost end of Algonquin’s mainline in southeast Massachusetts will provide Algonquin with greater flexibility across its entire route system, thereby potentially allowing natural gas from Atlantic Canada to flow physically or via displacement into both Connecticut and New York. Duke Energy’s proposed Islander East project from Algonquin’s C-1 mainline in North Haven, Connecticut to Brookhaven, New York, would extend the transportation pathway to allow gas from Atlantic Canada, and possibly from western Canada and the Gulf Coast, to flow to Long Island. Duke Energy also anticipates that this project will expand gas transportation capacity and flexibility in southern Connecticut.[125]

Production from Atlantic Canada is comparatively small in relation to traditional producing areas in the Gulf Coast and western Canada. Currently, daily production of raw gas off Sable Island averages about 0.5 Bcf/d, equivalent to about 0.45 Bcf/d of processed gas flowing to New England. The project operator is Exxon Mobil. In contrast, daily production from the Gulf Coast averages 28.6 Bcf/d and 16.7 Bcf/d from western Canada. However, Atlantic Canada is regarded as a promising area for future gas supplies in North America, particularly in light of the maturation of the conventional resource base in the Gulf Coast, including Texas, and western Canada.

[125]In an Islander East docket interrogatory, the FERC, which has approved the project, expressed the following: “…the available capacity on Algonquin Gas Transmission Company’s (Algonquin) HubLine facilities is substantially less than the capacity of Islander East’s facilities.” (Docket CP01-384. FERC 09/07/2001data request.) In response, Islander East states: “Transportation paths are available beyond the Algonquin system as a result of its existing interconnections with Tennessee, Iroquois, and Texas Eastern and others, including its future interconnection with Maritimes and Northeast via the HubLine project.” (Docket CP01-384. Islander East 09/24/2001 response).

In the last few years, major oil and gas producers in Canada have committed billions of dollars to expand production of natural gas from the Scotian Shelf as well as to expand the deliverability of pipelines in the Maritime Provinces and New England. EnCana Corporation, a major Canadian producer, estimated that by 2010, Sable Island will produce over 2.0 Bcf/d. While Shell, a key producer, has reduced its reserves estimate, other producers have maintained optimistic views about the recovery potential of 2,800 Bcf (proved and probable) in Atlantic Canada. Recently, the development of Nova Scotia's offshore gas fields has been slowed by a series of expensive dry holes. In February 2003, EnCana decided to ask for a regulatory "time out" on development of its $1.2 billion Deep Panuke project, considered by geologists to be the most promising of the offshore tracts.[126] While acknowledging the "promising new opportunities" for Atlantic Canada, EnCana has stated that "The project at this juncture of the regulatory process would provide an insufficient risk-adjusted return in the context of EnCana's other investment opportunities."[127]

As production from the initial wells in Atlantic Canada begins to decline, the second tier wells are scheduled to begin producing later this year to maintain overall gas flows of 0.45 Bcf/d into New England. Over the next three years, there is likely to be much additional exploration and drilling off the coast of Nova Scotia by major gas producers in order to define reserves before drilling licenses expire. As production from the first and second tier wells declines over time, other fields, such as Deep Panuke, will have to make up the shortfall. It is not known how the uncertainties surrounding the high cost and high risk of drilling in Atlantic Canada will impact pipeline developments in the New England and New York market areas. The quantity of Atlantic Canada gas that will, in the future, be destined for markets in Connecticut and Long Island is unknown.

2.4.1 Natural Gas Supply, Demand, and Infrastructure in Connecticut

In Connecticut, residential, commercial, and industrial natural gas customers are typically served by local distribution companies (LDCs). There are four LDCs in Connecticut. Three are investor-owned utilities regulated by the Connecticut Department of Public Utility Control: Yankee Gas is a subsidiary of Northeast Utilities; Southern Connecticut Gas and Connecticut Natural Gas are both subsidiaries of Energy East. The fourth LDC is the City of Norwich Department of Public Utilities, a municipally owned LDC whose rates are not regulated by the DPUC.

The four gas utilities receive gas at gate stations along the interstate pipelines traversing Connecticut: Algonquin, Tennessee, and Iroquois. There are 571 miles of gas transmission pipeline and 7,063 miles of distribution mains[128] in the state serving 514,455 customers.[129] Of Connecticut's 169 towns and cities, natural gas mains serve all or part of 113 of them. Portions of northwestern and eastern Connecticut remain without gas

[126] EnCana press release, February 14, 2003.
[127] *Ibid*.
[128] Northeast Gas Association.
[129] Information provided by the three investor owned utilities.

utility service. Connecticut's total annual gas consumption in 2001 was 144 Bcf. Connecticut residential customers consume about 28% of total demand, commercial customers 31%, industrial customers 18%, and power generation 23%.[130] Historic peak day demand experienced by the LDCs in 2000 was approximately 0.8 Bcf.[131] The Connecticut regulated LDCs forecast peak day demand to grow about 1.5% to 1.7% annually over the next five years. The forecasted peak day firm demand exclusive of interruptibles for the winter of 2003/2004 is approximately 0.76 Bcf (761,000 Mcf).[132]

Peak day deliverability of the LDCs is predominantly provided by interstate pipeline transportation. On-site storage facilities such as LNG or propane plants augment pipeline supplies as required. The LDCs in Connecticut have approximately 0.58 Bcf/d of pipeline capacity under contract, with approximately 0.13 Bcf/d of LNG vaporization capability and 0.06 Bcf/d of propane/air peak shaving capability.[133]

Natural gas is used extensively in Connecticut as a fuel in electric generating facilities. There is approximately 2,803 MW of existing gas fired electric generation (704 MW gas only, 2,099 MW combined gas and oil) in Connecticut.[134] These facilities have a maximum consumption of approximately 0.45 Bcf/d of natural gas. There are 2,642 MW of new gas-fired electric generating facilities that have been approved by the Siting Council since 2002. In a recent ISO-NE study, it was noted that electric generating facilities typically do not contract for interstate pipeline capacity on a firm basis for the plant's entire fuel requirements. Instead, these plants purchase gas on a less expensive, interruptible basis, and must rely on fuel oil to the extent allowed under air permit conditions, or not operate at all, on the coldest days when "core" gas customers utilize the pipelines' full capacity. ISO-NE's studies indicate that there is not sufficient pipeline capacity within New England's borders to meet the coincident gas requirements of New England's gas utilities and merchant generators during the coldest part of the heating season.[135]

2.4.2 Natural Gas Supply, Demand, and Infrastructure on Long Island

Long Island's growing demand for gas to serve its core heating load and to fuel new and repowered electric generation has created a market opportunity for interstate pipeline companies to expand service to Long Island. To understand the transportation and gas supply alternatives available to Long Island, this section presents an overview of the

[130] U.S. Energy Information Administration.
[131] Information provided by the three investor owned utilities. This number is not inclusive of Norwich's peak day volume.
[132] Information provided by the three investor owned utilities. This number is not inclusive of Norwich's forecasted peak day demand.
[133] Information provided by the three investor owned utilities.
[134] Connecticut Siting Council Review of the Connecticut Electric Utilities Ten Year Forecast of Loads and Resources 2002.
[135] ISO-NE *Steady-State and Transient Analysis of New England's Interstate Pipeline Delivery Capacity, 2001-2005* (2002).

Long Island gas market, the existing infrastructure, and related energy and environmental challenges.

The Brooklyn Union Gas Company (doing business as KeySpan Energy Delivery New York, or KEDNY) provides gas distribution services to customers in New York City in the boroughs of Brooklyn, Queens, and Staten Island. KeySpan Gas East Corporation (doing business as KeySpan Energy Delivery Long Island, or KEDLI) provides gas distribution services to customers in Nassau and Suffolk counties and the Rockaway Peninsula in Queens. The two separate, but contiguous, service territories served by KEDNY and KEDLI comprise approximately 1,417 square miles, and 1.66 million residential, commercial, and industrial customers.

Gas consumption on a peak winter day in KEDNY and KEDLI is approximately 2.2 Bcf/d (2.2 thousand dekatherms per day (MDth/d)). Current total annual gas consumption by KEDNY and KEDLI customers is 252 Bcf, including 70 Bcf for electric generation. Peak day gas supplies for the two systems come from a mix of gas shipped via long-haul pipeline, via pipeline from storage fields in Pennsylvania and western New York, and from LNG. As shown in Table 11, KEDNY and KEDLI each have currently sufficient resources to meet peak day requirements of up to approximately 2.0 BCF (2,036 MDth) and 0.73 Bcf (745 MDth), respectively.[136] The New York Energy Plan forecasted natural gas demand state-wide to grow at the rate of 1.5% per year over the next 20 years, with a low case forecast of 1.3% per year, and a high case forecast of 1.6% per year.[137] However, KeySpan forecasts a growth rate of 3.3% on Long Island, or twice the state-wide average, due to conversions from oil to gas for both core loads and new gas-fired generation. KeySpan has stated that, in addition to its current core heating load, "there is the need for incremental gas capacity and supply to serve future generation and the conversion of existing oil burning electric generation to gas."[138]

Table 11 – New York City and Long Island Natural Gas Delivery Capacity (Bcf (MDth)/d)

Source	KEDNY	KEDLI	Total
Pipeline	0.731 (752)	0.257 (263)	0.99 (1,013)
Underground Storage	0.758 (779)	0.287 (294)	1.05 (1,073)
Peaking Supplies	0.492 (505)	0.182 (188)	0.65 (692)
Total	1.981 (2,036)	0.726 (745)	2.71 (2,778)

Four interstate pipelines deliver gas to KEDNY and KEDLI: Transco, Texas Eastern (TETCO) , Iroquois, and Tennessee. Keyspan's distribution of pipeline capacity on Long Island is as follows: Transco – 58.8%, TETCO (via Transco) – 25.4%, Iroquois – 9.7%,

136 Brookhaven Energy Project, Article X Application to the Siting Board, June 2001, Docket 00-F-0566, at 9-5.
137 New York Energy Planning Board, *New York Energy Plan and Final Environmental Impact Statement*, June 2002.
138 KeySpan presentation to the Task Force, February 28, 2003.

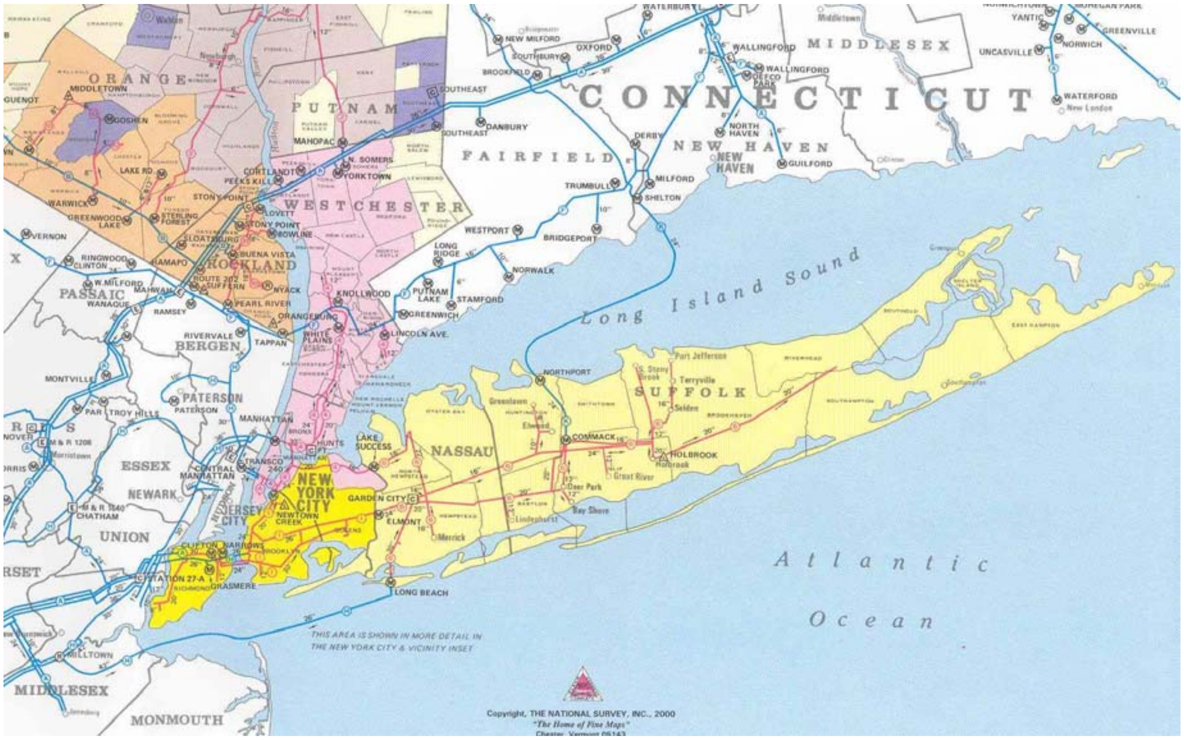
and Tennessee (via Iroquois) - 6.1%.[139] Transco and Texas Eastern are the primary source of pipeline capacity into New York City. Iroquois' Eastchester lateral into the Bronx, when completed, will add 0.22 Bcf/d. Tennessee's lateral into Westchester County comprises a comparatively small portion of total pipeline capacity into New York City, however. Transco and Iroquois are the only two pipelines directly connected to the KEDLI system on Long Island: Transco delivers Gulf Coast supplies via a southern path from New Jersey, across lower New York Harbor to Long Beach on the south shore of Long Island, and Iroquois delivers western Canadian supplies via a northern path from Milford across Long Island Sound to Commack.

Prior to the construction of Iroquois, Long Island historically had insufficient pipeline service. Consequently, Long Island today still has the highest concentration of oil heat customers in the continental U.S. Power generation on Long Island also relies heavily on oil. Through the 1980s and 1990s, KEDLI's predecessor on Long Island, LILCO, was forced to limit the number of new gas customer hookups. Even today, several areas in eastern Long Island do not have access to natural gas. Since Iroquois' commercialization in 1992, Long Island's constraints on pipeline capacity and natural gas supply have been alleviated, but not eliminated. The enhanced supply of natural gas transported via Iroquois has allowed KEDLI to significantly add new residential and commercial customers over the last decade. KEDLI has also made significant investment in its on-island gas distribution network.

Gas supplied to KEDNY and KEDLI customers is delivered via the New York Facility System, a high-pressure natural gas pipeline network extending across the Hudson River counties of Westchester, Putnam, Orange, and Rockland into New York City and Long Island (Figure 8). The New York Facility System is operated by Con Edison and KeySpan for purposes of maintaining adequate delivery capability to distribution customers throughout New York City and Long Island. From an operational standpoint, natural gas flows predominantly eastward across the New York Facility System. By delivering gas into western Suffolk County, Iroquois has "freed up" capacity in the congested New York City and Nassau County area and made it easier to serve new customers. Because the New York Facility System runs near its capacity limits most of the winter, Con Edison, KEDLI, and KEDNY supplement supplies with LNG from satellite tanks located in Astoria, Greenpoint, and Holtsville, New York. Both Con Ed and KeySpan intend to expand the capacity of the New York Facility System to accommodate increased demand, including new power generation facilities. KeySpan has begun a three-year expansion of the Facility System on Long Island by replacing 12.8 miles of 8" pipe with 20" pipe,[140] expected to be completed in 2004.

[139] Brookhaven Energy Project, Article X Application to the Siting Board, June 2001, Docket 00-F-0566, at 9-5.
[140] Brookhaven Energy Project, Article X Application to the Siting Board, June 2001, Docket 00-F-0566, at 9-2.

Figure 8 – New York and Long Island Facility System



LIPA's Draft Energy Plan, issued in October 2002,[141] supports development of an additional pipeline connection to Long Island to meet the increasing on-Island demand, provide reliability benefits, and offer an additional source of natural gas supply. LIPA notes that the Islander East project would provide physical access to upstream reserves in Atlantic Canada, which can compete against the traditional Gulf Coast and western Canadian supplies. KeySpan has also noted that Islander East would also facilitate gas deliveries directly to an area of high population growth in Suffolk County, thereby freeing up some of the capacity on the constrained New York Facility System.

The question of pipeline adequacy is not a simple exercise of comparing pipeline capacity and gas demand within a region. Gas deliverability is a complex function of upstream supply, storage, and transportation capacity, the hydraulics and physical characteristics of the interconnected pipeline systems, hourly and daily withdrawals and injections of gas (including LNG), the location and capacity of compressor stations, and other parameters. The seasonal variability of LDC gas demand, the availability and relative price of alternative fuels, and the dispatch of gas-fired electric generation on an hourly, daily, and seasonal basis are all critical factors in assessing regional gas demand.

[141] LIPA Draft Energy Plan, October 17, 2002.

As part of New York's 2002 Energy Plan, NYSERDA and NYISO initiated a study of the interrelationship between the electricity and natural gas systems in New York.[142] The study included integrated modeling of the natural gas pipeline and electric generation systems, with a particular focus on the downstate area, including Long Island. The study concluded that "New York has sufficient gas delivery capacity to deliver the amounts of gas required for 2005 generation projects and pipeline expansion scenarios analyzed, including the scenarios where pipeline expansions are limited to those currently under construction." The base case model assumed that the Eastchester Pipeline would be the only new pipeline operating within Long Island Sound. With no further pipeline expansions post-2003, the study predicted that oil would continue to be burned at roughly historical levels on many days in the winter and a few days in the summer. The study concluded that if pipeline capacity to New York City and Long Island were increased, less oil would be burned. The study did not specify where such pipeline additions would or should be constructed. Potential new combined cycle gas-fired generation at Brookhaven, Spagnoli Road, and/or Kings Park, and KeySpan repowering projects were not included in the study. Therefore, local area deliverability on Long Island to one or more of these new and repowered plants was not addressed.

2.5 Status of Existing Energy and Telecommunications Crossings of Long Island Sound

Five energy and telecommunications facilities presently link Connecticut and Long Island via crossings of Long Island Sound. These include:

- Two electric transmission cable systems:
  - The 1385 Line cable system (AC), which is jointly owned by CL&P and LIPA and consists of seven cables that link Norwalk and Northport, Long Island; and
  - Cross-Sound Cable's system (DC), consisting of a bundle of two solid dielectric cables and a fiber optic telecommunications cable, which traverses between New Haven and Brookhaven, Long Island (1,800 feet of cable has not been installed to depths required by permits).
- One natural gas pipeline (the Iroquois pipeline), which extends across Long Island Sound from Milford to Northport, Long Island.
- Two telecommunications cables:
  - AT&T's fiber optic cable, which traverses from East Haven to Shoreham, Long Island; and

[142] Charles River Associates, *Task 4: Initial Report - The Ability to Meet Future Gas Demands from Electricity Generation in New York* 2002.

- MCI's fiber optic cable, which extends from Madison to Rocky Point, Long Island.

In addition to these interstate energy and telecommunications facilities, a variety of other submarine facilities traverse portions of Long Island Sound, typically to provide mainland utility services to certain of the state's inhabited islands (e.g., the Thimble Islands), as well as to islands that have lighthouses and Fishers Island, New York. These facilities provide electricity, telecommunications service, and potable water to the islands, as well as power to lighthouses used in navigation.

Further, four other major submarine energy and/or telecommunication facilities traverse Long Island Sound, but are located entirely in New York. These facilities, which are in the central and western portions of Long Island Sound, consist of:

- Two 345 kV electric transmission lines between Westchester County and Long Island; the Y-49 line, owned by the New York Power Authority, and the Y-50 line, owned by LIPA and Con Edison;

- Iroquois' recently constructed Eastchester natural gas pipeline, which extends 35 miles from Northport, Long Island to the Bronx; and

- The Flag's fiber optic cable, which was installed within the last five years and which extends from Northport, Long Island, eastward through Long Island Sound to Europe.

This inventory focuses on the five energy and telecommunications facilities that cross Long Island Sound between Connecticut and Long Island. These facilities are separated both spatially (none of the five facilities are located in close proximity) and temporally (none of the five facilities were constructed within the same time frame).

Information for this section was drawn in part from project status reports that the Task Force requested from the owners of the crossings.[143,144,145,146,147] Other data were compiled from presentations made by project proponents and regulators to the Task Force. In addition, reports, permits, and regulatory decision-making documents relevant to the five crossings were reviewed.

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[143] Iroquois Gas Transmission System (Iroquois).
[144] Cross-Sound Cable Company, LLC, Letter to Joel Rinebold from Jeffrey A. Donahue dated February 5, 2003.
[145] Islander East Pipeline Company. Letter to Joel Rinebold from Gene H. Muhlherr dated July 24, 2002.
[146] Northeast Utilities System. Letter to Joel Rinebold from Paula M. Taupier dated February 5, 2003.
[147] The Task Force requested information from AT&T and MCI, but did not get a response and was unable to acquire information other than that contained in the DEP permits issued for their projects.

2.5.1 Background For Existing Crossings

The first of the five cross-Sound links was the 1385 Line, which was installed in 1969 and went into operation in 1970. The other four crossings were constructed within the past 12 years: Iroquois' pipeline in 1991; AT&T's fiber optic cable in 1993; MCI's fiber optic cable in 1996; and Cross-Sound Cable in 2002.

During the 33 years between the installation of the 1385 Line and the Cross-Sound Cable, significant changes have occurred in federal and state environmental protection requirements as a whole, as well as in the regulatory mechanisms that afford protection to Long Island Sound's natural resources during the construction of energy or infrastructure facilities (e.g., NEPA, MMPA, the Coastal Zone Management Act of 1972, Marine Protection Research and Sanctuaries Act (1972), ESA, the Clean Water Act of 1972 (CWA), PUESA, Connecticut's Tidal Wetlands Act, IWWA, and CMA, the FERC certificate conditions, Section 404 ACOE regulations, and the NHPA Sec. 106 Review). Likewise, electric cable, telecommunications, and pipeline technologies and designs have evolved and submarine construction techniques have become more sophisticated, both to facilitate work in marine environments and to minimize impacts to ecological resources.

Given the limited environmental regulatory requirements 35 years ago, pre-construction evaluations concerning the 1385 Line focused primarily around engineering and constructability parameters, rather than on establishing ecological baseline information or on analyzing the potential for impacts on natural resources. Similarly, 35 years ago, there were no certificate or permit conditions that required post-construction environmental monitoring.

With the promulgation of more protective state and federal environmental laws and regulations, and greater recognition of potential environmental impacts, detailed pre- and post-construction environmental information concerning proposed routes has become a requisite of permit/certificate applications and approvals. As a result, baseline environmental data for recent projects, such as Cross-Sound Cable, are extensive.

However, the lack of comprehensive long-term ecological data regarding energy and infrastructure facilities, as well as that of many other activities in Long Island Sound, limits the ability to evaluate the environmental status of cross-Sound infrastructure over time. Moreover, it is often difficult, if not impossible, to determine whether (or the extent to which) changes in environmental conditions along an energy or infrastructure route, such as species diversity and abundance, are attributable to the project or to other phenomena (e.g., other man-made disturbance, upland land management practices, non-point and/or point source pollution, natural processes, or a combination thereof).

Finally, over the past three decades, both state and federal regulators have invested substantial efforts to coordinate and refine initiatives and plans to protect the resources of Long Island Sound. This is evidenced by the Long Island Sound Study's *Comprehensive Conservation and Management Plan* for Long Island Sound, as well as by the stringent federal and state permit and certification processes that must be completed by applicants proposing energy or telecommunications infrastructure facilities in Long Island Sound. This Task Force is recommending enhancements to the current energy and telecommunications infrastructure siting process; providing for more transparent public participation and independent study of proposed projects; and endorsing closer interstate coordination with respect to projects proposed to cross Long Island Sound.

Considering the evolution of the environmental protection movement over the past 30 years and the increased public awareness about the importance of Long Island Sound's ecosystem, it is important to recognize that projects constructed using current technology, in accordance with existing regulatory requirements, can not be expected to experience the same impacts observed in connection with projects installed decades ago or even within the past 5-10 years.

2.5.2 Environmental Status of Electric Cable Crossings

The 1385 Line

The 1385 Line cable system traverses approximately 11 miles from the Norwalk Harbor Substation on Manresa Island in Norwalk, across both the seabed of Sheffield Harbor and Sheffield Island, to the Northport Substation in Northport, Long Island. The 138 kV cable system, which is owned by CL&P in Connecticut and LIPA in New York, was installed in 1969 and commenced operation in 1970. The system consists of seven separate three-inch-diameter fluid-filled cables, each containing a single hollow core copper conductor surrounded by paper insulation, a lead covering, and outside armoring. To serve as an effective insulator, the paper is impregnated with dielectric fluid maintained under pressure.

The cables are separated for safety and reliability reasons, as well as to allow for cable repairs. The spacing between the cables varies, depending on their location. In general, the cables are spaced farther apart in the offshore area (approximately 900 feet) and closer together approaching and on land (i.e., in the vicinity of Sheffield Island and the Norwalk Harbor Substation).

CL&P and LIPA have proposed removal of the seven existing cables and replacement with three solid core dielectric transmission cables. The proposed alignment for the replacement cables is along the route of the three easternmost existing cables. In conjunction with planning for the cable replacement project, CL&P commissioned detailed studies of the existing cable route, including bulk physical and chemical sampling and analysis, sediment transport analysis, and fisheries and benthic evaluations. CL&P submitted applications for the replacement project to the Siting Council and DEP in 2001 and 2002, with the Siting Council issuing a Certificate of Environmental Compatibility and Public Need in September 2002.

Construction History CL&P received a permit for the Connecticut portion of the 1385 Line project from the Connecticut Water Resources Commission, the predecessor of

DEP, in February 1969. CL&P and LIPA received an ACOE permit for the entire crossing in March 1969. On or about that time, CL&P purchased the state and local shellfish leases within the cable route.

Two primary construction methods were used to install the submarine portion of the 1385 Line. Although these methods were considered "state of the art" in 1969, they would not be used today, given the advances that have been made over the past 35 years in construction technology.

From the Connecticut shoreline to a point just past Sheffield Island, open trenching, using a combination of conventional and hydraulic dredges, was used to install the cables below the seabed. For the remainder of the route in Connecticut to the vicinity of the Long Island landfall at Northport, the cables were laid directly on the natural bottom of Long Island Sound. The state and federal permits issued for the project imposed certain depth of burial requirements, placed certain limitations on dumping of fill, and required restoration of the seabed as needed.

A review of documentation from the 1969 cable installation revealed that certain difficulties were encountered during the construction process. Some of these included:

- Rock and other hard bottom materials made cable burial difficult.
- Discharge currents from the Norwalk Harbor and Northport Power Stations affected the contractor's ability to control the laying of the cables, and divers had to be used.
- Initial trenching technology dispersed sediments on the water surface such that the ACOE restricted the use of the dredging method.
- Installation of the cables across the Federal Navigation Channel took longer than anticipated, necessitating longer closure of the Channel.
- Near the conclusion of construction, inspections revealed little or no cover over the portion of the cables between Sheffield Island and Norwalk Harbor Substation; resolution of the responsibility for backfilling to complete the work required almost a year and in some areas concrete material was added to the trenches to complete the backfilling process.

<u>Documented Impacts</u> Construction of the 1385 Line cable system pre-dated the promulgation of requirements for comprehensive baseline environmental studies and post-construction environmental monitoring. As a result, there is no pre- and post-installation environmental data that can be used to compare the present condition of the cable area to that immediately after the completion of the project over 35 years ago.

Since the mid-1990s, environmental monitoring has been conducted primarily to evaluate the effects of dielectric fluid releases caused by anchors or other objects hitting and damaging the cables. The most recent such damage occurred in November 2002 when the 1385 line was damaged by a survey vessel that dragged its anchor, severing four of the seven cables. CL&P and LIPA expect to restore the full transfer capability by summer 2003.

CL&P has reported these accidental releases to the DEP and other regulatory agencies in accordance with applicable requirements, including the Consent Orders issued to CL&P and LIPA in 1995/1996 and 1998 by DEP and the NYSDEC. Impact assessments also were conducted in accordance with these Consent Orders.

Except as displaced by anchor drag or other accidents and associated repairs, the existing 1385 Line cables have remained approximately where they were first installed. Certain portions of the cables that were not originally buried have settled into the silt on the seabed or have been covered by drifting sediments.

Although environmental baseline data were not compiled when the 1385 Line was installed in 1969, surveys of the cable routes were performed recently in support of CL&P's applications for certificates and permits for the cable replacement project. Such detailed environmental surveys include various analyses of existing conditions within and near the cable corridor.[148,149,150,151] Benthic survey transects were extended up to 1,000 feet outside of the mapped cable route in both eastern and western directions, specifically for the purpose of determining what differences in productivity there were between areas inside this cable route and those outside.[152] Chemical and physical characteristics of the sediments in which the cables would be buried were collected for both the proposed route and its principal alternatives, and a benthic environmental survey was performed of the more sensitive estuarine portions of the area near the existing/proposed cable route. These studies identified six different benthic habitats near the existing cable system; these ranged from silty fine sands with scattered shell debris in which were found both mud snails and macroalgae (near the Norwalk shoreline) to large rocks with small amounts of eastern oysters and blue mussels (on the south side of Sheffield Island). The number of oysters present in the project area varied, commensurate with the variations in habitat crossed, whereas hard clams were found throughout the survey area. In addition,

[148] CL&P (The Connecticut Light and Power Company). Final Report, Hydrographic, Geophysical, and Geotechnical Survey Program. Prepared for the KeySpan Energy (Northeast Utilities interconnect, Northport, NY to Norwalk, CT, OSI Project # 00ES088. Submitted to the Siting Council, as bulk Filing #1 to Docket 224, March. 2002.

[149] CL&P. Benthic Habitat Mapping & Shellfish Enumeration, Sediment Dispersion Modeling, and Simulations of Sediment Transport and Deposition Long Island Sound Connecticut. Submitted to the Siting Council, May 2002, in response to interrogatory CSC-02-052, Docket 224.

[150] CL&P. Dielectric Fluid in Long Island Sound: An Environmental Perspective Attachment 6-13, in Application to the Siting Council for a Certificate of Environmental Compatibility and Public Need for the Norwalk, Connecticut to Northport, New York Submarine Cable Replacement Project. Submitted to the Siting Council, February 2002, Docket 224.

[151] CL&P. Responses to interrogatories (CSC-01-021 and CSC-01-022) from the Siting Council, Docket 224.

[152] Norwalk, Connecticut to Northport, New York Submarine Cable Replacement Project; Benthic Habitat Mapping & Shellfish Enumeration, Sediment Dispersion Modeling, and Simulations of Sediment Transport and Deposition Long Island Sound-Connecticut; CL&P May 2002.

researchers found annelid worms, mollusks, small amphipods and crabs in all samples collected in the survey.

The Whitlatch OSI studies concluded that there were no discernible differences in sediment type or biological communities between habitats over the existing cables and those not over the cables[153]. Based on these studies, CL&P concluded that despite the relatively crude construction techniques (compared to those available today) used to install the 1385 Line, benthic productivity in the impact area recovered over time.

However, in one area -- the shallow portions of the sheltered cove north of Sheffield Island – researchers did find fewer numbers of species and individuals in depressions located over the buried cables. Researchers could not determine whether this reduction was related to differences in bottom topography or the dense accumulations of macroalgae found in these depressions.

Since the cables commenced operation in 1970, there have been approximately 55 instances resulting in the release of alkylbenzene-containing dielectric fluid into the marine environment. In response to Consent Orders issued in the mid-1990s, areas that were subject to dielectric fluid leaks were studied for impacts to shellfish and sediments.[154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167] Remediation of fluid releases

[153] Norwalk, Connecticut to Northport, New York Submarine Cable Replacement Project; Benthic Habitat Mapping & Shellfish Enumeration, Sediment Dispersion Modeling, and Simulations of Sediment Transport and Deposition Long Island Sound-Connecticut; CL&P May 2002.

[154] NUSCO (Northeast Utilities Service Company). 1997a. Literature search and review, effects of alkylbenzenes in the marine environment. Prepared for The Connecticut Light and Power Company arid Long Island Lighting Company by Northeast Utilities Environmental Laboratory, Waterford, CT Submitted to DEP and NYSDEC on February 28, 1997. 18 pp.

[155] NUSCO. 1997b. Baseline distribution study of alkylbenzenes in western Long Island Sound sediments. Prepared for The Connecticut Light and Power Company and Long Island Lighting Company by Northeast Utilities Environmental Laboratory, Waterford, CT. Submitted to DEP and NYSDEC on June 27, 1991. 14 pp.

[156] NUSCO. 1998a. Characterization of oyster (Crassostrea virginica) growing conditions in the vicinity of Norwalk Harbor underwater electric cables. Prepared for The Connecticut Light and Power Company and Long Island Lighting Company by Northeast Utilities Environmental Laboratory, Waterford, Connecticut. Submitted to DEP and NYSDEC on June 24, 1998. 14 pp.

[157] NUSCO. 1998b. Laboratory studies of the behavior of dielectric fluid in marine sediments and oysters using chemical fingerprinting techniques. Prepared for The Connecticut Light and Power Company and Long Island Lighting Company by Northeast Utilities Environmental Laboratory, Waterford, CT. Submitted to DEP and NYSDEC on October 27, 1998. 50 pp.

[158] NUSCO. 1999a. Dielectric fluid concentrations in sediments and shellfish following the December 1996 cable leak off Northport Station, Long Island, NY. Prepared for The Connecticut Light and Power Company and Long Island Lighting Company by Northeast Utilities Environmental Laboratory, Waterford, CT. Submitted to DEP and NYSDEC on February 10, 1999. 15 pp.

[159] NUSCO. 1999b. Dielectric fluid concentrations in sediments and shellfish following cable leaks beginning in April 1998 at the Norwalk Harbor Station Shoreline. Prepared for The Connecticut Light and Power Company and Long Island Lighting Company by Northeast Utilities Environmental Laboratory₁ Waterford, CT. Submitted to DEP and NYSDEC on February 25, 1999. 10 pp.

[160] NUSCO. 1999c. Long-term monitoring of alkylbenzenes in Norwalk Harbor sediments and shellfish (1996-1998). Prepared for The Connecticut Light and Power Company and Long Island Lighting

was not required, based on results from studies.[168,169] According to the reports, alkylbenzene levels in sediment and shellfish near the cables were found to be consistent with background levels for Long Island Sound.

John Volk, then Director of the Department of Agriculture, Bureau of Aquaculture, noted in a presentation to the Task Force that some trenches are still evident after 30 years.[170] He also noted that while alkylbenzene is relatively inert, the state required closure of a shellfish bed following one of the incidents.

Cross-Sound Cable

Company by Northeast Utilities Environmental Laboratory, Waterford, CT. Submitted to DEP and NYSDEC on July 8, 1999. 12 pp.

[161] NUSCO. 1999d. Alkylbenzene concentrations in sediments and shellfish following cable leaks first detected in September 1998 on the Norwalk Shoreline and in Mid-Long Island Sound. Prepared for The Connecticut Light and Power Company and Long Island Lighting Company by Northeast Utilities Environment Laboratory, Waterford, CT. Submitted to DEP and NYSDEC on October 8, 1999, 10 pp.

[162] NUSCO. 2000a. Alkylbenzene concentrations in sediment and shellfish following cable fluid leaks located on June 2, 1999 in Long Island Sound south of Sheffield Island, Norwalk Connecticut. Prepared for The Connecticut Light and Power Company and Long Island Lighting Company by Northeast Utilities Environmental Laboratory, Waterford, CT. Submitted to DEP and NYSDEC on April 5, *2000. 6* pp.

[163] NUSCO. 2000b. Alkylbenzene concentrations in sediment and shellfish following cable fluid leaks, June 25 and August 13, 1999 environmental leak monitoring. Prepared for The Connecticut light and Power Company and Long Island Lighting Company by Northeast Utilities Environmental Laboratory, Waterford, CT. Submitted to DEP and NYDEC on July 3, 2000. 6 pp.

[164] NUSCO. 2000c. Alkylbenzene concentrations in sediment and shellfish following cable fluid leak, February 8, 2000, environmental leak monitoring. Prepared for The Connecticut Light and Power Company and Long Island Lighting Company' by Northeast Utilities Environmental Laboratory, Waterford, CT. Submitted to DEP and NYDEC on September 29, 2000.6 pp.

[165] NUSCO. 2001. Alkylbenzene concentrations in sediment and shellfish following cable fluid leakage, February 4 and June 8, 2000 environmental leak monitoring. Prepared for The Connecticut Light and Power Company and Long Island Lighting Company by Northeast Utilities Environmental Laboratory, Waterford, CT. Submitted to DEP and NYDEC on March 31, 2001. 7 pp.

[166] NUSCO. 2001. Alkylbenzene concentrations in sediment and shellfish following cable fluid leakage, October 31, 2000 environmental leak monitoring. Prepared for The Connecticut Light and Power Company and Long Island Lighting Company by Northeast Utilities Environmental Laboratory, Waterford, CT. Submitted to DEP and NYDEC on July 27, 2001, 7 pp.

[167] NUSCO. 2001. Alkylbenzene concentrations in sediment and shellfish following cable fluid leakage, March 17, 2001 environmental leak monitoring. Prepared for The Connecticut Light and Power Company and Long Island Lighting Company by Northeast Utilities Environmental Laboratory, Waterford, CT. Submitted to DEP and NYSDEC on December 2, 2001. 7 pp.

[168] CL&P. Dielectric Fluid in Long Island Sound: An Environmental Perspective Attachment 6-13, in Application to the Siting Council for a Certificate of Environmental Compatibility and Public Need for the Norwalk, Connecticut to Northport, New York Submarine Cable Replacement Project. Submitted to the Siting Council, February, 2002, Docket 224.

[169] CL&P. Responses to interrogatories (CSC-01-021 and CSC-01-022) from the Siting Council, Docket 224.

[170] Presentation by Mr. John Volk, then Director of the Department of Agriculture, Bureau of Aquaculture, to Task Force meeting of September 19, 2002. John Volk retired from the Department of Agriculture in May 2003.

Recently constructed but not operational, the Cross-Sound Cable interconnects the electric transmission grids of New York and New England between Brookhaven, Long Island and New Haven. The Siting Council granted Cross-Sound Cable a Certificate of Environmental Compatibility and Public Need in January 2002. The project received permits from DEP and ACOE in March 2002.

Construction History In May 2002, the cable system, consisting of two solid dielectric power cables and one fiber optic telecommunication cable, was buried in a common trench within the seabed of Long Island Sound for the entire 24-mile route. Approximately 21,400 linear feet of the cable system was routed within the Federal Navigation Channel (Channel) in New Haven Harbor to substantially avoid cultivated shellfish beds.[171] In anticipation of possible future dredging of the Channel, the ACOE and DEP prescribed a minimum burial depth of -48 feet mean lower low water. The installation method used HDD and remotely operated water jetting burial tools from a self-positioning vessel. Construction was also subject to time-of-year installation restrictions.

Cross-Sound Cable's contractors subsequently determined that several short sections of the cable within the Channel collectively totaling 1,800 feet were not installed to the required burial depth of -48 feet mean lower low water. According to Cross-Sound Cable, the results of the characterization studies indicated that all but one of the sections of the cable system requiring further burial are located in areas of sediments. In the remaining section, the cable system is resting on bedrock for approximately 500 feet. Cross-Sound Cable has proposed alternative construction methods to achieve the required depth in these sediment areas, but DEP has stated that further review is pending until the moratorium established pursuant to PA No. 02-95 expires.

Documented Impacts In accordance with the state-approved benthic monitoring plan, Cross-Sound Cable completed the first post construction (six-month) monitoring in November 2002.[172] A similar pre-installation survey was completed in May 2002. Cross-Sound Cable reports that the results of the post-installation survey indicate the following:

- The only observable change in the seabed geomorphology from the pre--installation report is a shallow, localized, linear depression representing the path of cable installation. The depressions range from 0.5 to 3 feet deep, and 2 to 8 feet wide.

- The six benthic habitat types identified in the pre-installation survey are still detected in the post installation surveys. Based on video imagery and sediment

[171] Presentation by Mr. Michael Ludwig, a Fisheries Biologist for NOAA, before the Task Force on September 19, 2002.

[172] Six-Month Post Installation Benthic Monitoring Survey for the Cross-Sound Cable Project, New Haven CT, to Shoreham, NY. October 14 to November 20, 2002. Prepared by Ocean Surveys Inc. The survey protocol was approved by DEP with consultation with Department of Agriculture, Bureau of Aquaculture, NMFS, and the ACOE.

profile images, the only visible changes in substrate characteristics is in the Federal Navigation Channel. In this area is a patchy, thin, 1 to 2 cm sediment layer comprised of fine sandy silt. This feature was not observed in any of the other survey areas.

- The types and diversity of bottom dwelling organisms and macroalgae observed in the video imagery remained consistent between the pre- and post-installation surveys. Prominent organisms observed in remote video images obtained over the cable centerline were comparable to those observed in video obtained along survey lines offset from the cable area. More disturbance of sediment layers by biological activity was evident in the post-installation survey conducted in October/November compared to the pre-construction April/May survey, presumably due to seasonal conditions. The biological activity confirms recruitment of organisms into the installation area.

- Sediment oxidation depths, a marker for the quality of the benthic habitat in estuaries like Long Island Sound, were consistent between pre- and post-installation surveys. This measurement combined with the other parameters measured through sediment profile imagery suggests that the installation of the cable did not adversely impact habitat quality for benthic communities.

- Magnetic field readings did not detect the presence of the cable, which was not in service during the post-installation survey. Magnetic field readings did not detect any isolated magnetic anomalies representative of ferrous objects in any of the areas and observed magnetic field readings were normal for this geographic region on the earth. A comparison of the measured variation and expected variation at each area indicates there is minimal local disturbance to the magnetic field in the survey areas. Additional tests would be conducted to confirm magnetic field variations during line operations.

2.5.3 Environmental Status of Gas Pipelines

Iroquois Gas Transmission System

The Iroquois Gas Transmission System pipeline enters Long Island Sound in Milford and emerges at Northport, Long Island, New York. This 24-inch steel pipeline traverses 26.3 miles across Long Island Sound; of this, approximately 16.1 miles are in Connecticut. Installation of the Long Island Sound portion of the pipeline was completed in 1991, pursuant to certificate approvals from the FERC, the Siting Council, DEP, and the NYPSC, and a permit from ACOE. The entire 375-mile Iroquois pipeline system achieved commercial operation in 1992.

Construction History The location of the Iroquois crossing of Long Island Sound, including the alignment across shellfish lease areas off Milford, was determined based on consideration of engineering and environmental factors and on consultations with various federal and state regulatory agencies, including the Siting Council, Department of Agriculture (Bureau of Aquaculture), NMFS, the FERC, ACOE, and DEP.

To install the submarine pipeline, Iroquois used various construction methods available at the time, including dredging, plowing, and jetting, depending on water depth and sediment type.[173] Like the 1385 Line, these methods represented available existing technology at the time of Iroquois' construction.

Clamshell dredging was utilized to pre-excavate the pipeline trench for approximately 2.5 miles, from the Milford landfall through shallow-waters, including through shellfish lease areas. The excavated material was temporarily sidecast adjacent to the pipe trench to be later utilized to backfill the installed pipe. Plowing and jetting were generally used to install the pipeline in offshore areas.

The time window for construction was restricted to late winter and early spring to minimize potential impacts to commercial shellfish and other fisheries. Accordingly, the pipeline was installed in the winter and spring of 1991. A storm event, which occurred during installation, caused the sidecast spoils to partially refill the trench and re-deposit outside of the route, which required an additional pass of the dredge and clean fill to be brought in to supplement the backfill operation, in some discrete areas.

In nearshore areas of shellfish production in Milford, after dredging a trench and installing the pipe, Iroquois backfilled and then smoothed the pipeline trench with a drag beam. During this operation, the contractor experienced difficulty confining the movements of the drag beam to the prescribed 300-foot wide construction corridor in the nearshore area. Consequently, the contractor disturbed the surface sediments outside the route. The drag beaming operation resulted in 85% of the seabed within the 300-foot wide nearshore area to be restored to within one foot of the original bathymetry, and a mass balance calculation generally showed that the highs were equal to the lows in the area. Iroquois reached agreement with permitting agencies that there were diminishing returns in continuing the beam dragging beyond this point, and remaining restoration could be accomplished with natural sedimentation.

Iroquois permits and certificates did not require burial of the pipeline in offshore areas beyond the shellfish lease beds. However, the offshore portion of the pipeline (beyond the shellfish lease beds) was jetted and plowed during installation to reduce the impact that the pipeline could potentially have on lobster migration.

<u>Documented Impacts</u> The principal issues raised with regard to the Iroquois pipeline pertain to impacts to the benthic environment, including shellfish lease areas. No documented issues were identified with respect to depth of cover over the pipeline.

In addition to the use of the drag beam to smooth the nearshore areas affected by dredging activities, Iroquois implemented various measures to mitigate shellfish-related

[173] Observations of Pipeline Corridor from 1999 High Resolution Multibeam Survey Construction Details from 1991 Long Island Sound Pipeline.

concerns. These ranged from pre-construction route modifications to compensation to the shellfish leaseholders. Among these mitigation measures were:

- Alignment of the pipeline through shellfish lease areas as directed by the Bureau of Aquaculture and other involved agencies. The pipeline was routed to traverse areas primarily leased by a large shellfish leaseholder (Tallmadge Brothers); it was anticipated that routing through the Tallmadge leases would have less of an impact on the overall Tallmadge operations than would alignment through a single leaseholding of an individual. All but one of the leases along the Iroquois route was owned by Tallmadge. Route modifications to accommodate these initial shellfish-related concerns added approximately $2.1 million to the project capital cost.

- Financial compensation of $5.2 million was paid to leaseholders affected by the construction.

- Financial compensation of $525,000 was paid to Tallmadge to unload, store, and spread cultch on the disturbed lease beds after construction. At Tallmadge's request, this sum was instead paid to the Department of Agriculture for the purposes of funding a laboratory for the Bureau of Aquaculture.

- Iroquois provided 1,250,000 bushels of cultch, valued at $1.5 million, for the restoration of public and private shellfish beds impacted by the construction of the pipeline, and to aid in the restoration and revived productivity of the seabed. However, in a settlement agreement with state agencies, Iroquois released all rights to the placement of the cultch as part of restoration. The cultch was instead placed on other state leases (public fields off Bridgeport and Stratford) to compensate for impacts along the Iroquois pipeline. It was reported that a productive oyster set was established at this alternative location.

Iroquois surveyed the pipeline route in 1993 and again in 1999.[174] Based on the results of these surveys, Iroquois concluded that natural sediment transport and infilling covered the offshore portion of the pipeline within a year or two of installation in those areas where the pipeline was installed by plowing in clay sediments. During that period, the sediment slopes across the trench in general were naturally reduced on the order of 5 to 20 degrees. In the nearshore area, the seabed was observed to be smooth, with little or no bottom relief.

Iroquois also conducted surveys along the pipeline route in the shellfish lease areas off Milford. These surveys were conducted in February/March 1991 (pre-construction) and July 1991 (post-construction), and involved comparisons of oysters per square yard at monitoring points ranging from 100 feet to 4,250 feet from the pipeline centerline. In general, the results of the surveys showed that compared to pre-construction conditions,

[174] Observations of Pipeline Corridor from 1999 High Resolution Multibeam Survey, Construction Details from 1991 Long Island Sound Pipeline.

the number of oysters decreased after construction at distances of 100 to 400 feet from the pipeline centerline, but increased after construction at distances greater than 1,270 feet from the centerline of the pipeline.

In addition, Iroquois performed a water quality monitoring program using live oysters. Six monitoring stations were established near the pipeline in March 1991. The oysters were recovered in July 1991. At each of the six locations, the oysters appeared normal in color and no offensive odor was detected.[175]

The Bureau of Aquaculture was extensively involved in monitoring the impacts of the Iroquois project on shellfish resources.[176] Bureau of Aquaculture staff reported that anchors associated with the construction equipment disturbed bottom substrate as far as 2,000 feet on either side of the pipeline centerline, creating long-term impacts to oyster habitats. Bureau of Aquaculture staff also have noted that despite attempts to level the bottom, depressions left by the anchors have filled in with fine-grained sediments and presently have low or no productivity. In the short-term, oysters are particularly vulnerable to suffocation from sediments that are suspended and redeposited during construction. During construction, the width of the sediment plume appeared to extend out as much as 4,000 feet from the construction area. As it takes two to four years for oysters to grow to harvestable size, such effects can result in long-term disruption of the harvest.

Commercial shellfishermen provided the Task Force with personal, anecdotal evidence of disruption of oyster aquaculture operations from construction of the Iroquois pipeline.[177] They attested that construction resulted in an impact area as much as 400 feet on either side of the pipeline. They suggested that the use of the drag beam to level the trench has proved only partially effective, and portions of the trench may be as much as 6 feet deep. The steep slopes along the trench have interfered with the use of oyster dredges. Oysters do not appear to have returned to areas within the trench, although the area was recolonized with hard-shell clams. The shellfishermen also noted that anchor scar drag marks, some 800 to 900 feet long, persist several hundred feet outside of the primary impact area. These anchor scars likewise affect harvesting.

The identification of definitive data concerning the impacts of the Iroquois construction on shellfish resources is further complicated by the lack of pre- and post-construction shellfish productivity data for the affected leases.[178] Shellfishermen have indicated to the Task Force that such productivity data is not recorded. In the 12 years subsequent to the installation of the Iroquois pipeline, three new shellfish leases have been created directly

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[175] Summary of Data concerning Shellfish Resources in Milford Harbor Before and After Construction of the Iroquois Natural Gas Pipeline. Prepared by Andrew W. Rehm, Ph.D., September 1992.

[176] Presentation by Mr. John Volk, then Director, Bureau of Aquaculture, Connecticut Department of Agriculture to Long Island Task Force Meeting of September 19, 2002. John Volk retired from the Department of Agriculture in May 2003.

[177] Presentation by Mr. Larry Williams and Mr. David Hopp (independent shellfish farmers). Task Force meeting of March 12, 2003.

[178] Presentation by Mr. David Warman, Vice President of Engineering – Iroquois, Long Island Sound Task Force meeting of September 12, 2002.

along the pipeline route (i.e., these leases were established over the pipeline route, in areas where no such leases existed previously). This indicates that at least some areas in the vicinity of the pipeline route remain economically viable for shellfish production.

The Bureau of Aquaculture records indicate that the three post-construction leases total 1,114 acres through which the pipeline runs approximately two miles, including a 0.5-mile break (non-leased area). The shellfishermen harvest hard shell clams from these lease areas.

2.5.4 Environmental Status of Telecommunications Cables[179]

AT&T

AT&T Communications installed a submarine fiber optic cable from Momauguin Beach, East Haven to Shoreham, Long Island, in accordance with a DEP permit issued in February 1993,[180] and an ACOE permit.

The DEP permit required that the cable be installed using HDD for 3,500 feet waterward of the high tide line, approximately 8 to 50 feet beneath the sediment surface, in order to avoid impacts to oyster beds. From the drilling exit point, the permit required that the cable be installed using the jet plow trenching process, to a depth approximately 10 feet below the sediment surface, except for an anchorage area where the burial depth was required to be 20 feet.[181]

Construction monitoring chiefly focused on potential releases of HDD drilling fluid, and appropriate containment measures for drilling fluids were required. The monitoring plan did not require AT&T to collect post-construction environmental data.

No further information on the environmental status of the AT&T cable was provided to the Task Force.

MCI

MCI Telecommunications Corporation installed a fiber optic telecommunications cable conduit from Madison to Rocky Point, Long Island, pursuant to permits issued by the DEP in December 1995[182] and ACOE. The DEP permit required MCI to install approximately 1,600 linear feet of the cable using HDD to a depth of 50 to 75 feet NGVD. Beyond the HDD exit hole, the permit required the cable to be installed to a depth of three to six feet beneath the sediment surface using a jet cable plow method.

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[179] Siting Council does not have jurisdiction over telecommunication cables. See CGS Section 16-50i.
[180] Permit No. SD-LG-92-069 issued to AT&T Communications, February 18, 1993.
[181] Despite a request from the Task Force, AT&T and MCI did not provide additional information.
[182] Permit No. 199502243-DS issued to MCI Telecommunications Corporation, December 12, 1995.

The permit also imposed time-of-year restrictions, barring in-water construction between June 1 and September 30, to protect spawning shellfish in the area. However, the cable did not directly cross any shellfish concentration areas or leases, according to Department of Agriculture, Bureau of Aquaculture maps that were included in the permit.

MCI was also required to notify Connecticut licensed lobster fishermen who fish in the area of the jet plowing of the need to temporarily remove gear during construction.

Monitoring for accidental releases of HDD drilling fluid was required, and MCI was required to post a performance bond to secure the performance of the work in accordance with permit conditions.

No baseline or post-construction environmental monitoring was required under the permit, and no such information was available to the Task Force.

2.6 Status Update of Proposed Infrastructure Projects Within Long Island Sound

When PA No. 02-95 was enacted, at least eight new or replacement energy projects crossing Long Island Sound were announced and being actively pursued. In the last twelve months, however, project proponents have withdrawn, deferred, or not advanced all but four of these projects: Islander East, Cross-Sound Cable, the 1385 Line Cable Replacement Project, and the Eastchester Pipeline. Cross-Sound Cable was approved prior to PA No. 02-95 and was constructed, but is not yet operational.

The Assessment Report Part I summarized the projects crossing Long Island Sound that had been proposed or recently constructed as of January 1, 2003. This section provides a status update of the three remaining active projects, as well as a review of the projects which have either been cancelled, are inactive, or for which applications have not been filed.

2.6.1 Active Projects

CL&P/LIPA 1385 Line 138 kV Cable Replacement Project

The 1385 Line , which links the CL&P system with the LIPA system, has been in service for almost 35 years and is jointly owned by CL&P and LIPA. The Project calls for the replacement of the seven (six energized and one spare) existing fluid-filled paper insulated single-phase cables which lay on the bottom of Long Island Sound with three, three-phase solid dielectric cables. The new cables will be solid and will be buried within the existing cable corridor. In Connecticut, the permitting process is underway. The Siting Council issued a Certificate of Environmental Compatibility and Public Need to CL&P on September 9, 2002 and a permit application for a Structures, Dredging and Fill permit is pending before DEP. This cable replacement project is exempt from the moratorium provisions of PA No. 02-95.

LIPA is responsible for obtaining permits and approvals for the New York portion of the 1385 Line cable replacement project. LIPA remains committed to achieving a long-term solution for continued operation of the transmission interconnection between Connecticut and New York. LIPA has not yet completed its review of its potential options. At this time, LIPA and their Board of Trustees are still evaluating the long-term alternatives for this cable and have not agreed to move forward with the replacement project. CL&P remains firmly committed to the goal of completing the replacement project as expeditiously as possible.

In the interim, LIPA's Board has authorized and directed LIPA to work with CL&P to quickly address the most recent damage incident. CL&P and LIPA are in the process of repairing the existing 138 kV cables, four of which were damaged by survey vessel's anchor in November 2002, so that it will be back in-service and available to support reliability in Southwest CT this summer.

Cross-Sound Cable

The Cross-Sound cable, connecting New Haven and Shoreham, Long Island, was certificated by the Siting Council in January 2002, received required permits from DEP and ACOE, and installed the 330 MW HVDC cable in the spring of 2002. Seven areas of the cable did not achieve the required burial depth in New Haven harbor, and the project has not received authorization to operate. Cross Sound Cable has proposed to contract with a specialty construction firm, and if authorized, will remediate these areas.

Islander East

The Islander East pipeline project, sponsored jointly by Duke Energy and KeySpan Energy, would extend from the C-1 mainline of the Algonquin pipeline system in North Haven to Brookhaven, Long Island. The route would extend 10.2 miles through southern Connecticut and then 22.6 miles under Long Island Sound. Islander East's proposed initial capacity is 0.28 Bcf/d (285 MDth/d), but could be expandable to 0.43 Bcf/d (445 MDth/d). The Siting Council issued recommendations to the FERC on August 1, 2002.[183] The project received FERC approval on September 19, 2002. The DEP subsequently issued a determination of non-consistency with respect to the state's Coastal Zone Management Plan. Islander East appealed to the U.S. Secretary of Commerce. The appeal was stayed, upon agreement by both parties to pursue negotiations. These discussions, as well as Islander East's application to the DEP for a Section 401 Water Quality Certification and other state permits, are pending.

Eastchester Expansion

[183] Correspondence from Pamela B. Katz P.E., Chairman, to Anthony M. Fitzgerald, Esq. and the Service List for Siting Council Docket 221 dated May 29, 2003.

Iroquois' Eastchester Expansion is located in Long Island Sound, but fully within New York jurisdictional waters. It is designed to deliver up to 0.2 Bcf/d to New York City through the installation of two new compressor stations, upgrades to its three existing compressor stations, and the construction of a 30-mile lateral running from a point on the mainline at Northport, Long Island, westward across Long Island Sound, and into the Bronx where it ties into the New York Facility System. The project is under construction and is scheduled for commercial startup in 2003.

2.6.2 Inactive/Cancelled/Not Filed Projects

Connecticut Long Island Cable (CLIC)

Northeast Utilities (NU) filed an application to sell transmission rights on a proposed 300 MW HVDC merchant transmission cable to be built between Norwalk and Hempstead Harbor or Oyster Bay on Long Island. NU received the FERC approval for the CLIC project in March 2002. However, based on a weak market response during NU's open season solicitation, NU decided not to pursue this project, and withdrew its FERC application on November 25, 2002.

Eastern Long Island Extension (ELIE)

Iroquois proposed a 29-mile, 20-inch marine pipeline that would tap into its existing Milford to Northport, Long Island pipeline offshore near Milford, and deliver gas to the KEDLI Facility System in Brookhaven, Long Island. The FERC issued a favorable Preliminary Determination for the ELIE project in September 2002. This project was deemed by the FERC, in the Islander East final EIS, to have the fewest environmental impacts of the two projects.[184] Iroquois requested that the FERC defer further action on its application until January 2003, and made a similar request to the Siting Council. Subsequently, Iroquois withdrew its certificate application at the FERC on February 7, 2003 due to "the lack of continued customer support for this project."[185]

Connecticut-Long Island Lateral

In January 2001, Tennessee Gas Pipeline Company announced its intent to construct a 1.6 Bcf/d gas pipeline from Connecticut to Long Island. The lateral was intended to enable Tennessee to provide new transportation service from the company's mainline facilities in Massachusetts to markets in Connecticut and on Long Island, N.Y. Receipt and delivery points were not specified. Interested shippers responded to Tennessee's open season in February 2001. No project updates or press releases have been issued by the project proponent since spring 2001, and no applications have been filed at the FERC or state agencies.

[184] Docket CP01-387, FERC Final Environmental Impact Statement (FE19), pp. 5-11.
[185] Status Report of the Iroquois Gas Transmission System, L.P., submitted to the FERC, February 7, 2003, Docket No. CP02-52-000.

NeptuneRTS Phase IV

The Neptune Regional Transmission System Project, sponsored by Atlantic Energy Partners, LLC, envisions a multi-phase project consisting of several thousand miles of HVDC cables that would connect generation in Maine, New Brunswick, and Nova Scotia with markets in Boston, New York City, Long Island, and Connecticut. The FERC approved NeptuneRTS's Phase I application for two 600 MW merchant transmission cables from Sayreville, New Jersey, to New York City and to Newbridge on the south shore of Long Island. The Phase I project received its completeness determination from the New York PSC in February 2002, and has an expected in-service date of 2004 to 2005. Phase II, from Nova Scotia to New York City, has not been filed with the New York PSC. No applications have been filed for Phase IV, a marine cable connecting Connecticut with Maine and Maritimes Canada; the status of this future project is uncertain.

2.7 Environmental and Ecological Impacts of Marine Infrastructure

PA No. 02-95 Section 3(D) requires the Task Force to evaluate the individual and cumulative environmental impacts of electric power line, gas pipeline, and telecommunication crossings of Long Island Sound, and the methods to minimize such impacts. This section provides a review of available background information regarding the short-term and long-term environmental impacts associated with each of the available marine construction methods, as well as the impacts associated with long-term operation of infrastructure crossings. The discussion also incorporates the measures available to avoid, minimize, or mitigate such impacts.

An overview of the construction methods and their general environmental impacts was presented in Part I. For convenience and completeness, relevant sections of that material are reproduced here. That discussion is augmented here with available information on current research in the scientific and regulatory communities on the ecological impacts of construction and operation of energy transmission and telecommunication cables in marine environments. Projects undertaken in the last two years, such as Cross-Sound Cable, the Hubline pipeline project in Boston Harbor and the Eastchester pipeline project in southwestern Long Island Sound have provided marine construction contractors with recent local field experience. The design of these projects represent the current "state of the art" with respect to marine energy infrastructure construction techniques and reflect a variety of methods for avoiding, minimizing, and/or mitigating adverse impacts to the marine environment. To the extent such information is available; it is incorporated in this section

2.7.1 Marine Construction Methods

Submarine pipeline, electric cable, and telecommunication cable projects utilize a variety of construction methods. It is not uncommon for pipeline and cable projects in marine environments to utilize different construction methods for different line segments. The selection of a particular method for use along specific segments is dependent on a number of factors, including biological communities and habitat resources, sediment characteristics, depth to bedrock, distance from shore, and water depth.

In general, there is similarity between the construction methods used for a submarine pipeline, and those used for an electric or telecommunications cable installation. However there are very significant differences as well. Even techniques that go by the same name, such as "jetting," operate on different principles for a pipeline installation than for an electric or telecommunications cable installation. There is also the difference in scale. The size of the equipment required to bury a 24-inch pipeline, such as the Eastchester Project, is necessarily larger than that required to bury an eight-inch cable.

Each construction method has an associated impact footprint on the substrate surface and can cause changes in water quality during construction. The impact zone for each construction method is summarized in Table 12, and includes the trench and the spoil areas. Seafloor impacts include the direct footprint of a trench and adjacent areas when sediments removed from the trench are sidecast, as well as far field areas where sediments released into the water column are redeposited. If excavated sediments are not removed, they may be subject to dispersion into far field areas by strong currents resulting from storm events. Seafloor impacts may also include the footprint of any anchors or spuds which are used to position and stabilize the installation barge.

All trenching methods, including dredging, plowing, and jetting, cause a direct impact to bottom sediments and fauna, and the extent to which this effect is magnified is a function of the physical dimensions of the trench being excavated, the placement or degree of sidecasting of spoils, and backfilling. To the extent that anchors and spuds are used in positioning the trenching and lay barges and the HDD support vessels, they also directly disturb bottom sediments and habitats. In addition, the sea floor may be disturbed by the cable sweep of the anchors in the span between the barge and the anchor points. The impact associated with the anchor cable sweep may be minimized through the use of mid-line buoys.

The recovery of the seafloor to pre-construction conditions depends on the construction method employed, the geophysical characteristics of the sediments disturbed, and the physical environment, as well as on whether the trench is backfilled. Restoration of ecological function depends on factors such as type of preexisting biological community, complexity of the habitat, source of biota for recruitment, and time of year of the impact.

Table 12 – Typical Widths for Pipeline and Cable Construction Activities (Marine)

Activity	Typical Construction Width (ft)[186]	
	Pipeline[187]	Cable
Plow Burial	75	50-75
Jet Burial	100 – 300	50-150
Dredging	150 – 200	N/A
Blasting (only occasionally required)	Varies	Varies
Offshore Lay Barge Anchoring*	2,000 – 4,000	N/A
Shallow Lay Barge Anchoring*	200 (Spud) - 2,000	N/A
HDD Support Mooring*: Jackup (Jackup Pads)	200 - 300	200-300
Spud Mooring	75-200	N/A

*refers to anchor spread from vessel

Deep Water Pipeline Installation

Deep-water construction typically uses barges to first lay the pipeline on the bottom and then to bury and backfill the pipeline. A pipeline lay barge has on-board facilities to weld the pipe sections together and lower them to the sea floor. Once the pipeline is laid on the seafloor, the lay barge converts operations to burial. Using a jet or sub-sea plow, a trench is then excavated under the pipeline to bury the pipeline.

The deepwater barges are typically several hundred feet long, and positioned with eight to twelve anchors. The maximum extent of the mooring anchor array could be approximately 2,500 to 5,000 feet to the front and back of the installation barge, and up to 2,000 feet to either side. As the lay and bury barges advance, tugboats lift the anchors from the sea floor and reposition them at approximately 0.5 to 1-mile intervals in the direction of movement. The barges may be supported by a number of other craft such as pipe barges, dive support boat, and transport vessels.

[186] The distances also reflect the impacts associated with the various construction methods, including most of the sediment load. The full extent of a sediment plume in the direction of the currents may exceed the indicated construction widths.

187 Reported by Duke Energy Gas Transmission and Iroquois in a joint presentation to the Task Force on November 13, 2002.

The anchor movements (i.e., anchor touchdown point, drag point, set point) required to position the construction vessels will create scars that will affect bottom habitat at varying distances from the immediate construction area. For example, for a pipeline lay vessel, anchors may be 8 feet wide by 10 feet long, with a 20-foot drag. A typical pipeline installation may result in three anchor sets per mile per pass.[188]

Plowing. Under this method, the bury barge pulls the sub-sea plow, which physically cuts a trench beneath the pipeline. Typically, the pipeline trench may be six to eight feet deep by 20 to 25 feet wide at the surface of the seabed. The spoil material is displaced on both sides of the trench. After the proposed pipeline is located to the desired depth, the sub-sea plow may undertake another pass to place the trench spoil back on top of the pipeline. The sub-sea plow is preferred to other in-water installation techniques, such as dredging or hydraulic jetting, in areas where immediate backfilling of the trench is required, or where low water turbidity is desirable.[189] Plowing is most feasible in soft sediments, and works less effectively in rock or sand.

Jetting. The jetting method of trenching uses high-pressure water or air jets to excavate the trench and lower the pipeline. Excavated materials are discharged away from the pipeline and the pipeline gradually settles into the trench created behind the jet sled. In suitable substrates, the depth of burial of three to six feet or more typically can be attained with one pass of the jet sled, depending on the characteristics of the underlying sediments. Greater trench depths typically require multiple jetting passes. Backfilling of the trench is generally accomplished by natural slumping of the trench walls due to tidal and ocean current forces, or by subsequent infilling by suspended sediments, particularly during storm events. If natural sedimentation processes do not fully backfill the trench, it may remain partially open. Some jetting equipment can be operated remotely from ships. This equipment may be self-positioning, eliminating the need for anchors or spuds.

The short-term impacts for pipeline installation include increased turbidity during construction. The potential long-term impacts include alteration of bottom habitat within the trench and adjacent area. Anchor cable sweep can also alter bottom conditions especially where multiple passes are required. Midline anchor buoys that suspend the anchor cable(s) above the seabed may serve to minimize these impacts.

Deepwater Trenching for Cable Installation

Deepwater trenching for a cable installation typically requires only one vessel, and does not require the eight to twelve anchors required by pipeline installation barges, nor their accompanying anchor tugs. Unlike pipelines, which are assembled and welded together on board the lay vessel, a cable may come as a continuous length mounted on large spools, which are loaded at the factory and delivered to the site by the cable laying ship. In the case of deepwater operations, the cable laying and the burial operation are done

[188] FERC Islander East Pipeline Project, DEIS, March 2002, pp 3-38 and 3-39.
[189] Siting Council Docket 221, Finding of Fact No. 82.

simultaneously (i.e. the majority of the cable is placed on the bottom, and buried with the jet or plow in the same pass), or sequentially (i.e. the majority of the cable is first placed on the bottom, and then buried with the jet or plow in a second pass).

Plowing. The sub-sea plow that is used for a cable installation is smaller, and operates on a different principle than the pipeline sub-sea plow. It does not cast material to the side as much as spread the sediment some ten inches apart so as to permit the cable to slip down in between its blades. As the sub-sea plow moves forward, the ground behind it resettles over the cable. The sub-sea plow is pulled forward either by an anchored bury barge, or more often the ship's propellers are sufficient for the purpose. The sub-sea plow can twist and damage the cable during installation. The sub-sea plows' potential for causing damage to the cable is one of the reasons jetting is often considered preferable.

Jetting. The jetting method of trenching uses high-pressure water or air jets to excavate the trench and bury the cable. Typically, the jet is not used for casting material aside, but rather it uses two side-by-side blades, which are inserted into the sediment on either side of the cable. These blades liquefy the sediment, and allow the cable, which is heavy, to settle down by gravity. A depth burial of three to six feet or more typically can be attained with one pass of the jet sled, depending on the characteristics of the sediment. Greater trench depths typically require multiple passes. Unlike the sub-sea plow, the jetting equipment is self-propelled and thus it does not depend on a tow line from its tender ship for its forward motion. Jetting equipment for cables, unlike other equipment mentioned above, is buoyed so as to be neutral in weight underwater, thus further reducing the footprint and effects to the seafloor.

Jet-plowing. A jet-plow is a hybrid between the sub-sea plow and the jet sled. The jet-plow is pulled by a surface ship, like the sub-sea plow, but it is equipped with hydraulic nozzles on its blades. The use of pressurized water significantly reduces the tension on the towline and also, by liquefying the soil, facilitates the burial of the cable.

The short-term effects of the deepwater trenching include turbidity during construction, and alterations of the sediments within the installation trench. In the case of the jet, the effective width of the trench depends on the characteristics of the sediment and the resultant angle of repose. The jet-plow could create a trench approximately nine feet deep, and six feet wide in fine-grained sediments or twelve and one-half feet wide in sand-grained sediments.[190] The majority of the hydrated sediment produced by the jetting equipment would remain in the trench, and settle immediately adjacent to the trench. A small percentage of the total volume of hydrated sediment becomes suspended in the water column, (sediment plume) and settles as a film of sediment generally in the direction(s) of the currents. The long-term signature of the trench, and the depth and extent of the sediment deposition from the plume, are among some of the issues being examined in connection with recent cable laying projects.

[190] Siting Council Docket 208, Finding of Fact No. 67.

Shallow Water Installation

In both pipeline and cable installations, alternate construction techniques are required in shallow waters that are beyond the reach of the deepwater installation equipment.

Horizontal Directional Drilling. Horizontal directional drilling (HDD) is typically employed in near-shore environments to achieve minimal disturbance of the bottom materials that would normally occur with conventional open-cut technology and to allow installation under obstacles or sensitive areas. It can be used for both pipeline and cable installation. As it is a trenchless process, there is minimal direct disturbance of benthic communities as well as minimal indirect disturbance from resettling sediment. However, in determining the advisability of this technique, one must also consider whether there are suitable places for both the entry hole and the transition basin at the exit hole. As previously mentioned, that transition basin often requires supplementary underwater excavation. Hand-jetting might be sufficient, but if dredging is required, then the resulting potential for adversely affecting a nearby sensitive area (e.g., shellfish beds) is a consideration that is balanced against the benefits achieved via this trenchless process. The drilling process is completed in a series of steps, including pilot drilling, reaming, swabbing, and conduit installation. Electronic positioning systems guide each step. The drill rig is typically staged and operated from the landfall area, where the entry pit is established.

Bentonite, a non-toxic, non-native clay, used to make the drilling fluid, is delivered to the cutting head to provide hydraulic cutting action, lubricate the drill bit, stabilize the hole, and remove cutting spoils as the drilling fluid returns to the entry point of the pilot hole. Typically, drilling fluid returns are processed to remove the cuttings, and the bentonite is recycled for use as the drilling operation continues. Some bentonite will leak from the HDD exit point. Because the drilling fluid is denser than water, it tends to remain near the seafloor, and can be recaptured at the exit hole. However, if the drilling fluid, which is under pressure, encounters a weakness in the soil or bedrock, it may “frac-out” and cause an uncontrolled discharge to the seafloor at a location other than the exit hole.

The feasibility of the HDD technique for a specific location is a dependent upon the subsurface geologic conditions, pipe diameter or cable strength, and entry and exit conditions. Installations through profiles with diverse geologic strata are difficult and may require re-tooling the drilling and reaming heads to accommodate the varying formations. Gravel lenses, cobble, or boulders within the profile strata represent the most adverse geologic condition for HDD installations, and consequently, the HDD technique is typically not a feasible alternative in this type of strata. Current technology can achieve directionally drilled installations of approximately 4,000 to 6,000 feet, under favorable conditions; however, the length of the installation may be limited by the physical characteristics of the cable or pipeline. Electric cables will not normally withstand such long cable pulls without some risk of damage.

Dredging (as sometimes used for pipeline installations). Dredging is used primarily for trenching along the shallow water portions of a pipeline route. Barges equipped with a crane and a bucket are used to excavate a trench to the appropriate depth. Barges may also support a hydraulic excavator. Depending on quality of the sediments and nature of the bottom environment, excavated material may be lifted to the surface and placed on a barge for transport to a disposal site, or side-cast adjacent to the trench. Barges are typically positioned by three spuds, large columns that are sunk into the bottom to anchor the barge. Once the pipeline has been installed and tested, the trench is backfilled. Dredging may also be used when directional drilling from an onshore location to offshore requires the construction of a transition basin, which must be made between the directionally drill exit hole and the pipeline or cable trench.

Short-term impacts may include an increase in water turbidity resulting from the loss of sediments from the bucket and release of contaminants. Longer-term impacts may include erosion of spoil mounds by wave action from storm events, if sediment is sidecast. Minimizing and mitigating these impacts calls for completing dredging, pipe lay and backfill of contaminated sediments in as short a time period as possible. The use of silt curtains, which are designed to restrict suspended sediments to a controlled area of the construction site, may be limited in certain areas (i.e., locations with less than 1-2 knot currents). Environmental dredge buckets, which minimize the loss of sediments from the dredge bucket, may also be employed for contaminated sediments. Monitoring of water quality is generally required during operations. Long-term impacts include alteration of bottom habitat within the trench footprint and sidecast footprint.

<u>Dredging (as sometimes used for cable installations)</u>. For cable installations, this method need only be used in specialized instances where other techniques are impractical. For example, if there is a lens of material along the cable path that prevents installation to the required depth by jetting or plowing, the preferred solution is to circumvent the obstacle through a deviation in the route, or to simply leave the cable closer to the surface and protect it in other ways. However, if neither of these choices is allowed, then dredging is likely the only remaining option.

<u>Jetting (the preferred technique for cable installations)</u>. For cable installations in shallow waters, jetting is the preferred technique, even for areas beyond the reach of a cable-laying ship. In this instance the jetting equipment is smaller, and may be diver assisted. The effects of operating a jetting burial tool in shallow water are no different from those in deep water, except that the column of water in which any escaping sediment disperses is much shallower.

<u>Plowing (an alternate technique for cable installations)</u>. Plowing can also be used for cable installations, since both the dimensions of the sub-sea plow and the force required to pull it are moderate. The disadvantage of the sub-sea plow is that it is not self-propelled, and requires the barge from which is it operated to be solidly fixed at each pulling location with spuds or anchors.

Shoreline Trenching. Shoreline trenching refers to the use of conventional excavating equipment to install the cable or pipeline. Also called "conventional open-cut technology," it is an extension of the technique used in undergounding the inland portion of the cable or pipeline. In general, for both pipelines and cables, if this technique is utilized at all, it is only for the purpose of reaching the point where one of the previous techniques can be used. For electric cables, jetting equipment is available that reaches up to the high tide line, provided that the tender with the pumps can get close to shore. In such a case, shoreline trenching can be minimized. However, shorelines that are exposed to substantial wave action can be very resistant or coarse-grained, making jetting or plowing not feasible. In such cases a conventional trench is extended from the upland past the shoreline until the point where the sediment is sufficiently fine-grained to enable the jet or sub-sea plow to operate.

Hand Jetting. A diver-operated hand jet may be used to bury the cable or pipeline. Hand jetting is typically used for distances of less than several hundred feet, including where HDD-installed pipeline is connected to conventionally installed line, at tie-in pipeline welds, and at lateral side taps. For hand jetting, a support vessel provides pressurized water through a hose and nozzle maneuvered by a diver. The diver works the sediment from under the cable or pipe to create a trench into which the cable or pipe settles. Hand jetting is also commonly used by divers to locate damaged sections of cables or the ends of severed cables.

Surface Lay

For certain applications, the pipeline or cable is laid on the sea floor and covered with an armoring of stone rip-rap or concrete mats. This method may be employed where a line must cross bedrock, other cables or pipelines, or contaminated sediment where disturbance is undesirable. Typically this method is only utilized for short distances.

Armoring

Armoring is also required for short distances where the cable or pipeline, while not at the surface, cannot be buried sufficiently to protect it against external forces, such as wave action or damage from ships. Placement of armoring materials alters the benthic habitat along the construction footprint unless conditions happen to be roughly similar, such as they would be at a rocky seashore. In the right environment, these can be configured to serve as shelter, and a point of attachment for species requiring hard surfaces. In the wrong environment, however these structures may form a physical barrier to demersal or epibenthic organisms, or simply cause an unwarranted change to the litoral quality of the seashore.

Blasting

Underwater blasting may be required where the trench encounters resistant bedrock, where maintaining a predetermined depth is required, and/or where alternate techniques, such as armoring the cable or pipeline, are not practical or are not authorized by permits. Noise and pressure waves can cause short-term impacts on marine species including marine mammals, turtles, and fish.

2.7.2 Construction Impacts on Marine Resources

Construction impacts can be grouped into five basic categories:

- Direct habitat disturbance related to excavation (plowing and jetting), dredging (soft and hard substrate), and blasting (some hard substrate);
- Direct impact to marine species;
- Sediment resuspension (water quality impacts) and deposition (benthic impacts) resulting from trench excavation, blasting, and to a lesser extent HDD exit points or “frac-outs”(release of bentonite drilling fluid);
- Substrate disruption related to anchor cable sweep; and
- Permanent habitat alteration related to placement of armoring materials.

The timing of construction affects the type and level of impacts that will occur. Avoiding construction during the sensitive life stages of marine species will minimize potential impacts. These impacts can vary depending on the species.

Water Quality Impacts

Water quality is directly affected by the displacement and disturbance of bottom sediments and the resultant release of sediments into the water column. This causes increased turbidity, which can affect habitat and marine species. Increased turbidity associated with construction activities is a function of the construction method employed, the amount of material that is displaced, and the sediment characteristics . The suspension of sediments into the water column can temporarily affect water quality through the reduction of dissolved oxygen and depth of light penetration. Contaminants, if present in the sediments, also may potentially be released. The suspended sediment drifts with the water currents and eventually settles on the bottom. The sediment plume’s duration and extent of migration depend on many site-specific variables, including the amount of sediment in suspension, the size of sediment particles, water depth and temperature, current velocity and tidal stage, and wind direction and speed. Coarse sediments generally settle quickly, whereas finer sediments remain suspended in a plume for longer periods of time.

Water quality impacts associated with construction are generally short term in duration. Dredging, plowing, and jetting all have varying capabilities of releasing sediments into the water column so that the primary impact is increased turbidity. The duration of the impact depends on local hydrodynamics, grain-size composition of the sediment, and duration of the construction activity. Generally, a turbidity plume generated by bottom disturbance will dissipate within hours of cessation of the activity that caused it. Release of anoxic organic sediments into the water column can also remove dissolved oxygen from the water column in the immediate vicinity of the disturbance. Organic sediments are more commonly found in deep areas in the western portions of Long Island Sound and in some of the dredged material disposal areas (Appendix C, Figure C-19). The biological significance of this effect depends on the time of year. It is more likely to pose a potential problem in the summer, when dissolved oxygen levels are naturally suppressed.

There is also concern that contaminants can be released from sediments in the water column. Several monitoring programs[191,192] have shown that metals and organic pollutants such as PCBs are rarely dissociated from sediment particles and released into the dissolved form when sediments are disturbed. However, any contaminants that are bound to sediment particles will be transported with the particles.

The federal and state agencies that regulate construction activities in Long Island Sound generally require pre-construction sediment testing and analyses to assure that contaminated sediment areas are avoided. If avoidance is not possible, special mitigation techniques are typically mandated. Another short-term impact includes water quality impairment from the release of HDD drilling fluids, "frac-outs", and the disposal of spent drilling fluids and cuttings. The release of HDD drilling fluids has the potential to impact water quality and marine life through localized increases in turbidity and sedimentation. This very fine-grained material can suffocate benthic organisms and alter the seafloor habitat. The DEP currently requires all permit-holders in Long Island Sound who utilize HDD to post an environmental performance bond to guarantee cleanup, in the event of an uncontrolled release of bentonite fluid. In addition, applicants are required to prepare and implement a detailed monitoring plan to minimize the possibility of a release.

2.7.3 Impacts on Benthic Communities and Fish

Benthic communities and fisheries resources may potentially be impacted by direct disturbance of bottom sediments from trenching, barge anchoring and cable sweep, and by acoustic shock from bedrock blasting, if such construction methods are used. Indirectly, these organisms may be impacted by the associated turbidity and sediment deposition, and by subsequent erosion of the trench spoil mounds. Potential direct

[191] ACOE (New England Division) and Massachusetts Port Authority. 1995. Final EIR/EIS Boston Harbor Navigation Improvement Dredging and Berth Dredging Project.

[192] Pembroke, A.E. and J. Bajek. 2000. Disposal of Boston Harbor Sediments using In-Harbor CADS: Minimal Water Quality Effects. Presented at Sea Grant Conference on Dredge Material Management: Options and Environmental Considerations. Dec. 2000, Boston, MA.

significant adverse impacts in the construction area include mortality by dislodgement or burial, and disturbance and/or destruction of commercial shellfish resources. Potential indirect, significant, adverse impacts include mortality by suffocation beneath silt, interruption of spawning and migration, habitat loss or alteration, and introduction of water pollutants. Once again, the degree to which these effects may occur has to be investigated and evaluated based on site specific and project-specific conditions.

A primary concern relates to shellfish beds and fisheries resources and habitats in the nearshore and shallow marine environment (less than 30 feet). The effects of construction on such areas depends on the project and the specific installation techniques used. Recovery of the bottom habitat and shellfish resources depends on a number of factors, including depth of the scar or disturbance, the local sediment transport regime, the original nature of the benthic environment, and methods used to restore the substrate, such as placement of cultch or sandy top dressing. These factors are likely to be variable along a project route. For example, if anchor scars do not refill by natural sedimentation or are not actively backfilled, they might persist as depressions, accumulate fine-grained materials and organics, and develop different benthic communities. This would represent a long-term conversion of shellfish habitat.

Long Island Sound has been the subject of extensive research on successional stages in benthic communities. The number and type of organisms change based on the degree of environmental disturbance or stress.[193] One viewpoint relies on principles of landscape ecology to explain small, medium, and large-scale spatial and temporal variations in benthic community structure.[194] Another viewpoint focuses on the role of disturbance in creating successional stages in benthic communities. The number and type of organisms change based on the degree of environmental disturbance or stress. Communities typically progress from a Stage I, or early successional stage, typified by an abundance surface dwelling, resilient or opportunistic species, which have high reproductive rates and minimal or weak predation and competition defenses, are rapidly established following a disturbance. The Stage I community transitions to a Stage II community, which includes species such as the clams *Tellina agilis* and *Nucula annulata*. The final stage, Stage III, is a mature community typified by large, deep dwelling, subsurface deposit feeding species that include polychaete worms *Nephtys incisa* and razor clam *Ensis directus.* Stage III species burrow more deeply into the sediment. These species are longer-lived and their position deeper in the sediment provides greater protection against predation. These more mature communities are characteristic of fairly stable physical conditions. The successional stage of the community becomes important when estimating the level and time frame for recovery from potential impacts.[195] While useful to explain invertebrate communities in the Central Sound, this explanation may oversimplify Sound-wide invertebrate communities.[196]

[193] Rhoads, D.C., P.L. McCall, and J.Y. Yingst. 1978. Disturbance and production on the estuarine seafloor. *Am. Sci. 66*: 577-586.
[194] Zajac *et al.* 2000.
[195] Rhoads, D.C., P.L. McCall, and J.Y. Yingst. 1978. Disturbance and production on the estuarine seafloor. *Am. Sci. 66*: 577-586.
[196] Zajac *et al.*, 2000.

Disturbance and Recovery of Fine-grained Substrates

Potential benthic impacts in fine-grained sediments (clays, silts, and fine sands) include habitat burial, sediment resuspension and deposition, and substrate disruption. Construction using HDD may disturb habitat around the exit or entrance holes through dredging for the tie-in to other construction methods and through potential release of drilling fluids to the substrate.

Dredging, plowing, and jetting may disturb communities in the immediate trench footprint as well as the adjacent areas where sediments are sidecast. Benthic invertebrates in the areas of this direct impact footprint will likely be killed. Larger, more mobile invertebrates and fish may be able to avoid the disturbance. Loss of the benthic community also results in the loss value for predators.

Pioneering species of benthic invertebrates may start recolonizing disturbed sediments within a period of days to weeks, depending on when the disturbance occurs. Rhoads *et al*. found that organisms colonized azoic sediment trays in Long Island Sound within 10-29 days.[197] Murray and Saffert found that dredged material disposed at the Western Long Island Sound disposal site was initially recolonized in one to two weeks.[198] In areas where the pre-construction benthic community is typified by pioneering species, full recovery could occur within a month or less. Northeast Utilities Service Company (NUSCo) found that the sedimentary character and benthic infaunal communities recovered in five to six years after the Millstone Unit 3 intake structure was constructed and began withdrawing cooling water from Long Island Sound.[199] Other fine-grained habitats may support intermediate (Stage II) to climax (Stage III) communities and recovery would take longer, on the order of several months to several years (Table 13).

[197] Rhoads, D.C., P.L. McCall, and J.Y. Yingst. 1978. Disturbance and Production on the Estuarine Sea Floor.

[198] Murray, P.M. and H.L. Saffert. 1999. Monitoring Cruises at the Western Long Island Sound Disposal Site. DAMOS contribution No. 125. U.S. Army Corps of Engineers New England Branch. Waltham MA. 80 pp.

[199] NUSCo. 1992. Monitoring and Marine Environment of Long Island Sound at the Millstone Nuclear Power Station, Annual Report, (1991), Benthic Infauna, pp. 185 –222.

Table 13 – Results of Soft Substrate Recolonization Studies Including Location, Stressor, and Time to a Stage III Recovery

Study	Location	Stressor	Time to Recovery
Germano *et al*. 1994[200]	Coastal New England	Dredged material Disposal	6 months–1 year
Rosenberg 1971[201]	Sweden	Paper mill (sulfite)	3 years
Rosenberg 1976[202]	Sweden	Enrichment	5 years
Murray and Saffert 1999[203]	Western Long Island Sound	Dredged material disposal	1–4 months
MWRA[204]	Massachusetts Bay	Storms	1–2 years
Rhoads *et al*. 1978	Long Island Sound	Dredged material	1–2 years
Rhoads *et al*. 1978	Long Island Sound	Azoic sediment	6–8 months
NUSCo, 1992[205]	Eastern Long Island Sound	Dredging for power plant intake	5-6 years

Recovery of the fish and shellfish functions is in part dependent on the recovery of the benthic infauna, which help create the appropriate food resources and habitat for larger organisms. Mobile fish and larger invertebrates (e.g., lobster) may be able to avoid construction activities and return as part of the habitat recolonization. Other species that rely on substrate-specific characteristics (e.g., demersally spawning fish such as winter flounder) can begin using the habitat as it returns to its previous condition.

Dredging and jetting resuspend sediment and cause substrate disruption. As a result, these activities cause temporary, localized reductions in water clarity and sedimentation as suspended particles are released from the water column. Results from dredging studies indicate that recolonization to a Stage III community occurred in as little as one to four months to as much as one to two years. Disposal of dredged material has been found to

[200] Germano, J.D., D.C. Rhoads, and J.D. Lunz. 1994 An integrated, tiered approach to monitoring and management of dredged material sites in the New England region. DAMOS contribution no. 87. SAIC Report No. 90/75/234. U.S. Army Corps of Engineers, New England Division. Waltham, MA.

[201] Rosenberg, R. 1971. Recovery of the littoral fauna in Saltkallefjorden subsequent to discontinued operation of a sulphite pulp mill. Thalassia jugol. 7: 341-351.

[202] Rosenberg, R. 1976. Benthic faunal dynamics during succession following pollution abatement in a Swedish estuary. Oikos 27: 414-427.

[203] Murray, P.M. and H.L. Saffert. 1999. *op cit*.

[204] Kropp, R.K., Diaz, R., Hecker, B, Dahlen,D., Boyle, J.D. Hunt.C.D. 2000. 1999 Outfall Benthic Monitoring Report. Boston: Massachusetts Water Resources Authority. Report ENQUAD 2000-15. p. 230.

[205] NUSCo. 1992. Monitoring and Marine Environment of Long Island Sound at the Millstone Nuclear Power Station, Annual Report, (1991), Benthic Infauna, pp. 185 –222.

stimulate productivity, resulting in development of an advanced benthic community in as little as six to twelve months.[206] Studies along the New England coast suggest that dredged material disposal actually improves juvenile lobster habitat by increasing burrowing activity.[207]

Cable sweep is likely to disturb the surface of fine-grained substrates with some loss of organisms and disturbance of spawning habitat (depending on the time of year), but recovery is typically less than for trenching activities because of the shallower depth of the disturbance.

Disturbance and Recovery of Sandy Substrates

Potential impacts to sandy substrates are the same as for fine-grained substrates: habitat burial, sediment resuspension and deposition, and substrate disruption. Sandy sediments may support a more advanced benthic community than silty sediments, however, and would require a longer period for recovery from impacts. Suspended sandy sediments would be deposited more quickly than in fine-grained areas which are beneficial to water quality, although it increases the thickness of the depositional layer near the construction. Recovery could take from six months to several years (Table 13).

Disturbance and Recovery of Gravel and Cobble Habitat

Potential impacts in gravel and cobble sediments include habitat conversion from nearby sediment suspension activities (jetting), direct habitat disruption from plowing and armoring, and substrate disruption from cable sweep and anchoring. Recovery after habitat disruption would entail recolonization following substrate stabilization, with the assumption that there would be little survival of original fauna.

Disturbance and Recovery of Bedrock Habitat

Potential impacts in bedrock habitat include habitat conversion (siltation from nearby construction activities), direct habitat disruption from blasting, and substrate disruption from cable sweep and anchoring. Habitat conversions caused by sedimentation onto bedrock may result in a change to different functions and values. However, recovery to the original habitat is dependent on the depth of sediments and water depth, which will determine the likelihood that winter storms will disperse newly deposited materials. Recovery of kelp beds following overgrazing and subsequent population decimation of sea urchins provide an approximation of recovery of unpopulated hard substrate habitat. In Nova Scotia, recovery of kelp beds took as little as four to five months to as long as 18 months.[208] Surface fouling panels also provide an indication of recovery time. Fouling panel studies off coastal New Hampshire using Plexiglas panels set out in January reached peak biomass and percent frequency by July (six months), with a community that included most typical fouling

[206] Germano, J.D., D.C. Rhoads, and J.D. Lunz. 1994 An integrated, tiered approach to monitoring and management of dredged material sites in the New England region. DAMOS contribution no. 87. SAIC Report No. 90/75/234. U.S. Army Corps of Engineers, New England Division. Waltham, Massachusetts.
[207] *Ibid*.
[208] Johnson, C.R. and K.H. Mann. 1988. Diversity, patterns of adaptation, and stability of Nova Scotian kelp beds. *Ecol. Monogr.* 58:129-154.

species.[209] Surveys in shallow sublittoral rocky substrates after ice scour in eastern Newfoundland indicate that biomass returns to original levels in two months, with kelp recovery taking less than a year.[210] Artificial reef studies also provide an indication of recovery time. Concrete modules deployed in Delaware Bay had a well-developed epifaunal and fish community in one to two years.[211] An artificial reef in the New York Bight constructed from both concrete and coal ash contained fully developed communities by the end of the first year following deployment, although biological interactions led to continued successional changes during the following year.[212] In Puget Sound, invertebrate settlement on concrete blocks increased rapidly for a period of six months, and had stabilized after a 10-month period. Fish recruitment was complete after seven to nine months.[213]

Lobster

Potential impacts on lobster include barriers to movements and alteration of habitat especially for early benthic phase lobsters.

Lobster movements can be classified into small-term movements, generally on a daily basis, and larger-scale movements occurring on a seasonal basis. Small-scale movements of lobsters greater than 45 mm in carapace length (CL) are generally less than 300 m.[214] The extent of these movements is inversely related to water temperature where activity decreases with lower water temperatures.[215] Lobsters in Long Island Sound are not thought to undergo large-scale migrations.[216]

Sources of mortality may include direct contact with construction equipment, the open trench as a barrier to migration increasing exposure to predators, burying of lobsters in the trench during backfilling, and loss of early benthic phase (EBP) habitat. Lobsters that directly encounter ongoing trenching and side casting construction activity are likely to be killed. Impacts can be minimized by restricting activity to cold water temperature periods when movement of lobsters is at the annual low, and the probability of encounter between

[209] Normandeau Associates. 1996. Seabrook Station 1995 Environmental Studies in the Hampton Seabrook Area. A characterization of environmental conditions during the operation of Seabrook Station. Prepared for the North Atlantic Energy Service Corp.

[210] Keats et al. 1985. (Cited in Mathieson, A.C., C.A. Penniman, and L.G. Harris. 1991. Northwest Atlantic rocky shore ecology. *in* A.C. Mathieson and P.H. Nienhuis, eds., Intertidal and Littoral Ecosystems, Ecosystems of the World, Vol. 24. Elsevier, Amsterdam, pp. 109-191.)

[211] Foster, K.L., F.W. Steimle, W. Muir, R.K. Kropp, and B.B. Conlin. 1994. Mitigation potential of habitat replacement: concrete artificial reef in Delaware Bay – preliminary results. *Bull. Mar. Sci.* 55:783-795.

[212] Woodhead, P.M.J. and M.E. Jacobson. 1985. Epifaunal settlement, the processes of community development and succession over two years on an artificial reef in the New York Bight. *Bull. Mar. Sci.* 37.

[213] Buckley, R.M. and G.J. Hueckel. 1985. Biological processes and ecological development on an artificial reef in Puget Sound, Washington. Bull. Mar. Sci. 37: 50-69.

[214] Cooper, R.A. and J.R. Uzmann. 1980. Ecology of Juvenile and Adult *Homarus*. Pages 97-142 *in* J.S. Cobb and B.F. Phillips, eds., *The Biology and Management of Lobsters, Vol. II.* New York: Academic Press.

[215] Ennis, G.P. 1984. Territorial behavior of the American lobster *Homarus americanus*. Trans. Amer. Fish. Soc. 113(3): 330-335.

[216] Briggs, P.T. and F.M. Mushacke. 1979. The American lobster in western Long Island Sound. *New York Fish and Game Journal* 26:56-86.

lobsters and construction is reduced. Regardless of the time of year, any lobsters residing in the path of the utility crossing will suffer mortality due to trenching activities, but the probability of "new" lobsters entering the area of construction activity is minimized when temperatures are lower.

Both the temporarily open trench for the pipeline and the pre-lowered pipe laid on the seafloor have the potential to form a barrier to lobster movements. The extent to which the trench forms a barrier is dependent on the slope of the sides of the trench and the probability of a lobster encountering the trench. To determine the impact of the side slopes of the proposed trenches, the slopes need to be compared to known natural lobster habitat to assess the potential to interfere with movements. The probability of a lobster encountering the trench will be dependent on the period of time the trench is exposed, the time of year of construction, and any behavioral attraction an open trench may exert on lobsters.

Depending on the underlying geology, sideslopes of a dredged trench are likely to be about 1:3 (vertical to horizontal). Lobsters are able to negotiate a 1:3 slope (about 20°).[217] However, the placement of a pipe in the bottom of the trench may form a partial barrier for lobsters attempting to cross over the trench, especially when water temperatures are low and lobsters are less active.

A plowed trench will initially have side slopes of approximately 4:5, or about 40°, but slumping will occur shortly after the plow passes, which will also assist in covering the pipe. As with the dredged area, this slope should not form a major barrier to lobster movements. Lobster habitat includes areas that have been extensively excavated with slopes from 5° to 70°. As with conventional dredging, the pipe at the bottom of the trench may form a barrier, particularly in sediments where there is minimal slumping.

Where jetting or a combination of plowing and jetting is proposed, generally the slopes of the trench would be approximately 2:1, or about 65º, but slumping occurs shortly after the equipment passes. Although lobsters can use areas with slopes as great as 70° as habitat for burrows,[214] it is likely that the slopes of the open jetted or plowed trench will be a partial barrier to movement. The length of time that the trench would be expected to remain open would be project-specific, depending on the water depth, substrate, frequency of disturbance, etc.

Any lobsters that construct burrows in the sides of the installation trench will likely be killed when the trench is backfilled as part of the installation. However, this impact can be reduced if construction is restricted to periods when low water temperature limits lobster activity.

The existing 1385 Line, which consists of seven cables, was placed on the sea floor and has remained for almost 35 years. No divers, that have descended to repair or inspect the cables, have reported observing lobsters in distress. These field observations suggest that electric cables on the seafloor do not pose a significant obstacle to lobster movement.

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[217] Cooper, R.A. and J.R. Uzmann. 1980. Ecology of Juvenile and adult *Homarus.* In: Cobb, J.S. , Phillips, B.F. (ed.) The Biology and Management of Lobsters, Volume II. Academic Press, Inc. New York, p. 97-142..

Construction Impacts on Early Benthic Phase Lobsters. EBP lobsters appear to prefer complex habitat that provides shelter. Incze and Wahle defined EBP lobsters as having a carapace length (CL) of 5-40 mm.[218] These lobsters are highly shelter dependent, gradually ranging out from their refuge as they reach 35-40 mm CL.[219] The preferred habitat for newly settled lobsters is cobble beds.[220] This shelter dependent phase lasts for about two years until they reach about 45 mm CL when they may begin nocturnal foraging away from their shelters.[214] Juvenile and adult lobsters also prefer shelter. Habitat consisting of a sand, gravel, or bedrock base with a rock overlay is a common inshore lobster habitat.[214]

Hard bottom substrate consisting of coarse glacial till (CGT: gravel, cobbles and boulders with sand) is important habitat for EBP and young lobsters. Habitat alteration or loss can be minimized by backfilling a plowed trench with the native gravel and cobble. In locations where plowing and jetting are to be used, it is possible that the gravel and cobble will be too widely dispersed for the backfill plow to replace all the material.

Attraction of Lobsters to Disturbed Sediments. Benthic organisms and lobsters may potentially be attracted to the disturbed sediments resulting from construction activities. Presumably, the disturbed sediments provide increased feeding opportunities for epibenthic organisms. The effects of a large-scale trenching operation on lobster movements and catch rates was assessed in Boston Harbor as part of the construction of the Third Harbor Tunnel, where a 40-foot trench was excavated through Boston Harbor. The east end of the trench area consisted primarily of soft sediments and was excavated by conventional dredging. Constructing the south end of the trench area required blasting through bedrock. A lobster monitoring program was implemented to determine the relative abundance and condition of lobsters adjacent to and ongoing blasting and dredging activities.[221] Data from the program indicated that there was a noticeable decline in the catch of lobsters in Boston Harbor during the two-month study at all stations. However, the decline was attributed to the occurrence of the annual molting period during construction activities.[222] The study did not indicate any attraction of lobsters to the trench, as there was no increase in catch per unit effort at stations near the trench during the construction activities.

Any significant trenching activity will disturb surface sediments where infaunal organisms live and expose azoic sediments that were previously below the water sediment interface. The

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[218] Incze, L.S., and R.A. Wahle. 1991. Recruitment from pelagic to early benthic phase in lobsters *Homarus americanus*. Marine Ecology Progress Series 79:76-89.

[219] Mackenzie, C. and J.R. Moring. 1985. Species profiles: Life histories and environmental requirements of coastal fishes and invertebrates (North Atlantic) – American Lobster. U.S. Fish and Wildlife Service Biological Report 82(11.56). U.S. Army Corps of Engineers, TR WL-82-4. p. 21.

[220] Palma, A.T., R.A. Wahle, and R.S. Steneck. 1998. Different early post-settlement strategies between American lobsters *Homarus americanus* and rock crabs *Cancer irroratus* in the Gulf of Maine. *Mar. Ecol. Progr. Ser.* 162:215-225.

[221] Noyes, C.L., S. Truchon, C. Meininger, and M. Best. 1993. Central Artery/Tunnel Project: A survey of lobsters in Boston Harbor during harbor dredging and blasting operations. Abstract of paper presented at the Eighth Annual Boston Harbor/Massachusetts Bay Symposium. Presented by the Massachusetts Bay Marine Studies Consortium. J.F. Kennedy Library, March 31 and April 1, 1993.

[222] Cortell (Jason M. Cortell and Associates). 1992. Boston Harbor Lobster Monitoring Program. Prepared for the Massachusetts Highway Department by Jason M. Cortell and Associates Inc. in association with ENST Consulting and Engineering under subcontract to Bechtel/Parsons Brinckerhoff.

volume of azoic sediments will be much larger than the surface sediments that contain infaunal organisms. Plowing and jetting would result either in overturning of surface sediments and covering them with the deeper azoic sediments (plowing), or in a wider dispersal of both surface and deeper azoic sediments (plowing and jetting). In either case, infaunal prey organisms will likely be smothered, resulting in a reduction in the food source for scavenging epibenthic megafauna such as lobsters and crabs. There is a possibility that scavenging epibenthic megafauna may be attracted to feeding on dead and injured infauna if present at the surface of the spoil mounds on either side of the trench, but the low water temperatures during trenching activities can minimize this activity.

2.7.4 Finfish Impact Assessment

Finfish have the potential to be affected by construction through direct contact with construction equipment, obstruction of migrations, blasting, and degradation of habitat. Fish are obviously mobile organisms that will to a great extent avoid construction activities. In addition, permit and/or certificate conditions typically prohibit or limit in-water construction activities during sensitive periods in the lifecycle of finfish.

Fish that move between fresh and salt water habitats to spawn and complete their life cycle (i.e.., anadromous and catadromous species) are most susceptible to disruption of migratory routes. Degradation of habitat can occur due to siltation from trenching activities, increased suspended solids affecting water quality, and from modification of the habitat following backfilling. Demersal fish that live on the bottom are most susceptible to habitat degradation. Release of pollutants from contaminated sediment is another possible source of habitat degradation.

Species Characterization and Impact Assessment

Marine fishes found in Long Island Sound include pelagic and demersal fishes. Pelagic fishes are found primarily in the water column. They are highly mobile and are able to use behavioral mechanisms to avoid areas of high turbidity. Environmental impacts due to turbidity exposure are likely to be limited to physiological effects such as increased respiration and coughing.[223]

Migratory Species

Adult anadromous fish migrate into freshwater to spawn, and the eggs and larvae develop in freshwater. Typically, YOY fish will migrate downstream and enter marine waters. When anadromous fish are sexually mature, they return to freshwater to spawn.

Alewife and blueback herring have similar life histories; the adults begin to ascend rivers in March for spawning. Eggs and larvae develop in freshwater throughout the spring and

[223] Newcombe, C.P. and J.O.T. Jensen. 1996. Channel suspended sediment and fisheries: A synthesis for quantitative assessment of risk and impact. *North American Jour. of Fish. Manage.* 16(4):693-727.

summer. By late summer through fall, YOY alewife and blueback herring descend the rivers and enter the ocean.

Rainbow smelt enter rivers and streams to spawn in March through May, with peak spawning occurring on the spring tides.[224] Adults return to nearshore coastal waters soon after spawning. The eggs develop throughout the spring and summer, and by fall YOY move into higher salinity waters.

The American eel is a catadromous fish (spawns in salt water and develops in freshwater) that occurs Long Island Sound. American eels spawn in the Sargasso Sea in February through April, and larvae develop as they are transported up the East Coast.[225] American eels reach the glass eel and elver stages by the time they reach Long Island Sound in the late winter and early spring, about one year after hatching. Upstream migration occurs in the spring, primarily between April and June. After spending several years in freshwater, eels may begin a spawning migration to the ocean in late summer and fall. Due to the complex life cycle of American eels, and long residence time in freshwater, they may be found in Long Island Sound year-round.

Nearshore construction has the greatest potential to disrupt anadromous fish migration when these activities take place in relatively narrow waters. Upstream migration tends to be concentrated temporally and, therefore, has the greatest potential for being affected. Downstream migration of YOY alewife, blueback herring, and rainbow smelt, and mature eels involve more of a diffuse movement that occurs throughout the summer and fall, than the upstream migration in the spring. Most of the downstream migration may be complete by October, and the remaining fish would be able to move around trenching activities. YOY Rainbow smelt may remain in the more saline portions of the estuary and may not leave the river at all.[224]

Pelagic Species

Fish eggs and larvae are susceptible to increased turbidity and siltation resulting from dredging, especially if the eggs are demersal. Most larvae are poor swimmers and it is not expected that they could avoid any areas of high turbidity. It is likely that elevated turbidity would occur temporarily and only in a small area around active construction.

The primary impact is likely to be a temporary increase in suspended sediments in the water column. Newcombe and Jensen rated the impacts of suspended sediments on fishes on a scale that included no effects, behavioral effects, sublethal effects, and lethal and paralethal effects depending on the concentration of suspended sediments and the duration of exposure.[223] Usually, the severity of the impacts increased with increasing concentrations of suspended sediments and duration of exposure. At low concentrations

[224] Buckley, J.L. 1989. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (North Atlantic) – Rainbow smelt. U.S. Fish and Wildlife Service Biological Report 82(11.106). U.S. Army Corps of Engineers, TR EL-82-4. 11pp.

[225] Facey, D.E. and M.J. Van Den Avyle. 1987. Species profiles: Life histories and environmental requirements of coastal fishes and invertebrates (North Atlantic) – American eel. U.S. Fish and Wildlife Service Biological Report 82(11.74). U.S. Army Corps of Engineers, TR WL-82-4. 28 pp.

and exposure times, only behavioral effects such as avoidance and alarm reactions occurred. At extremely high concentrations, reduced growth rates and mortality could occur. In practical terms for evaluating the impacts of dredging activities on fishes, these findings imply that fish will use behavioral mechanisms to avoid areas of high suspended sediments that may cause lethal or paralethal effects, assuming that the turbidity plume is not so large as to completely prevent escape.

Newcombe and Jensen used data from several studies to evaluate the effects of suspended sediments on adult estuarine nonsalmonids.[223] Some of the fishes used to represent estuarine nonsalmonids were considered by the authors to be relatively sensitive such as bay anchovy, Atlantic herring, Atlantic silverside, Atlantic menhaden, spot and fourspine stickleback. Few strictly demersal fish were included, and no data on winter flounder were available. Therefore, the impacts on fishes from the models of Newcombe and Jensen can be considered conservative, meaning that they will likely overestimate impacts.[223]

In an active construction area, exposure times are assumed to be short, one hour or less, because if given the opportunity, fish will move out of areas with high concentrations of suspended sediments. An increase suspended sediment concentrations of 30 to 55 mg/l, as might occur near an active bucket dredge, could result in temporary impacts including minor physiological stress such as increased respiration and coughing rates.[223] Jetting would be likely to cause greater increases in suspended sediment concentrations, but these concentrations would decrease rapidly. Suspended sediment concentrations of about 1,500 mg/l may result in minor to moderate physiological stress to indications of major physiological stress such as long-term reduction in feeding rate and success. Physiological stresses would decrease with distance from the source.

Demersal Species

Demersal fishes are found in close association with the bottom, and therefore are sensitive to siltation and changes in bottom composition resulting from trenching activities. In the short term, it is expected that most adult demersal fishes will be able to avoid construction activities. However, eggs and larvae, particularly demersal eggs, will be susceptible to siltation and turbidity effects. Demersal fishes with specific habitat requirements are most susceptible to the long-term impacts due to dredging, such as habitat modification. These fishes would include those that have specific preferences for spawning, YOY, or feeding habitat. Substrate restoration and other engineering measures to minimize siltation and turbidity can minimize the potential for population-level impacts to demersal fish species.

Short-Term Finfish Impacts

Short-term impacts include disruption of spawning habitat during construction, and impacts of the turbidity plume resulting from trenching on eggs and larvae. Most commercially important fishes have pelagic eggs and larvae that would not be directly affected by trenching. However the turbidity plume resulting from dredging, plowing, and plowing and jetting, could affect pelagic eggs and larvae. Eggs are expected to be more resistant to turbidity as their food source is contained within the egg. However, demersal eggs, especially the commercially important winter flounder and ocean pout, may become silted over and experience mortality. Larvae may be more susceptible to turbidity impacts because they have limited ability to avoid high turbidity and are actively seeking food sources after the yolk-sac stage.

Winter flounder are commercially and recreationally important fish found throughout Long Island Sound that deposit demersal, adhesive eggs in estuaries of nearshore areas from February through May.[226] The preferred habitat for deposition of eggs is not well described, but Bigelow and Schroeder state that they spawn over sandy bottom in water as shallow as 6 to 18 feet.[227] Crawford and Carey found winter flounder eggs deposited on a tidally submerged gravel bar and attached to fronds of macroalgae.[228] Pereira *et al*. stated that winter flounder eggs are generally collected from waters less than 15 feet deep and mortality will likely be complete for any winter flounder eggs in the area that are buried to a depth greater than 3 mm.[229] Scheduling construction activities in shallow waters outside of the winter flounder spawning season will minimize impacts to this species.

Winter flounder larvae are also susceptible to short-term impacts due to increased turbidity from trenching activities. Winter flounder larvae are non-dispersive, meaning that they remain close to spawning areas.[230] Therefore, the majority of winter flounder larvae will occur in waters less than 15 feet deep from February through August.

Long-Term Finfish Impacts

Long-term impacts are related to changes in physical habitat, such as substrate type, that are not naturally reversible. Fish with specific requirements for substrate are susceptible to these changes. Almost all demersal fishes probably have some preference for substrate type for various activities such as feeding, spawning, and juvenile habitat. However, for most fishes these preferences are not well described in the scientific literature.

2.7.5 Submerged Vegetation

Seagrass and algae beds may be impacted by underwater construction through direct disturbance, sedimentation, or water quality impairment. Seagrass beds are nearshore features and direct impacts can generally be avoided by route selection or construction method (HDD rather than open cut trench). They are susceptible to heavy sediment

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[226] Klein-McPhee, G. 1978. Synopsis of biological data for the winter flounder, *Pseudopleuronectes americanus* (Walbaum). NOAA Technical Report, NMFS Circular 414. U.S. Dept. of Commerce, National Oceanographic and Atmospheric Administration, National Marine Fisheries Service.

[227] Bigelow, H.B. and W.C. Schroeder. 1953. Fishes of the Gulf of Maine. Fishery Bulletin of the Fish and Wildlife Service 74:53.

[228] Crawford, R.E. and C.G. Carey. 1985. Retention of winter flounder larvae within a Rhode Island salt pond. *Estuaries* 8:217-227.

[229] Pereira, J.L., R. Goldberg, J.J. Ziskowski, P.L. Berrien, W.W. Morse, and D.L. Johnson. 1999. Essential Fish Habitat Source Document: Winter flounder, Pseudopleuronectes americanus, life history and habitat characteristics. NOAA Tech. Mem. NMFS-NE-138.

[230] *Ibid.*

loads, although they naturally function as sediment traps. Exposure to total suspended solids in excess of 18 mg/l for extended periods (more than two months) may kill eelgrass plants.[231] Unlike channel or harbor dredging projects, construction of linear projects is likely to be centered in a particular area for a relatively short period of time. It is more likely, therefore, that turbidity will reach only sublethal levels, resulting in a short-term reduction in productivity. This effect can be further reduced by restricting the nearshore work to the winter when eelgrass production is low.

Algae beds are most likely to occur in areas where there is hard substrate for attachment. Impacts to Long Island Sound algal beds can be avoided by avoiding areas of hard substrate. Sedimentation or water quality impairment from nearby construction activities can reduce productivity, but this effect is likely to be very temporary in nature.

2.7.6 Birds

Marine waterbirds can be divided into three groups based on the period of their residency: summer, winter and year-round. Summer and year-round residents typically breed during their stay. The winter visitors are usually migrants from farther north or inland, seeking open water and food along the coast during the winter months. Marine waterbirds generally nest in colonies on small nearshore islands, which offer protection from mainland predators and most human disturbances. Many nesting locations are used annually by a number of species, however it is well documented that colonial waterbirds frequently relocate their nest sites.[232] Many species cycle through several locations, possibly due to changes in ecological conditions, competition among species, and human disturbance. Such shifting of nesting colonies is particularly characteristic of terns and waders. Foraging habitat for marine waterbirds is often widespread and diffuse.

Because birds are highly mobile during feeding and migration, impacts of the infrastructure crossing construction to most marine birds will be negligible. Various species may be displaced temporarily from feeding and resting areas as the construction passes through particular habitats. For example, shorebirds and waders may avoid the shorelines and mudflats at the landfalls during HDD activities, and diving ducks will avoid the immediate work area and most likely the sedimentation plume during jetting and plowing. However, because of their mobility and large ranges, the birds typically will utilize other available habitat during construction and move back into the work areas quickly after construction is complete. This brief loss, if any, of feeding and resting habitat generally represents little to no threat to any marine birds.

However, birds are much less mobile during nesting and many marine species nest in colonies on offshore islands, where they are vulnerable to disturbance. Timing restrictions imposed in permit and certificate conditions typically require that construction avoid such critical nesting periods.

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[231] Short, F.T. 1994. Cited in Normandeau Associates, Inc., Sears Island Cargo Terminal Marine Resources Impact Assessment and Mitigation. 1995. Prepared for Maine Department of Transportation.

[232] Veit, R.R. and W.R. Petersen. 1994. *Birds of Massachusetts.* Massachusetts Audubon Society, Concord, MA. 514 pp.

2.7.7 Marine Mammals

The likelihood of impacts to marine mammals or sea turtles is limited because project permit and certificate requirements typically prohibit construction during periods when such species would be present in Long Island Sound, or may require marine mammal monitoring during construction, and contingency plans in the event of a marine mammal sighting. For those individual marine mammals or sea turtles that are present during construction, however, there are several ways by which they could be affected, including:

- Noise associated with blasting and vessel engines;
- Collisions with vessels and/or anchor lines;
- Loss of feeding habitat because of disruption of the substrate and resulting turbidity plumes;
- Loss of prey items impacted by the trenching; and
- Impacts of surface oils from fuel spills and releases from construction activities.

Noise and Blasting

Response of whales to noise such as vessel operation is generally related to the behavior of the whale at the time of the noise. Feeding and courting whales tend to be unresponsive to the approach of boats while cows with calves and single long-diving whales appear to be more sensitive and are more apt to avoid boats. Intense sounds in either air or water likely produce discomfort in marine mammals, but individuals would be expected to avoid a "zone of discomfort" surrounding the noise source. Marine mammals in the area will be startled and will likely swim out of the area. It is likely that those individuals that remain in the vicinity of a lay barge would become acclimated to the steady noise of the barge engines. Pacific harbor seals have been found to become somewhat acclimated to powerboats, delaying their departure from the haulout areas.[233] Minke whales, Atlantic white-sided dolphins and harbor porpoises are not likely to reside in the vicinity of a construction project unless schools of fish are present there. Seals are likely to react similarly.

Blasting would present the greatest potential risk to marine mammals and should not be performed if marine mammals are observed in the blasting area. Injury and response depends on several factors, including size of the charge, depth of the water, and size of the animal. Methods to direct the force of the blast into the bedrock, rather than into the water column, have been developed and can minimize impact. These include stemming (placement of rock into the top of the borehole) and delays (multiple small charges that are set off sequentially rather than simultaneously). In addition, if there is a concern that

[233] Suryan, R.M. and J.T. Harvey. 1999. Variability in reactions of Pacific harbor seals, *Phoca vitulina richardsi*, to disturbance. *Fish. Bull.* 97:332-339.

marine mammals could be in the area, a safety zone and monitoring plan should be established.

Collisions

The slow speed at which the lay barge and support tugs generally move minimizes the risks of vessel strikes with marine mammals. Any risk of entanglement with anchor lines is limited to the periods when anchors are being repositioned. At other times, the anchor lines would be relatively taut. In addition, given the cable thickness and rigidity, it is unlikely to be twisted or knotted around marine mammals. Although Minke whales and harbor seals have been found to be susceptible to collision with vessels, there is no apparent evidence that Atlantic white-sided dolphins, harbor porpoises, and gray seals are especially susceptible to such collision with vessels.[234]

Loss of Feeding Habitat/Loss of Prey Items

Minke whales[235], harbor porpoise[236], Atlantic white-sided dolphins, harbor seals[237,238] and gray seals are predominantly fish and squid eaters. Impacts to these prey items could, therefore, also impact these mammals. The most likely response will be avoidance of the immediate construction area where turbidity is highest because the fish and squid will tend to move away from the densest part of the plume. This effect will be temporary until the plume dissipates.

Surface Oil

Surface oil spills resulting from refueling of construction equipment would be relatively localized. Marine mammals would be likely to move away from the most concentrated spill areas. The risk and impact of fuel spills can be minimized by equipment operators by implementing appropriate spill control plans.

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[234] *Ibid*.

[235] Gusey, W.F. 1977. The fish and wildlife resources of the Georges Bank region. Environmental Affairs, Shell Oil Co., Houston, TX. 553 pp.

[236] Trippel, E.A., M.B. Strong, J.M. Terhune, and J.D. Conway. 1999. Mitigation of harbour porpoise (*Phocoena phocoena*) by-catch in the gillnet fishery in the lower Bay of Fundy. *Can. J. Fish. Aquat. Sci.* 56(1):113-123.

[237] Selzer, L.A., G. Early, P.M. Fiorelli, P.M. Payne, and R. Prescott.1986. Stranded animals as indicators of prey utilization by harbor seals, *Phoca vitulina concolor*, in southern New England. *Fish. Bull.* 84(1):217-220.

[238] Boulva, J. and I.A. McLaren. 1979. Biology of the harbor seal, *Phoca vitulina*, in eastern Canada. *Bull. Fish. Res. Bd. Can.* 200:1-24.

2.7.8 Sea Turtles

Trenching, particularly by jetting, would temporarily remove potential prey items from the immediate area and suspend large volumes of sediment in the water. This could temporarily deplete the down current area of sea turtle prey items. This impact is likely to be short-term and minimal.

There is a slight risk of collision between sea turtles and fast-moving vessels. Sea turtles have been reported to dive as an avoidance behavior in response to on-coming vessels, potentially exposing themselves to contact with the vessel's propellers or in the undertow. It is unlikely that the turtles will collide with the slow moving lay barge and its support tugs because the movements of these vessels will be slow and sporadic. In addition, most turtles found in Long Island Sound are absent during the winter months, and would not be affected by winter construction.

Sea turtles are susceptible to the effects of oil or fuel spills either by direct encounter or ingestion of oiled prey.

2.7.9 Impacts of Infrastructure Operation on Marine Resources

Potential impacts on the marine and coastal environment from the operation of a natural gas pipeline, electric cable, and/or telecommunications line crossing include interference to navigation, impediments to commercial and recreational fishing, alterations to the ambient electric and magnetic field, and contaminant release either through fuel spills or from damaged fluid-filled cables. Modifications to the seabed caused by the installation of energy and telecommunications infrastructure may cause long-term changes in benthic habitat that can affect invertebrates, shellfish, finfish, birds, and other resources.

Navigation Concerns

Navigational concerns are related to interference with anchoring and trawling as a result of exposed cables or pipelines. Burial of cables and pipelines reduces the risk of entanglement. However, burial may increase the area affected by the project and habitat disturbance.

A second concern arises from the changes in magnetic field that result from subsea electric cable operation. Concerns have been raised that changes in the magnetic field would affect vessel navigational equipment. For example, energy cables were initially implicated as the cause of the collision between the Baltic Carrier and Tern in the Baltic Sea. Further investigations indicate that the overlying magnetic fields did not contribute to the accident.[239] Studies for the Cross-Sound Cable suggest that changes in the

[239] Division for Investigation of Maritime Accidents, Udrag af soulyhkkesrapport af 18.juli 2001 fra Sofartsstyrelsens Opklaringsenhed om kollisionen mellem "tern" og "Baltic Carrier". http://www.stubbekobing.dk/nyheder/sidste_nyyt

magnetic field from operation of the cable system would result in maximum magnetic compass deflection of less than 0.05 degrees in 35 feet of water, which would not affect navigation. There is no other evidence of interference with navigation.

EMF

Electric and magnetic fields (EMF) are produced by electric transmission cables and lines. While both electric and magnetic fields are produced by submarine electric cables, electric fields are shielded by the submarine cable materials. The intensity and frequency of the magnetic field depends on the type of transmission (AC or DC) and current levels.

Many phyla of marine organisms have been studied for their ability to detect electric or magnetic fields in the natural environment. The principal focus of research has been to determine whether the earth's geomagnetic field can be detected and used in orientation and migration. What is known is that some species use the earth's magnetic field for orientation and navigation and that other species, e.g., sharks, appear capable of detecting low frequency electric fields. This electrical sensing may be related to orientation and the detection of prey. EMF effects on marine organisms are largely known from laboratory experiments, which have limited applicability to field conditions. Effects of magnetic fields from undersea transmission lines would depend on the field levels in combination with the species and life stages that would be exposed.

A review was conducted of the potential environmental impacts of the Cross-Sound Cable project on marine species in Long Island Sound. This study reached a conclusion that the DC magnetic field that could be generated by the 330 MW HVDC cable would cause the ambient DC magnetic field one meter above the ground over the cable to increase or decrease within a range of about 31 percent, the change depending upon the orientation of the cable with respect to the earth's magnetic field. At the surface of the seabed, the maximum magnetic field produced by the cables would be approximately 0.16 Gauss. This level can be compared to the earth's natural magnetic field of 0.5 Gauss.[240]

Calculations performed to estimate the AC magnetic field expected to be generated by the cables replacing the 1385 Line indicate that the AC magnetic field level would be 0.021 Gauss at the seabed six feet directly above the proposed cables, and less than 0.020 Gauss at an elevation of three feet above grade. This is less than the estimated AC magnetic field level of the existing 1385 Line which is 0.45 Gauss at six feet above the seabed and 1.39 Gauss at three feet above grade directly over the cables under the heaviest expected power flow.[241]

[240] Exponent. Electric and Magnetic Field Assessment: Cross-Sound Cable Project, July 19, 2001. submitted as an Exhibit to Cross-Sound Cable, LLC filing with the Siting Council.

[241] Zaffanella, L. E. 2001. EMF Study of LIPA-NUSCO Submarine Cable. Enertech Consultants. (July 3, 2001) submitted as Attachment 8a to CL&P's filing with the CSC.

EMF effects on marine resources continue to be a subject of debate and research.[242]

Thermal Effects

Electrical cable operation will generate heat, which will vary depending on the cable load, water depth, ambient temperature, burial depth, and ability of sediment to dissipate temperature changes (resistivity). Thus any thermal changes in overlying water or sediments and any associated impact on benthic communities will be project dependent. For example, the 480 MW HVDC Basslink project in Tasmania estimated that surface sediment temperatures would have negligible heat dissipation around the cable; surface sediments temperature differences would be less than 1^{o} C from ambient.[243] Natural gas pipelines typically do not result in thermal effects; the temperature of the natural gas will depend on the proximity to compressor stations.

Dielectric Fluid Releases

High pressure fluid filled and self-contained fluid filled cables most commonly utilize an insulating fluid. This fluid can be inadvertently released into the marine environment through leaks in pipe joints, from corrosion or damage from external sources such as a vessel's anchor. Common types of dielectric fluid are alkylbenzene, polybutene, or a combination thereof. The 1385 Line utilizes an alkylbenzene insulating fluid. Although the fluids are non-toxic and relatively inert, they are slow to degrade in the environment. There are a number of sources of alkylbenzenes entering the coastal areas other than from dielectric fluid in transmission cables. Alkylbenzenes are used in the manufacturing or processing of products such as detergents, cutting fluids, wetting agents, textile scrubbing agents, fuel oil additives, and printing inks and they are naturally occurring components of petroleum products.[244,245,246] As discussed in Section 2.5.2, areas that were subject to dielectric fluid leaks from the 1385 Line after the mid-1990s were extensively monitored for impacts to shellfish and sediments, and results indicated that alkylbenzene levels in sediment and shellfish near the cables were consistent with background levels for Long Island Sound. In one instance, as a precaution, the State required a shellfish bed area to be closed as a result of a 1994 fluid release. The area was subsequently reopened.

[242] For example, Basslink Project. 2002. Environmental Impact Statement and Supplement to the Draft Integrated Impact Assessment Statement.
[243] NSR Environmental Consultants. 2002. Basslink Pty. Ltd. Final Environmental Impact Statement and Supplement to the Draft Integrated Impact Assessment Statement.
[244] Eganhouse R.P., Blumfield, and I.R. Kaplan. 1983. Long-chain alkylbenzenes as molecular tracers of domestic wastes in the marine environment. Environ. Sci. Technol. 17:523-530.
[245] Ishiwatari R.T., H. Takada and S. Yun. 1983. Alkylbenzene pollution of Tokyo Bay sediments. Nature 301:599-600.
[246] Murray, A.P., C.F. Gibbs, and P.E. Kavanagh. 1987. Linear alkylbenzenes (LABS) in sediments of Port Phillip Bay (Australia). Mar. Environ. Res. 23:65-76.

Cumulative Impacts

NEPA is generally viewed as the legislative catalyst that first raised interest in the assessment of cumulative impact analysis. NEPA introduced a national environmental policy into the normal business practices of the Federal government.

While NEPA established the basic framework for integrating environmental considerations into federal decision making, it did not provide the details of a process for federal agencies to follow. Federal implementation of NEPA was the charge of the Council on Environmental Quality (CEQ), which interpreted the law and promulgated regulations and guidance, the bulk of which are focused on the preparation of EISs.

NEPA requires the preparation of an EIS for any major federal action that significantly affects the quality of the human environment. Because federal actions as defined include the approval of private proposals by a federal agency, the NEPA process extends to any private action that requires a federal permit or other form of approval. The EIS must contain an analysis of the cumulative impact of that one proposal when taken together with other reasonably foreseeable actions. The regulations promulgated under NEPA define cumulative impacts as:

> "…the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions." (See 40 CFR Section 1508.7.)

Like NEPA, the Connecticut Environmental Protection Act (CEPA) requires state agencies to draft an Environmental Impact Evaluation before approving or undertaking a state action that may "significantly affect the environment." Conn. Gen. Stat. § 22a-1b(c). CEPA applies to activities being undertaken by the State or funded in whole or in part by the State. Section 22a-1a-3 of the Regulations of Connecticut State Agencies (RCSA) requires that a state agency consider "Cumulative Impacts" when determining whether a state action will have a significant effect. The regulation defines "Cumulative Impacts" as:

> "…the impacts on the environment which result from the incremental impact of the action when added to other past, present or reasonably foreseeable future actions to be undertaken by the sponsoring agency. For the purposes of these regulations, cumulative impacts include the incremental effects of similar actions with similar environmental impacts and the incremental effects of a sequence of actions undertaken pursuant to an ongoing agency program which may have a significant environmental impact, whereas the individual component actions would not. (RCSA § 22a-1a-3(b).)

In Connecticut, the legislature has enacted a number of statutes expressly requiring agency analysis of cumulative effects when considering certain proposed projects or programs that do not fall under CEPA. For example, before the Siting Council may grant a Certificate of Environmental Compatibility and Public Need for an underwater transmission cable it must find and determine "the nature of the probable environmental impact, including a specification of every single adverse and beneficial effect that, whether alone or cumulatively with other effects, conflict with the policies of the state concerning the natural environment, ecological balance, public health and safety, scenic, historic and recreational values, forests and parks, air and purity and fish and wildlife" and "why the adverse effects or conflicts referred to [above] are not sufficient reason to deny the application…" CGS Section 16-50p(c)(2). In another instance, before the Commissioner of Environmental Protection may issue a general permit for minor activities involving dredging and erection of structures and placement of fill in tidal, coastal or navigable waters, he must first determine, among other factors, that the permitted activities will " cause only minimal environmental effects when conducted separately…and cause only minimal cumulative environmental effects…" CGS Section 22a-361(d)(1).

Also, any applicant for a federal ACOE permit for work which would result in the discharge of dredged or fill material into the waters of the United States, including wetlands, may also be required to obtain a state Water Quality Certificate from DEP pursuant to Section 401 of the federal Clean Water Act. Such work or discharge must be consistent with the provisions of the federal Act and with the Connecticut Water Quality Standards. Generally, certification is made in conjunction with issuance of a state permit under the structures, dredging and fill statutes. Under Connecticut's Anti-Degradation Implementation Policy, which is incorporated as part of the Water Quality Standards, before the DEP may issue a certificate or permit for a "non-point discharge to Class AA, A, or SA waters" consisting "of a dredging activity or discharge of dredged or fill material" it must find "that the resulting change in water quality will not be significant…" *See* Conn. Water Quality Standards, App. E, Connecticut Anti-Degradation Implementation Policy, paragraph III.2. To establish whether a change in water quality is significant, DEP must consider, among other factors, the "cumulative impact of the proposed discharge or activity on water quality of the proposed receiving surface water, taking into account all other existing regulated discharges and activities therein…" Conn. Water Quality Standards, App. E, paragraph IV.1. Additionally, "high quality Class B or SB water resources, which support designated uses, will be maintained at their existing high quality unless…" the DEP finds that "the resulting change in water quality would not be significant" in accordance with, among other factors, the cumulative impact considerations quoted above. Connecticut Water Quality Standards, App. E, paragraph III.3.

Under both the federal and Connecticut definitions, only impacts from current or reasonably foreseeable actions that are collectively significant must be considered. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Cumulative impacts may result when the environmental effects of a single project combine with either temporary (construction related) or permanent (operation related) impacts associated with past, present, or reasonably foreseeable future projects. Cumulative impacts need to be considered in light of the baseline conditions, which may include some degree of pre-existing environmental impairment. However, this does not mean that a potential adverse impact of a project is insignificant if it incrementally contributes to a broader trend of environmental degradation.

Although a cumulative impacts analysis requires an assessment of the impacts of past, present, and reasonably foreseeable developments that may contribute to the impact of the proposed project, a "crystal ball inquiry"[247] is not required. Cumulative impact analysis does not require consideration of the cumulative effects of projects which are speculative and/or contingent.

Any evaluation of potential impacts of energy and telecommunications infrastructure that may be cumulatively significant should include:

1) water quality;
2) submerged vegetation;
3) shellfish;
4) threatened and endangered species; and
5) air quality.

Other cummulative impacts may be considered on a project-specific basis. Some cumulative impacts may be avoided, minimized, or mitigated. Avoidance may be either spatial (avoidance of critical habitats, such as piping plover nesting areas) or temporal (time of year restrictions to avoid winter flounder spawning, or avoid concurrent construction of multiple projects). Impacts may be minimized or mitigated with the construction method selected.

2.8 ALTERNATIVES TO LONG ISLAND SOUND CROSSINGS

The Task Force evaluated a broad range of alternatives to electric cable, gas pipeline, and telecommunications line crossings of Long Island Sound. This section is intended to provide an inventory of alternatives that could serve to reduce the number of Long Island Sound crossings, including those measures that have already been successfully implemented, as well as projects that have been proposed but appear to lack market support. Alternatives can be organized into the following categories:

- Alternative routes for natural gas pipelines that do not cross Long Island Sound;
- Alternative routes for electric cables that do not cross Long Island Sound;
- Measures to expand, reinforce, or upgrade existing generation and transmission assets in Connecticut and Long Island that do not require cables crossing Long Island Sound;
- Alternative fuels and energy sources that do not require Long Island Sound crossings;

[247] Natural Resource Defense Council vs. Morton, 458 F. 2d 827, 837 (D.C. Cir. 1972).

- Measures that reduce the demand for natural gas and electricity through conservation, load management, and demand response programs; and
- Alternatives to telecommunications line crossings Long Island Sound.

2.8.1 Alternative Routes for Natural Gas Pipelines That Do Not Cross Long Island Sound

In recent years, two projects to construct or expand gas pipelines to the southern shore of Long Island have been proposed: Blue Atlantic and Cross Bay. Neither of these routes would cross Long Island Sound. Neither project is being actively pursued at this time, nor are there prospects for pipeline expansions to the south shore of Long Island for the foreseeable future.[248]

Blue Atlantic

The Eastern Pipeline Group of El Paso Corporation proposed an ambitious 1,000-mile submarine pipeline to transport gas supplies from Sable Island, Nova Scotia, to markets in eastern Canada and the northeastern U.S. The project would also serve as a gathering system for the multiple production fields off the coast of Nova Scotia. The pipeline would start from a natural gas processing facility on Nova Scotia, cross the Gulf of Maine, and be diverted around George's Bank to a delivery point in Linden, New Jersey. A potential off-shore maintenance platform south of Long Island may afford an opportunity for a connection directly to Long Island or New York City. The pipeline is envisioned to consist of a 36- or 42-inch diameter pipe, accommodating 1.0 Bcf/day of natural gas. The Blue Atlantic project completed an initial sub-sea survey, commenced environmental, geotechnical, and engineering studies, and began outreach to public officials in Canada and the United States, including U.S. and Canadian regulatory agencies. El Paso had anticipated that construction would begin in 2006-2007 with pipeline operations commencing in late 2007. However, Blue Atlantic was put on hold in April 2003, pending more favorable discoveries of deep gas reserves off Nova Scotia.

Cross Bay Pipeline

In July 2000, Cross Bay Pipeline Company and Transco jointly filed an application with the FERC to increase the capacity on approximately 3.3 miles of Transco's existing onshore pipeline in Middlesex County, New Jersey, and approximately 33.7 miles of the existing marine segment under the Lower New York Bay, terminating at Long Beach on the south shore of Long Island. The proposed project included an additional compressor station, modifications to meter stations, and replacement of several sections of pipe. The project would have added 0.122 Bcf/d (125,000 Dth/d) of incremental capacity available to new shippers for service to Long Island and to New York City by displacement. At the time the project was proposed, Cross Bay anticipated up to 6% growth in the Long

[248] Iroquois' ELIE project was withdrawn from consideration for market reasons on February 7, 2003. The ELIE project would have minimized, but not completely avoided, new pipeline construction in Long Island Sound. The ELIE project is discussed in Section 2.6.2.

Island area and approximately 0.49 to 0.58 Bcf/d (500,000 to 600,000 Dth/d) of additional gas needed by 2005 to supply new generation facilities on Long Island and New York City. [249] The FERC approved the project in November 2001. The following month, Cross Bay requested that the FERC vacate the order approving the certificate citing "significant tariff and rate provisions that will carry long-term economic uncertainty." In addition, Cross Bay stated that "the market targeted by the Cross Bay project has not materialized in the time frame anticipated, resulting in additional economic risk."[250]

2.8.2 Alternative Routes for Electric Cables That Do Not Cross Long Island Sound

Overland Route

A land-based transmission route connecting Connecticut and Long Island would give rise to many of the issues that the Working Group has addressed. Such a route could traverse SWCT and Westchester County, and would intertie with the line Y-49 or Y-50 interconnections between Westchester and Long Island. Land acquisition in these highly developed areas, aesthetic and environmental impacts, environmental justice concerns, and the additional distances involved do not portend well for this overland route. Furthermore, an overland route would not remedy the problems regarding SWCT, Y-49 or Y-50, and the LIPA transmission system in western Long Island, and may worsen congestion in SWCT.

South Shore Route

The NeptuneRTS Phase I project envisioned the installation of two 600 MW HVDC submarine electric transmission cables that would connect load centers in New York City and Long Island with transmission and generation resources in New Jersey (Figure 9). The Sayreville, New Jersey to Newbridge substation in Levittown, Long Island route will extend a distance of 54.5 miles, including 47 miles of solid-state cable beneath New York Harbor and the Atlantic Ocean. According to the project proponent, NeptuneRTS would increase the available capacity and energy in a more flexible and reliable manner than siting new generating facilities in New York City or Long Island because NeptuneRTS Phase I is a transmission connection to the Pennsylvania, New Jersey, Maryland (PJM) system.[251]

In addition to the FERC project approval in July 2001, NeptuneRTS has prepared and filed all required major state and federal environmental permit applications. These permit applications include filings with the ACOE, and an Article VII application to the NY

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[249] FERC Order Issuing Certificates and Authorizing Abandonments, Cross Bay Pipeline Company, LLC, Docket No. CP00-412-00, November 8, 2001.

[250] Cross Bay Pipeline Company letter to FERC December 7, 2001, Docket CP00-412-000.

[251] www.neptunerts.com.

PSC. The project expects to file for a Waterfront Development Permit shortly with the New Jersey Department of Environmental Protection. NeptuneRTS Phase I has an expected in-service date of 2004 to 2005.

Figure 9 – Proposed NeptuneRTS Phase I

2.8.3 Measures to Expand, Reinforce, or Upgrade Generation and Transmission Assets

Expand Generation Capacity in SWCT

Relatively new central station generating projects in SWCT include Bridgeport Energy (520 MW) and Milford Power (536 MW operation pending). However, owners of other facilities have submitted requests to deactivate some of their units in SWCT. The resolution of the deactivation of these units is ongoing.

A January 2003 ISO-NE technical assessment of the generating resources required to operate Connecticut's bulk electric system reliably concluded that all existing generation in Connecticut is required unless new resources are added or transmission improvements are made. Furthermore, the assessment concluded that additional generation resources are needed in SWCT to ensure reliability.[252]

[252] ISO-NE *Technical Assessment of the Generating Resources Required to Reliably Operate Connecticut's Bulk Electric System 2003 and 2006*. Final Report. System Planning, January 29, 2003.

Expand Distributed Generation (DG) in Connecticut

DG resources in Connecticut can be grouped into two categories: self-generation units, typically installed at large commercial or industrial facilities that displace some portion of the facility's outside electric purchases on a regular basis; and emergency generators. According to the Siting Council, there were 71 different facilities that self-generate and utilize the electricity on-site, with a total capacity of 128.45 MW, as of 2001.[253] These include gas, oil, dual-fueled, and other types of units ranging in capacity from 0.01 to 25 MW. The emergency generation capacity in Connecticut comprises thousands of emergency generators located at institutional and industrial sites ranging in size from several kW to 2 MW. Although emergency units include propane and natural gas-fueled generators, the vast majority are generally older and less efficient diesel fuel units with minimal air pollution controls. The DEP maintains a database of emergency generators, roughly 400 of which are located in SWCT with a collective generating capacity of roughly 110 MW.[254] Separately, in August 2002, the DOE issued a report that inventoried the emergency generators in SWCT (with slightly different results than the DEP), as shown in Table 14.

Table 14 – DOE Inventory of Emergency Generators in SWCT

Fuel Type	Number of Units	Capacity (MW)
16 Critical Cities		
Diesel	120	
Natural Gas	13	
Propane	3	
Fuel Type Unknown	26	
Sub-total	162	62.29
36 Cities "of Special Concern"		
Diesel	164	
Natural Gas	23	
Propane	1	
Fuel Type Unknown	81	
Sub-total	269	61.24
Total	431	123.53

The DOE Report, *Improving Transmission Reliability: The Role of Emergency Generation in Southwest Connecticut*, also concluded that, "…emergency generators can considerably support the [SWCT transmission] system by allowing consumers to disconnect themselves from the grid and produce power locally during times of peak demand." The DOE Report also agreed with other analyses that, in a competitive electric market, emergency generators can mitigate price spikes during times of peak demand.

Acknowledging the potential role of DG in improving reliability for SWCT, but also recognizing the potential air quality impact of emergency generators, the DEP initiated a

[253] Connecticut Siting Council, Review of the Connecticut Electric Utilities' Twenty-Year Forecasts of Loads and Resources, October 2001, Appendix A.
[254] See DPUC Order in Docket No. 02-04-12, at 33.

new General Permit program in April 2002. This program is intended to allow DG units of equal to or greater than 50 hp (roughly 37.3 kW) in SWCT to operate when called upon by ISO-NE under the demand response program provided the unit complies with specified general permit conditions. Specifically, when ISO-NE declares there is a certain need (Operating Procedure No. 4 Step 12 or higher), the permitted DG unit can operate for up to 300 hours in a rolling 12-month period. These hours are in addition to the hours of operation allowed for the facility's own emergency or backup use. Further, the General Permit requires use of ultra-low sulfur fuel, and imposes strict emission limits for NO_x, SO_2, and particulate matter. The Waterside Power Project, in Stamford, was permitted under this general permit program. However, an analysis submitted in the DPUC's investigation of possible shortages in SWCT (Docket 02-04-12) concluded that the vast majority of diesel units in Connecticut cannot meet the DEP's NO_x standard.

The DPUC supports DG as a potential means to address reliability concerns in SWCT and across the state, but recognized that "there was little factual evidence of the potential for DG in SWCT."[255] The DPUC also noted that the lack of transmission capacity in the region may be a hindrance to DG development. Additional critical barriers to the more widespread use of DG resources include lack of technology maturation, lack of manufacturing economies of scale, regulatory barriers such as high stand-by rates,[256] inconsistent interconnection requirements, and other permitting and siting hurdles[257]. These issues have been explored in a parallel study by Xenergy commissioned by the ISE and released on January 10, 2003. This study found that the technical potential for DG use among commercial/institutional and industrial customers in southwest Connecticut is over 650 MW. However, only 20.70 MW of new DG is projected to be installed by 2013, based on use of current DG technologies and a "Base Case" for market penetration. An "Accelerated Case" (business and regulatory climate more supportive of DG) using advanced DG (products/improvements expected to be commercial in the near- to mid-term) would allow the development of up to 186 MW by 2013.[258]

Expand Generation Capacity on Long Island

Additional on-island capacity would reduce Long Island's reliance on interconnections with Connecticut and New York City. LIPA's Draft Energy Plan incorporates multiple initiatives to bring additional generating projects to Long Island. As referenced in Section 2.3.2, ANP is developing a 480 MW merchant combined-cycle facility in Brookhaven. KeySpan is also developing a 250 MW combined-cycle project at its Spagnoli Road site. Both projects will be fired primarily by natural gas and are expected to achieve commercial operation by 2005. Increasing the amount of on-island gas-fired generation would also increase the demand for natural gas on Long Island.

[255] Decision in Docket No. 02-04-12.

[256] The Connecticut DPUC has recently released a decision on Stand-by Rates in Docket 02-02-06 that require the customer to pay a standby rate of $60/kW-yr to act as backup to the cogeneration capacity.

[257] FERC is currently evaluating standardized interconnection procedures for small generators. See FERC RM02-12.

[258] An Assessment and Report of Distributed Generation Opportunities in Southwest Connecticut, Institute for Sustainable Energy at Eastern Connecticut State University, January 10, 2003.

LIPA has also initiated development of smaller combined-cycle and peaking facilities, similar to the fast track units developed prior to the summer of 2002. These units, including Calpine's cogeneration facility at SUNY Stony Brook and projects developed by Global Common (Village of Greenport) and FPL Energy (the Rockaways), are expected to bring roughly 189 MW on-line by the summer of 2003.

LIPA has also identified for future consideration the utilization of LIPA-owned property for the development of a combined cycle facility. LIPA's Draft Energy Plan envisions a 300 MW generating plant on-line by 2007 at one of the sites, however no merchant developers have yet been identified.[259]

Repowering of Existing Generation on Long Island

Repowering represents a wide range of infrastructure improvements at existing generation facilities. Repowering often refers to the replacement of a traditional boiler, which is fairly inefficient, with a modern and more efficient combustion turbine and heat recovery steam generator (HRSG). Steam from the HRSG is then utilized in the existing steam turbine and electric generator, improving the overall plant efficiency by 20 to 30% and significantly expanding the plant's capacity. It should be noted that repowering has been considered at many plant sites and rejected because of the difficulties in matching steam conditions between a new HRSG and the existing steam turbine, the inability to optimize cycle efficiency, the difficulty of fitting in new equipment at an existing site, or the inability to obtain a performance guarantee for the entire plant. In addition, repowering can double a plant's daily fuel requirements, thereby placing new demands on the gas delivery infrastructure, and triple the plant's output, requiring an expansion of the electric transmission link. For example, a 100 MW traditional boiler power plant might require about 26,400 MMcf/d (assuming a 10,000 BTU/kWh heat rate) of gas. Replacing the boiler with a 180 MW gas turbine would require about 51,700 MMcf/d (assuming a 7,000 BTU/kWh heat rate) of gas, about twice the previous amount. The power output would almost triple, to 280 MW. If the original facility was oil-fired, a new gas pipeline to the plant would be required.

A stated goal in LIPA's Draft Energy Plan is to work with KeySpan to repower old power plants prior to siting new generation on Long Island. LIPA and KeySpan are both actively evaluating repowering options. In the Draft Energy Plan, LIPA indicated that a Phase 1 "initial screening study" was conducted by KeySpan on all five units operated by KES on behalf of LIPA.[260] LIPA also indicated that a Phase 2 detailed analysis of Wading River Units 1-3 and EF Barrett Unit 2 is about to proceed, and has including the additional capacity of these plants in its resource plan.[261] Should those four units proceed with repowering, an incremental 395 MW could be brought on-line by 2006.

[259] LIPA Draft Energy Plan, Executive Summary, at 5.
[260] LIPA Draft Energy Plan, Executive Summary, at 5.
[261] At the writing of this report, we believe the Phase 2 analysis is currently ongoing.

Expand Distributed Generation on Long Island

NYSERDA is nationally recognized for its innovative technology development and cost-sharing programs to promote DG throughout New York. NYSERDA's DG and combined heat and power (CHP, also referred to as cogeneration) program is funded at $15 million per year. This program supports the development and demonstration of DG systems, components, and related power systems technologies, and CHP application in industrial, municipal, commercial, and residential sectors. As of 2002, New York had approximately 5,000 MW of installed CHP capacity.[262] According to a recent NYSERDA study, there is a technical potential for approximately 8,500 MW of new CHP over the next decade, although the economic potential is estimated at 764 MW.

DG on Long Island

Long Island has several new generation facilities, including traditional technologies (e.g., combined cycle and combustion turbine units) and alternative technologies (e.g., wind, solar, fuel cell). Alternative technology facilities are discussed in Section 2.8.4. The traditional technology facilities that have been recently developed (or are in the development process) are relatively large in electric output, and thus, often excluded from the list of DG developments. These facilities are, however, in close proximity to the load requirements, and therefore, require less transmission infrastructure to deliver the power than more distant generation units. Such facilities include the 79.9 MW cogeneration facility being developed at SUNY Stonybrook, as well as the 55 MW Greenport and Jamaica Bay simple cycle facilities; all of these facilities are expected to be operational by summer 2003.

Long Island has only modest opportunities for the development of cost-effective, small-scale cogeneration facilities. Small-scale cogeneration is generally developed in industrial and large commercial facilities, where steam requirements are relatively consistent year-round. However, Long Island comprises primarily residential and small-to-medium commercial loads. Therefore, even in situations where air conditioning can be met through steam-based chillers, such customers generally do not have a sufficient need for steam output to justify the commitment of capital for the development of a cogeneration system.

Reinforce and Upgrade of Electric Transmission

The principal east-west electric transmission corridor across Long Island was designed to operate at 345 kV, but is currently operated at 138 kV. If operated at 345 kV, the line could bring more power east from its interconnection with Con Edison, or west from plants developed in Suffolk County, such as the ANP Brookhaven project. However, the line is missing a five to ten mile segment that would allow interconnection with the 345 kV system operated by Con Edison in New York City. Multiple transformer stations would need to be developed in at least six locations where the 345 kV line interconnects

[262] See http://www.nyserda.org/dgchp.html.

with the remaining 138 kV transmission infrastructure.[263] Therefore, operating the Long Island system at 345 kV would require tens of millions of dollars in improvements.

LIPA has identified dozens of committed and planned upgrades to its transmission and distribution system. In total, LIPA projects that it has spent or committed over $200 million to improve its transmission and distribution system and interconnect new generation facilities.

For information on the transmission system in Connecticut and New England, refer to Section 2.3.1 of this report. For more detailed information regarding SWCT, refer to Comprehensive Assessment and Report, Part I.

In general, there are several different ways to raise the capacity of a transmission line to accommodate increased power deliveries as given below:

Reconductoring. The capacity of existing transmission lines can be increased by reconductoring – removing the existing cable (i.e., conductor) from the transmission towers and replacing it with a conductor of greater capacity. Reconductoring can be done using a new single larger conductor, or by using new twin conductors of the same size in parallel ("twinning" the existing conductors) to provide a nominal double capacity provided the remaining life of the existing conductor is acceptable and the towers can accept the added load.

Increase Operating Temperature. HVAC transmission lines are rated to a maximum operating temperature based on line sag and corridor clearances. Increasing this maximum operating temperature may allow the cable to carry more current, but increases the risk of line failure due to overheating or breaching ground clearances as conductor sags increases. The sagging problem can sometimes be resolved by re-stringing the conductor, which requires re-tensioning the line, rearranging insulator configurations, and increasing structural heights as required. The benefits of increasing the maximum operating temperature are relatively modest, but the costs are not as high as reconductoring or replacement.

Implement Dynamic Line Rating. Transmission line capacities can change based on weather conditions, such as wind and temperatures (both ambient and net radiation). Dynamic Line Rating (DLR) systems monitor conductor sag in real time or estimate conductor sag by continually monitoring the weather conditions and re-rating the line capacity accordingly. This allows transmission operators to operate a transmission line closer to its ultimate rating when temperature and wind conditions allow, while maintaining the necessary ground clearances.[264]

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[263] To change voltages, power needs to "step-up" to a higher voltage or "step-down" to a lower voltage through the use of transformers.
[264] A Connecticut-based firm, The Valley Group, develops conductor tension monitors.

Reinforce Gas Pipelines

A gas pipeline is typically designed to allow its delivery capacity to be expanded over time in response to customer demands. Capacity can be expanded, provided that the pipeline's maximum allowable operating pressure (MAOP) is not exceeded, by either adding compression along the route or looping segments of the line. Compression is added by installing additional compressors (also referred to as adding horsepower), typically small gas turbine units, at existing or new compressor stations along the pipeline route. Looping requires adding parallel pipe segments along specific portions of the pipeline to increase the entire pipeline's overall capacity.

For example, the Iroquois pipeline, which crosses the Long Island Sound to Northport, Long Island, has been certified by the FERC to add 10,000 horsepower of additional compression at the Brookfield, Connecticut compressor site. This additional compression is required to transport 85 MDth/d of incremental gas supplies for the new Astoria combined cycle plant in Queens, New York and for PP&L Energy on Long Island. The Iroquois pipeline is also being physically extended (Eastchester Extension) from Northport to the New York Facilities System at Hunts Point in the south Bronx. When the Eastchester Extension is completed, Iroquois will be capable of delivering 284 MDth/d to Long Island and 241 MDth/d to Hunts Point, for a total of 525 MDth/d

2.8.4 Alternative Fuels and Energy Sources That Do Not Require Long Island Sound Crossings

Renewable Energy - Connecticut

Through the Connecticut Clean Energy Fund (CCEF), Connecticut invests in technologies and initiatives for renewable energy. The fund will provide mechanisms to achieve the Renewable Portfolio Standards for the State.

Wind. Regulators have acknowledged that wind turbines would require siting in windy areas including hilltops and in or adjacent to Long Island Sound. An issue associated with the placement of wind turbines is the potential impact on scenic protected areas. After completion of a wind power study, CCEF invested in a start-up wind energy company that could develop wind turbines in a remote area outside of Connecticut.

Photovoltaics. CCEF is an active member of the Northeast Sustainable Energy Association and has invested in Solar Dynamics, a start-up company that produces solar power units. In addition, CCEF has promoted the application of solar technology through a formal request for proposals.

Fuel Cells. CCEF has made the development and deployment of fuel cells a priority. Initiatives have included a formal request for proposals that have led to the award of funding for fuel cell deployment; investment in a company that designs and installs high reliability applications for fuel cells; and investment in the University of Connecticut

Global Fuel Cell Center. The installed capacity of fuels cells in Connecticut is approximately two MW.[265]

Renewable Energy - New York

New York Governor Pataki recently announced the state's intention to implement an aggressive Renewable Portfolio Standard, which would require all electricity suppliers to provide 25% of their portfolio from renewable supplies by 2012. Most of the increase is expected to result from wind and biomass energy development. Renewables, including hydro-electric power, currently supply about 17% of electricity sold in New York.

On Long Island, LIPA currently has long-term agreements with resource recovery (i.e., waste-to-energy) and landfill gas generating facilities. At present, LIPA has long-term contracts with seven such facilities (four resource recovery and three landfill gas). These contracts provide LIPA 111 MW of summer capacity through at least 2008,[266] almost all (106 MW) from the four resource recovery facilities.

Wind. LIPA is currently pursuing several wind energy projects. On January 21, 2003, LIPA issued a Phase II Siting Assessment in support of a large-scale off-shore Wind Energy Facility.[267] On January 22, 2003, LIPA issued a Request for Proposals for a 100 MW to 140 MW off-shore wind energy project.[268] Proposals were due on May 1, 2003 and proposal acceptance is expected by September 30, 2003. Commercial operation of the wind power facility is currently expected for December 2007.

LIPA is working with the Long Island Farm Bureau to site five 50 kilowatt (kW) electric generating wind turbines on Long Island farms.[269] LIPA is also co-sponsoring the installation of a 10 kW wind turbine at Long Island University's Southampton College campus.

The wind resource is seldom a steady, consistent flow. It varies with the time of day, season, height above ground, and type of terrain. Wind turbine output depends on wind resource intermittency, the wind farm site's wind speed distribution, turbine design, and turbine reliability. The degree of wind resource intermittency may vary both daily and seasonally. Therefore, wind resources are not always available at all hours of the year to serve electric load.

Photovoltaics. NYSERDA and LIPA each have several initiatives to promote solar energy. NYSERDA has provided over $1 million to install and maintain a 92 kW PV

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[265] Review of Siting Council information including Docket 171, Petitions 376, 482, 553, and 598.
[266] One Landfill Gas contract, with the Smithtown Landfill, provides no capacity to LIPA, but sells energy to LIPA when available.
[267] The Phase II Assessment was the follow-up document to a preliminary assessment of wind energy potential issued in April 2002.
[268] The request for proposal can be found at www.lipower.org/pdfs/projects/wind/offshore_wind_RFP.pdf.
[269] See LIPA web site at http://www.lipower.org/projects/wind.html.

system at SUNY Farmingdale on Long Island. NYSERDA has also awarded grants to firms that develop technologies related to solar- or wind-powered generation, and offers a Residential PV Program to stimulate residential implementation of PV systems.
LIPA is a member of DOE's Million Solar Roofs Initiative and Solar Pioneer Program to encourage PV technology in residences and businesses. As part of LIPA's involvement with the Million Solar Roofs Initiative, LIPA has pledged to install 10,000 PV systems on Long Island roofs by 2010.[270] LIPA is offering a rebate of $5,000 /kW on installed grid-tied photovoltaic systems, representing approximately 50% of the installed cost through the LI Solar Roofs Initiative.[271] Once 500 kW of systems are installed, the rebate will be reduced to $4,000 /kW.[272]

LIPA was also directly involved in two installations: a 20 kW system and a geothermal heat pump at the New York Nature Center located at Jones Beach State Park, and a 15.5 kW system at the New York Institute of Technology.

While PV can help ameliorate Long Island's energy situation, it is doubtful that it could economically provide a sufficient quantity of electricity to avoid the need for a major new generating source (either located on Long Island or located off-island with a high voltage electrical connection to Long Island). PV facilities generate relatively small amounts of electrical power when receiving sunshine, and the capital cost must include the PV arrays, as well as the electronic control and safety modules to connect the PV output to the electrical system, i.e., either direct interconnection with the electric grid or as a behind-the-meter installation on a customer's premises.

Fuel Cells. NYSERDA and LIPA are each implementing initiatives to promote fuel cells in various location around the state. At present, the net impact of these alternative generation technology initiatives is small in relation to LIPA's current energy needs. In 2002, LIPA deployed 17 five-MW fuel cell systems at commercial and academic institutions across Long Island. LIPA is currently considering proposals for a ten MW fuel cell substation deployment program.

While fuel cells have great potential to generate power across a region, there are practical questions concerning their siting and the economics of fuel cell facilities. Fuel cells are extremely capital intensive, much more so than competing standard technologies, such as combined cycle or simple cycle gas turbines. Furthermore, fuel cells operate on hydrogen, which is typically "stripped" away from natural gas through a reforming process, thus continuing the dependence on fossil fuels. Any significant development of fuel cells on Long Island would require a considerable amount of natural gas.

[270] See http://www.lipower.org/solar/.
[271] In addition to LIPA's rebate, homeowners can take advantage of New York's 25% tax credit towards the total cost of a PV system, with a maximum credit of $3,750.
[272] On December 10, 2002, LIPA auctioned two photovoltaic systems (one residential, one commercial) to Long Island ratepayers. The proceeds of which will go to Citizens Advisory Panel's (a primary member of SEA) Clean Energy Campaign.

LNG

Gas utilities throughout the Northeast rely on LNG imported from overseas to supplement pipeline supplies during the heating season. LNG is created by chilling natural gas to about minus 260 degrees Fahrenheit so that it can be converted to liquid form. LNG requires approximately 1/600th of the volume that natural gas vapor requires, thus making storage and transoceanic tanker transport economically feasible. LNG has been transported into the United States for more than three decades and in 2001 represented about 6% of total U.S. gas imports.[273]

There are four marine LNG terminals in the U.S.: Everett, Massachusetts; Cove Point, Maryland; Elba Island, Georgia; and Lake Charles, Louisiana. The Everett terminal, serving most of the Northeast, receives LNG cargoes primarily from Algeria and Trinidad. Up to 1 billion cubic feet per day can be vaporized at Everett, injected into pipeline interconnections, and transported to end-users through the Tennessee and Algonquin pipelines and through the local Boston Gas system. Up to 100 million cubic feet per day can also be delivered by truck to satellite LNG storage facilities at regional LDCs throughout the Northeast. The Cove Point terminal currently provides only LNG storage services, but expansion of this terminal is underway. By July 2003, Cove Point will be able to receive ocean-going tanker deliveries and will have a peak sendout capacity of over 1.2 billion cubic feet per day.

More than a dozen proposals for new import facilities have been announced since the beginning of 2001, primarily in California, the Gulf Coast, and the Bahamas. None of the proposals would directly impact LNG deliverability to Long Island or Connecticut. Truck deliveries of LNG are used to refill satellite storage tanks that the LDCs rely on to maintain gas pressures on the coldest winter days, but truck transported LNG is not sufficient or economically feasible for year-round deliveries. LDCs and merchant generators who utilize LNG that is injected into pipelines at the Everett or Cove Point terminals will continue to rely on existing interstate pipelines to ship gas to Long Island and Connecticut, either by direct forward haul or by displacement. Therefore, LNG as an alternate fuel will not obviate the need for cross-Sound pipeline capacity.

Yankee Gas Services Company (Yankee) has proposed to build a 2 Bcf LNG storage and production facility in Waterbury. The project, currently being reviewed by the DPUC, would provide a secure, reliable natural gas supply to meet the growing energy demands of customers well into the future. This project will provide greater control over managing natural gas supply, while helping to keep prices lower and more stable for customers. Yankee is in the process of obtaining required regulatory approvals; for example, Yankee has obtained approvals for the project from the Waterbury Inland Wetlands Commission, Zoning Commission, City Plan Commission, and Zoning Board of Appeals. Pending receipt of all required pre-construction regulatory approvals, groundbreaking is projected to occur in early 2004 with an estimated in-service date of 2007.

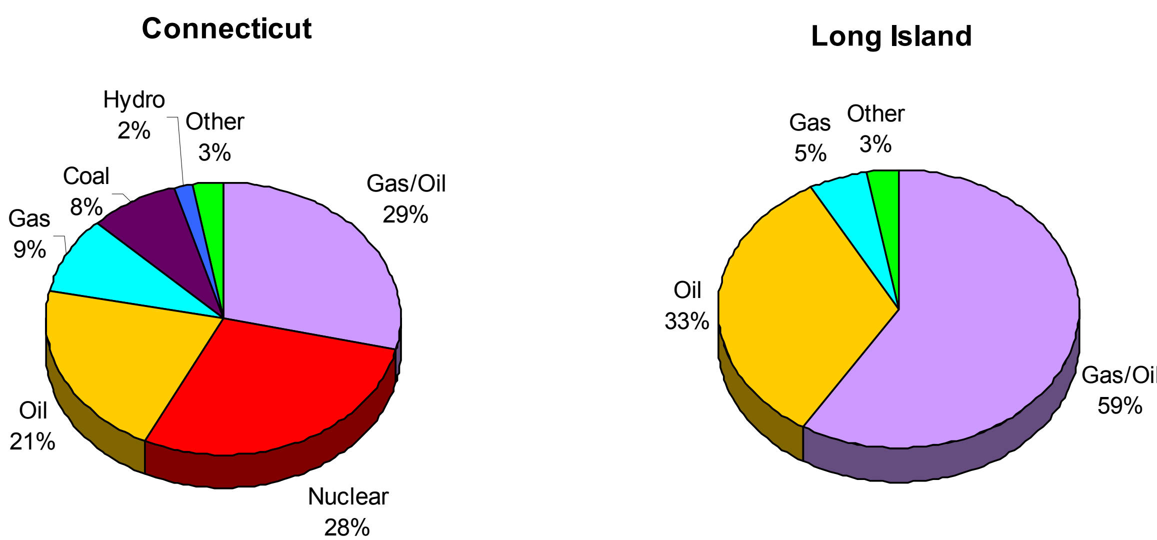
[273] Energy Information Administration, Office of Oil and Gas, January 2003.

Fuel Oil

Fuel oil includes a number of different liquid petroleum products. Distillate fuel oil (DFO), which includes No. 2 fuel oil, jet fuel, and kerosene, are critical energy sources. In Connecticut, 52.4% of households rely on No. 2 fuel oil for home heating.[274] On Long Island, nearly 70% of households use oil heat.[275] DFO, residual fuel oil (RFO), and other petroleum products are commonly used in industrial boilers and for other manufacturing purposes.

RFO and, to a lesser extent, various types of DFO are currently utilized throughout Connecticut and Long Island for electric power production. As indicated in Figure 10, almost 60% of generating facilities on Long Island and almost 30% in Connecticut are dual fuel, i.e., they are capable of firing both gas and oil. The option to burn gas or RFO has economic and reliability value. The flexibility to fuel switch based on price lowers the cost of electrical production. The ability to burn oil also allows gas-fired plants with non-firm transportation entitlements to be dispatched on cold days when gas service is otherwise curtailed. However, relative to natural gas, fuel oil generally has higher emissions of NO_x, SO_2, and particulate matter. Importantly, the amount of oil burned, particularly during the summer ozone season (May to September), is limited by each facility's air permit and applicable state regulations. Most of the new gas-fired combined cycle plants constructed in the last few years are permitted to burn oil for up to about 720 hours per year. Air quality regulations promulgated in both Connecticut and New York require the use of low-sulfur oil and impose more stringent emissions limits. These regulations will increase compliance costs for burning oil in the more vintage plants.

Figure 10 – Connecticut and Long Island Electric Capacity by Fuel Type



One advantage of fuel oil is that it can be stored in aboveground or underground tanks. Oil can therefore be purchased and stored as a backup fuel when prices are favorable.

[274] Northeast Gas Association, based on U.S. Census data for year 2000.
[275] Oil Heat Institute of Long Island. http://www.ohili.org/index.shtml.

However, facilities that rely on oil may face difficulties to refill storage tanks that are depleted during periods of prolonged cold. Oil storage capacity is, increasingly, a limited asset. Permits for new oil storage tanks are difficult to obtain. Accidental release of oil, either from overfilling or from tank leakage, may cause contamination of soil, surface water, or groundwater. Potential groundwater contamination is a particular concern on Long Island. Virtually all of Long Island's water supply is derived from groundwater, which is vulnerable to contamination due to the highly permeable nature of the soils. Long Island's groundwater aquifer has been designated a "sole source aquifer" by EPA and is subject to enhanced environmental protections.

Fuel oil is delivered by barge to the major ports in Connecticut (e.g., Bridgeport, New Haven, and New London), as well as to locations on Long Island. According to the U.S. Coast Guard Vessel Traffic Division, in 2000, 11,968 barges passed under the Throgs Neck Bridge going into or out of Long Island Sound. Oil spills from grounded barges, most recently last February in Norwalk, remain an ecological threat to Long Island Sound.

2.8.5 Measures That Reduce the Demand for Natural Gas and Electricity Through Conservation, Load Management, and Demand Response Programs

Gas Conservation - Connecticut

Three Connecticut natural gas local distribution companies (LDCs) fund energy efficiency programs within their service territories through either the Conservation Adjustment Mechanism or through base rates. Most of the programs below have been developed in conjunction with the Conservation Collaborative Group.

Connecticut Natural Gas (CNG) has three residential conservation programs plus one state program. The total budget for 2002 is $569,000 for the following:

- Conservation and Retrofit Energy Services (CARES) program provided 182 insulation and weatherization installations for low-income customers in 2001;
- Energy Conservation Loan Program (ECLP) is administered by the Connecticut Housing Investment Fund and provides below-market interest rate loans;
- Residential Conservation Services (RCS) program provided 130 low cost and free (for qualified and hardship customers) energy audits in 2001; and
- Conservation Program for State Facilities per P.A. No. 93-417 has completed 9 projects, and one project is in process.

Southern Connecticut Gas (SCG) has two residential conservation programs and one state program. The total budget for 2002 is $400,000 for the following:

- SCG funds a low income weatherization program approved by the Conservation Collaborative Group and a Limit the Gap program administered by the

Community Action Agency - New Haven; 147 customers received such services in 2001;
- ECLP provides below-market interest rate loans for energy conservation improvements;
- The RCS program provided 144 low cost and free (for qualified and hardship customers) energy audits in 2001; and
- Conservation Program for State Facilities (P.A. No. 93-417) has undertaken several projects; all work is expected to be completed by 2003.

Yankee Gas Services Company (Yankee) has three residential conservation programs that are administered by Northeast Utilities' Community Relations Department. The total budget for 2002 is $282,000:

- Insulation Program (formerly the Attic Insulation program) for low-income customers;
- The RCS program provided 153 free energy audits in 2002 (for qualified and hardship customers); and
- ECLP provides below-market interest rate loans for energy conservation improvements.

In the Comprehensive Assessment and Report, Part I, the Working Group recommended that the scope of the LDC's energy efficiency programs be expanded and consolidated under an Energy Efficiency Collaborative Group (EECG) that would develop, implement, and evaluate the cost-effectiveness of these programs. DPUC approval would be required before the final EECG program could be implemented. It was anticipated that the annual program funding would be approximately $1.5 million.

Electric C&LM Programs and Initiatives – Connecticut

C&LM initiatives in Connecticut are primarily implemented via the state's electric utilities, CL&P and UI. The two electric utilities develop their programs with input from the Connecticut Energy Conservation Management Board (ECMB); funding and program design approval is authorized by the DPUC.

State funding for C&LM programs in Connecticut is being considered for transfer to the General Fund. The programs discussed below reflect historical efforts and may not be funded and continued beginning July 2003.

CL&P offers a wide variety of C&LM programs aimed at the residential sector[276] and for commercial, industrial, government, and institutional entities.[277] UI offers a similar slate of programs, targeted towards all primary customer sectors.

[276] The residential programs include: residential retail lighting; "Smartliving Catalog'; EnergyStar appliances; EnergyStar homes; and low income and residential HVAC.

In May 2002, the DPUC approved an $86.5 million budget in Docket No. 02-01-22 for DSM initiatives in the state, $69.5 million for CL&P customers and $17.0 for UI customers. These values are based on the projected investments into the C&LM Fund established by the legislature pursuant to PA 98-28. The C&LM Fund receives an assessment of three mills per kWh on electricity sold to each customer of an investor-owned electric utility. After discussions with the DPUC, UI reassessed their C&LM budget, and focused the implementation of measures in SWCT. The DPUC also required CL&P to alter their program investments, and to apply greater effort and budget dollars towards SWCT initiatives. For example, CL&P was required to increase the incentives for participants in the ISO-NE LRP.

The utilities develop their programs and budget with the advice and assistance of the ECMB, created by the Connecticut Legislature pursuant to Section 33 of PA 98-28. The ECMB, an eleven-member Board made up of representatives from business groups, consumer organizations, environmental groups, government agencies and distribution utilities, provides oversight and recommendations on utilities' C&LM program and budgets before they are submitted to the DPUC. The ECMB monitors energy efficiency and LRPs, with particular emphasis on SWCT.

C&LM initiatives are projected to have large paybacks on the investments made. In 2001, CL&P and UI invested roughly $86 million of ratepayer funds acquired through the C&LM Fund. All programs must be cost-effective with a benefit-cost ratio of at least 1.0. According to an ECMB report of 2001 DSM implementation, the $86 million investment is projected to produce a lifetime savings for customers over of $473 million.[278] More than 400,000 customers participated in 2001, including industrial, commercial, and residential customers. At this time, the potential cumulative savings from all current and previous C&LM sources are forecast to reduce the 2006 summer peak demand by approximately 700 MW from levels otherwise expected. The most successful C&LM programs in 2001, measured in terms of participation and benefit/cost ratio, were retail lighting, advanced design for new residential, commercial, and industrial construction, energy efficient residential washing machine sales, and custom on-site energy audits for commercial and industrial customers. The programs with the lowest benefit/cost ratios were residential audits, heat pump water heater sales, and express services targeted to small load commercial and industrial customers for upgrading lighting, motors, and heating/cooling units.

Within the C&LM Fund, a research development and demonstration (RD&D) program was established to identify and manage projects that would advance the development of reliable and efficient use of electricity. RD&D projects seek to deliver sustainable energy savings benefits to Connecticut businesses and residents. RD&D seeks to complement

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[277] The non-residential programs include: new construction; customer services; express services; small business energy advantage; RFP for energy efficiency program; operation and maintenance RFP program; and state and municipal buildings program.

[278] Report of the Energy Conservation Management Board Year 2001 as represented by UI in Connecticut's Conservation and Load Management Fund, Year 2001 Accomplishments.

the DSM portfolio of energy-efficient measures for all customers by uncovering new products and services that save energy, benefit the state's environment and economy, and enhance power system reliability. CL&P and UI separately administer their RD&D programs, also referred to as Market Transformation Programs.

The RD&D Program solicits innovative technology or technical service proposals in the categories of Energy Efficiency and Distributed Resources. Energy Efficiency technologies are defined as technologies that offer large electric energy savings whether from one improvement or from a series of smaller ones. Innovative technologies sought for consideration include lighting, energy management/load control, computer/ electronics, refrigeration, water heating, electro-technologies, and space conditioning/ HVAC. Distributed Resource technologies are defined as the combined or individual use of DG, energy storage, and load management on the customer side of the meter with complementary energy efficiency benefit, and to address specific customer reliability and power quality needs. Innovative Distributed Resource technologies sought for consideration include photovoltaic (PV), fuel cells, and distributed resources and fuel cell cost analysis.

SWCT C&LM Activities

The DPUC has indicated its belief that "an increased focus on C&LM activities in SWCT, particularly in the NOR area" should be part of a balanced approach to solve the transmission congestion issues facing the region. In Docket No. 02-01-22, the DPUC approved $5.633 million for CL&P's 2002 load management programs in SWCT.[279] CL&P established a goal of 28.85 MW of local reduction in SWCT. As of November 2002, CL&P was able to enroll only 0.7 MW in the NOR sub-area and 6.88 MW in the remainder of the CL&P's towns in SWCT. The DPUC also approved $660,000 in uncommitted funds for UI to reallocate to the NOR sub-area.

The DPUC expected total conservation program savings of 65.6 MW throughout the state and 36.9 MW in SWCT due to 2001 expenditures (Table 15). Savings values for the 2002 implementation are expected to be slightly higher (67.2 MW) with most of the savings in SWCT (40 to 45 MW). According to the DPUC Investigation in Docket 02-04-12, load management savings were projected to reduce load by an additional 44 MW, all in SWCT, but there is some overlap between CL&P's and UI's load reduction values and ISO-NE's LRP program, as outlined in Table 15.

[279] CL&P originally proposed a $2.46 million budget, expected to save roughly 10 MW of peak demand. The DPUC subsequently identified $0.93 million of C&LM funds to be reallocated to SWCT load management and CL&P proposed an additional $2.25 million for such endeavors.

Table 15 – Peak Load Reduction from CL&P and UI C&LM Programs[280]

	2002 Peak Load Reduction (MW)	
	State-Wide	**SWCT only**
Energy Efficiency Programs		
Original Program Filing	67	40
Incremental SWCT Initiatives	5	5
Total Energy Efficiency	72	45
Load Response Programs		
C&LP	28	28
UI	12	12
ISO-NE SWCT RFP	4	4
Total Load Response	44	44
Total C&LM	116	89
% of SWCT Peak	*n/a*	*2.7%*

Electric C&LM Programs and Initiatives – New York

The New York Energy Research and Development Agency (NYSERDA) is a public benefit corporation created in 1975 by the New York Legislature. NYSERDA is nationally recognized for its innovative research and technology development, energy efficiency and conservation, and environmental protection programs. NYSERDA derives its revenues from a system benefits charge (SBC) on in-state gas and electric utility sales, voluntary annual contributions by the New York Power Authority and LIPA, and corporate funding.

NYSERDA is authorized by the NY PSC to administer and implement a range of C&LM programs through its Energy $mart initiative intended to improve the economics of conservation measures or efficiency activities, and to support research and development of renewable energy technologies and fuels. The Energy $mart initiative is an 8-year program (1998 through 2006) with a total budget of $932.1 million. Approximately $372.2 million has been committed, and $115.6 million invoiced, as of March 31, 2002. Solicitations for the implementation and marketing of ongoing programs continue on a regular basis. Energy $mart contains ten unique C&LM programs targeted to commercial and industrial customers and eight unique programs targeted to residential customers, including low-income programs. Unlike customers of investor-owned utilities, LIPA and NYPA customers are not charged a SBC, and thus, are not eligible to participate in NYSERDA's C&LM programs.

LIPA directly administers its own C&LM programs in its service territory and coordinates certain aspects of its DSM programs, as well as alternative generation

[280] DPUC Docket 02-04-12.

initiatives, with NYSERDA. In 1999, LIPA committed $170 million over five years to its Clean Energy Initiative targeting energy efficiency, load management, and renewable energy resources.[281] According to LIPA, these programs have yielded over 122 GWh of energy savings, roughly 40 MW of installed peak load reduction, and more than 200 MW of curtailable load reduction capability as of October 2002. LIPA expects that its efficiency programs with committed funding will produce a total of 290 GWh of energy savings and over 110 MW of installed load reduction (excluding curtailable load) by the end of 2004.

ISO-NE Demand Response Program[282]

ISO-NE is responsible for administering the Demand Response Program (DRP) for the New England Power Pool (NEPOOL). There are approximately 254 commercial and industrial customers throughout New England enrolled in the DRP that could provide a total of 343 MW of demand response to help manage peak demand for electricity in New England.

Customers can receive incentive payments if they reduce their electricity consumption or operate generation in response to high real-time wholesale electricity prices or when the reliability of the region's electricity grid is stressed. Customers can contribute load reduction in a variety of ways:

- Turning off non-essential lights and office equipment
- Adjusting HVAC, refrigeration and water heater temperatures
- Delaying or reducing manufacturing processes
- Operating on-site generators
- Using energy management system (EMS)

Demand response participants provide an important resource for New England. They help ensure the power grid's reliability, reduce wholesale price volatility that drives up the cost of power for everyone, and reduce air pollution by enabling older, less efficient power plants to run less often.

Real Time Demand Response. The Real Time Demand Response Program is designed for customers who can make a commitment to reduce electricity demand within either 30-minutes or 2-hours advance notice. By making a commitment, customers will receive a guaranteed minimum payment of $0.50 per kilowatt hour (kWh) in the 30-minute program and $0.35 per kWh in the 2-hour program. Payments may be higher (up to a maximum of $1.00 per kWh) based on the actual hourly wholesale prices. In addition, customers may receive additional credit for Installed Capacity (ICAP) and reserve margin.

[281] LIPA Draft Energy Plan, October 17, 2002, at 7-3.
[282] Information obtained from ISO-NE on May 30, 2003.

Real-Time Profiled Response. The Real Time Profile Response program is designed for groups of customers who can reduce their loads within 30-minute notice from ISO-NE. This program is intended for:

- Businesses with similar facilities in multiple locations such as retail stores, office buildings, etc.
- Companies installing direct load control technologies in residential homes or commercial buildings (e.g., super-thermostat programs, water heater and pool pump controls, etc.)
- Distributed generation installed in multiple locations

A minimum of 1 MW of load reduction for this program is required to provide a statistical response factor for the group. For example, an aggregated 10 MW demand resource having a 50 percent response rate would be credited for 5 MW of response. In addition, customers may receive additional credit for Installed Capacity (ICAP) and reserve margin.

Real Time Price Response. The Real Time Price Response Program is designed for customers who can reduce electricity demand when wholesale prices are projected to be greater than $0.10 per kWh. This is a voluntary program. Customers are not required but can choose to reduce demand on a case-by-case basis. These customers are paid the actual hourly wholesale prices (up to a maximum of $1.00 per kWh) with a guaranteed minimum price of $0.10 per kWh. Customers in this program do not qualify for Installed Capacity (ICAP) credit.

Most customers pay about $0.05 per kWh for retail electricity supply; however, wholesale electricity prices can reach as high as $1.00 per kWh during peak demand periods. For example, in the summer of 2002 wholesale electricity prices exceeded $0.10 per kWh for over 40 hours on 12 different days. Each hour over $0.10 per kWh represents an opportunity for customers to reduce their consumption and receive incentive payments.

Hourly Metering and Data Reporting. With the exception of the Real Time Profile Response Program, an advanced meter capable of recording energy consumption every 5 to 15 minutes is required to participate in these programs. Interval meter data must be reported to ISO New England to determine the customer's load reductions. ISO-NE offers internet based communications system (IBCS) and low tech data reporting options.

A detailed description of ISO New England's Demand Response Program is available on the web at www.iso-ne.com.

NYISO Load Response Program

During the summer of 2001, NYISO tested two price-responsive load pilot programs: the Emergency Demand Response Program (EDRP) and the Day-Ahead Demand Response Program (DADRP).

- Participants in the EDRP are provided at least two hours advance notice of a curtailment need. Customers who do curtail are paid the higher of the location based marginal price (LBMP) or $500 / MWh. During the summer of 2001, the EDRP program provided 418 MW of load reduction in critical peak periods.

- Participants in the DADRP submit reduction bids comparable to supply bids from generators, and receive market prices for load reductions scheduled for the next day. Over a dozen customers subscribed to the DADRP program in 2001, supplying over 25 MW of load reduction coincident with summer peaks.[283]

Customers with at least 100 kW of curtailable load were allowed to participate in these programs. Forty percent of subscribers chose to participate in an existing NYISO load management program, which allows load serving entities to claim certain curtailable loads to fulfill their installed capacity requirements. Industrial customers, located primarily in Western New York, represent the bulk of the curtailable load, so only about 43 MW was curtailed in the New York City and Long Island, as shown in Table 16.

Table 16 – New York EDRP Loads by Zone

Zone	Average Hourly Event Value		Total EDRP Load (MWh)
	EDRP Load (MWh)	% Change in RT Load due to EDRP	
Capital	63	3.1%	1,446
New York City	37	0.4%	860
Long Island	6	0.1%	128
Western NY	293	3.3%	5,276
Hudson Region	19	0.5%	430
Grand Total	**418**		**8,159**

As indicated in Table 16, curtailable load on Long Island is small compared to other regions of New York. This reflects Long Island's relatively small proportion of industrial load compared to commercial and residential load, which have less flexibility to modify daily operations and energy use. LIPA intends to establish a new energy conservation rate as a further incentive to its customers.

2.8.6 Alternatives to Telecommunications Lines Crossing Long Island Sound

The existing telecommunications network has sufficient capacity due to the redundancy built into the network and techniques to improve equipment utilization. The major service providers have no near-term plans to install additional lines across Long Island Sound, and the relative ease of expanding wireless systems may reduce any long-term plans as well.

[283] See NYISO PRL Program Evaluation: Executive Summary.

2.9 Ocean Management and Planning

Planning tools such as common utility corridors, ocean zoning, and marine protected areas were considered as potential options for the management of energy and telecommunications infrastructure in Long Island Sound.

2.9.1 Utility Corridors[284]

On land, linear infrastructure such as roadways, gas and electric transmission lines, telecommunications lines, and railroad rights-of-way (ROW) are often clustered in common corridors. The use of common corridors is sometimes preferred by regulators.[285] However, use of common corridors often pose engineering and design considerations. The main design issue for co-locating a gas pipeline and a high voltage alternating current (HVAC) electric transmission line is the induced current that can be transferred from the HVAC line to the steel gas pipe. Induced currents can lead to accelerated corrosion of the pipe. Proper pipeline design may mitigate this problem. Cathodic protection, including placement of sacrificial anodes or rectifiers along the pipeline, may prevent electric corrosion from stray currents.

Co-locating multiple transmission infrastructure along a common ROW may raise significant security concerns, particularly if there is a gas and electric line or multiple electric lines serving the same load. Such contingencies could conceivably include accidents or intentional subversive acts.

Because common infrastructure corridors have been used on land, the Task Force considered whether a similar concept would be adaptable to infrastructure across Long Island Sound. However, construction and maintenance of marine infrastructure is significantly different from terrestrial ROWs. Because of these differences, many of the benefits of terrestrial ROW corridors are not applicable to the marine environment. For example, several lines (gas, electric, cable) could potentially be constructed within a single on land corridor approximately 100 to 200 feet wide, whereas deepwater marine construction methods could require separation distances of approximately 2,000 to 4,000 feet between lines for lay barge anchoring. Near shore construction methods may require a separation distance between lines of 75 to 300 feet. Substrate type and water depth also affect infrastructure installation techniques and the separation distances required to provide protection from construction and excavation equipment (

[284] The discussion relates to the potential for the placement of multiple and varied energy and telecommunications infrastructure within common linear routes or "corridors". This discussion is generic and does not pertain to the replacement, repair or maintenance of existing facilities in Long Island Sound.

[285] FERC citation regarding preference for giving consideration to utilizing, enlarging, or extending existing right-of-ways:18 CFR 2.69(1).

Table 12.). As a consequence, multiple pipelines or cables cannot be compactly located within a single designated marine corridor, unless that corridor is thousands of feet wide.

In conclusion, marine corridors raise the following unique issues:

- The inherent difficulty in delineating the area of any such corridor;
- National security concerns with placing multiple utility infrastructures in a common area;
- Operational concerns associated with utility facilities in proximity to each other, i.e., increased likelihood of electrolytic corrosion and an increased potential for third party damage;
- Substrate types and water depth can affect construction techniques and corridor width;
- Repair, inspection and maintenance considerations;
  - Minimum separation distances required for safety;
  - Distance affords protection from construction/excavation equipment;
  - Avoid as much as possible crossing of cables/pipes to assure adequate access;
- Impacts on utility infrastructure insurance requirements;
- Liability considerations in connection with construction and post-construction activity relating to utility infrastructure;
- May minimize right-of-way needs if assume finite number of utility infrastructures and/or no significant change in technology for installation and repair;
- Could benefit efficiency of siting process if the corridor is identified;
- May or may not facilitate avoidance or minimization of impact on discrete sensitive resources;
- May increase cumulative environmental impacts, albeit within an identified area;
- Use of a Long Island Sound corridor may increase adverse terrestrial environmental impacts in connection with the concentration of related utility infrastructure;
- May require infrastructure in Long Island Sound to be longer in total length thereby impacting, among other things, the infrastructure cost and the extent of needed right of way;

- Any corridor proposed for Long Island Sound would require the concurrence of New York;

- Current lack of data adversely impacts a conclusive decision on location; and

- Establishing a common corridor will result in repeated impacts in the same areas and will likely result in long-term effects.

Marine Protected Areas and Marine Zoning

A number of proposals have been reviewed in recent years for the construction or installation of electrical cables and gas pipelines in and through Long Island Sound. In the course of evaluating alternative management processes for such activities, the question has been asked, "How do or might states use marine protected areas and marine zoning for the purpose of reviewing and/or regulating subtidal energy and telecommunications infrastructure?"

Marine protected areas (MPAs) have been established in various locations nationwide, including areas designated in response to federal Executive Order 13158. The Executive Order, issued in May, 2000, defines a MPA as "any area of the marine environment that has been reserved by Federal, State, territorial, tribal or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein." As described on The National MPA Center's website, www.mpa.gov, MPAs have been designated to conserve biodiversity, manage natural resources, protect endangered species, reduce user conflicts, provide educational and research opportunities, and enhance commercial and recreational activities.

The MPA Center website further describes the varying levels of resource protection provided and uses allowed in MPAs, ranging from areas closed to public access to multiple-use areas. Existing MPAs also range in size (from 14 acres to 5,300 square miles) and shape. Some MPAs are located entirely within federal waters and are managed under federal laws by federal agencies. Others are found in state waters where both state and federal laws may apply. Some MPAs, such as the Cape Cod National Seashore, include both marine and terrestrial components.

Marine protected areas generally create a level of management over and above the existing authorities that apply outside of MPAs, and can provide a focused, ecosystem-based approach to resource management. Activities that are permitted or regulated by law outside an MPA may be prohibited or severely curtailed within an MPA in order to achieve the benefits for which the MPA was established. Oil exploration and production, dredging, dredged material disposal, certain types of vessel traffic, fishing, and placement of structures on the seabed are examples of activities that have been restricted in certain MPAs.

Nevertheless, while MPA program objectives, as described above, are intended to provide necessary and effective resource protection, outstanding management issues remain. The Ocean Conservancy (formerly known as the Center for Marine Conservation) evaluated 95 MPAs of widely divergent jurisdiction and scope within the U.S. Gulf of Maine. Given the variety of sites reviewed, the study's reported observations may be indicative of MPAs in a broader geographic context, including Long Island Sound.

The Ocean Conservancy study found that the resource areas most frequently lacking fully or permanently needed protection are subtidal habitats. In ranking the degree of resource protection provided, the Conservancy found that while the majority of MPAs prohibit certain activities year-round, such as non-renewable resource development (sand and gravel mining, oil and gas extraction, dredging), many still allow activities causing high and widespread impacts to such benthic habitats, primarily bottom trawling and scallop dredging. Of relevant concern to Long Island Sound, these prohibitions do not generally include energy and telecommunications infrastructure.

The following analysis describes a number of existing MPAs that have been established at the national and state levels in this country, as well as in Australia. It also describes the concept of marine zoning as it has been applied in the United States and Australia. The examples that are cited provide insight into the applicability of these mechanisms for resolving the potential impacts of the installation of energy and telecommunications infrastructure on resources in Long Island Sound, including but not limited to shellfish and eelgrass beds, as well as water quality. The content of this document reflects information gathered by the Connecticut Department of Environmental Protection (DEP) and Save Long Island Sound from listed resources, including telephone conversations with state and federal agency staff.

National Programs

The primary initiative through which MPAs have been established at the federal level is the National Marine Sanctuaries (NMS) Program. The review of any activity in a National Marine Sanctuary is dependent on the purpose for which the area was designated. At the inception of the MPA program, the impacts of energy and telecommunications infrastructure were not considered specifically. Consequently, NMS administrators find that they must address these issues in the context of a non-existent legal framework. However, while such infrastructure is not specifically prohibited in Sanctuaries, disturbance of the seabed is disallowed.

National Marine Sanctuaries on the U. S. west coast, as well as Stellwagen Bank NMS in Massachusetts, have developed a system of Special Use policies and permits, in consultation with the oil industry and the White House, for dealing with the particular issue of the installation of oil pipelines. These policies and permits address, among other things, grandfathering of such uses, and the assessment of user fees. Subject activities must be compatible with the purposes for which the sanctuary was designated and must be protective of sanctuary resources.

State Programs

The four New England coastal states other than Connecticut, as well as New York, New Jersey and Florida, were surveyed to determine the existence of marine protected areas, and whether those MPAs have been used to review or regulate subtidal energy and telecommunications infrastructure. All of the surveyed states review proposals for activities such as energy infrastructure through conventional regulatory authorities. For example, Rhode Island, like Connecticut, enforces seasonal restrictions on such activities to avoid impacts to shellfish resources.

To date, neither Maine, New Hampshire, Rhode Island nor New York have established under state authority MPAs in which any or all development activities, including utility construction, are prohibited. Maine's staff speculated, however, that any proposed offshore activity expected to adversely affect an onshore special resource area, such as the Rachel Carson National Wildlife Refuge, part of the Wells Estuarine Research Reserve, would focus the review of that activity on the impacts to area-specific sensitive resources. Nevertheless, Maine also indicated that energy infrastructure would likely be reviewed as a special exception to other regulated activities.

Massachusetts, New Jersey and Florida have established MPAs, all of which offer examples pertinent to the management of energy and telecommunications infrastructure in Long Island Sound. Massachusetts has designated a series of five Ocean Sanctuaries spanning most of the state's coastline. The sanctuaries extend from mean low water seaward to the three-mile limit of the state's jurisdiction. The primary incentive for their designation was the protection of water quality for fisheries and tourism. Working harbors and developed shoreline are excluded from the sanctuaries. The sanctuary that is contiguous with the Cape Cod National Seashore contains the most use restrictions, reflecting the sensitive nature of the marine resources at that location.

Under the relevant enabling legislation, the Ocean Sanctuaries are to be "protected from any exploitation, development, or activity that would seriously alter or otherwise endanger the ecology or appearance of the ocean, the seabed, or the subsoil thereof." The state Department of Environmental Management (MADEM) acts as trustee of the sanctuaries, ensuring that any activity proposed within a sanctuary is consistent with the Massachusetts Ocean Sanctuaries Act, while the Department of Environmental Protection (MADEP) evaluates and regulates activities proposed within sanctuaries.

Activities prohibited in Massachusetts' Ocean Sanctuaries include the building of any structure on the seabed or under the subsoil thereof. However, exceptions are made for "activities, uses and facilities associated with the generation, transmission, and distribution of electric power, and laying cables," and projects deemed to be "necessary to the public interest." Determination of such necessity is based on the evaluation of, among other things, the importance of the project to public safety and welfare; the impact of the activity on the ecology or appearance of the ocean, seabed or subsoil thereof; the effect of the activity on existing uses; and the financial and technical ability of the applicant to build and properly maintain the project. In the state's North Shore sanctuaries, infrastructure is allowed if it is the only feasible alternative.

Among those projects that have been reviewed by the Ocean Sanctuaries program is the Hubline, a gas pipeline traversing Massachusetts Bay. Review of the pipeline, which was proposed to be buried in the seabed and which is presently under construction, was bundled with the state's coastal regulatory process. The project was approved by MADEP, however due to the Ocean Sanctuaries program's concerns about potentially serious environmental impacts, a variety of mitigative requirements were imposed on the sponsors of project. Such measures included long-term monitoring of the pipeline and funding of projects intended to provide insight into better management of the Hubline itself and other activities which would potentially impact Sanctuary resources, e.g., mapping of the Sanctuary seafloor.

Massachusetts also has designated a system of Areas of Critical Environmental Concern (ACEC). While ACECs address protection of both terrestrial and aquatic resources, proposed work within area boundaries is reviewed by DEM in accordance with existing policies and regulations.

Florida has established a system of aquatic preserves to protect extensive seagrass beds and mangroves, and the accompanying fish and wildlife habitat, in addition to significant cultural resources. Certain activities are restricted within the preserves depending on the resources at risk, and the nature of the activity of concern. Any proposal for work within a preserve must meet a "public interest" test. Prohibited activities include new dredging and shoreline armoring. Public energy and telecommunications infrastructure is not prohibited in aquatic preserves, however, otherwise unregulated or privately funded and constructed utility facilities which do not pass the public interest test would be prohibited.

International Programs

New South Wales, Australia has established two types of MPAs:

Aquatic reserves. These are areas designated under the *Fisheries Management Act of 1994* to conserve the biodiversity of fish and marine vegetation. Aquatic reserves protect fish habitats, and can also be used specifically for fisheries management purposes, to protect threatened species, facilitate educational activities, or scientific research.

National parks and nature reserves. These are areas established under the *National Parks and Wildlife Act of 1974*. All land (including submerged land) and all native plants and animals (except fish and marine vegetation) are protected within parks and reserves. Coastal parks and reserves often extend to low water and beyond, and sometimes include the beds of adjoining lakes or estuaries.

The principles upon which the qualifications of an area for protection are based can be found at http://www.mpa.nsw.gov.au/pages/overview/6_goals.htm. The process for identifying and designating such areas may be found at http://www.mpa.nsw.gov.au/pages/overview/7_identifying.htm.

2.9.2 Marine Zoning

State Programs

Marine protected areas have been established in the United States, including in New Jersey and Florida, through a mechanism known as marine zoning, also referred to as ocean zoning and ocean management areas. Marine zoning is the temporal and geographic division of a waterbody by legislative regulation into districts to reduce user conflicts and lessen the concentrated impact to marine resources.

The focus of marine zoning is the protection of critical portions of sensitive habitats, while not restricting activities within the zone any more than necessary. It has the following potential benefits, and is achieved through the management procedures indicated parenthetically:

- reduction of impacts on sensitive species or communities (i.e., buffer zones);
- protection of biodiversity and habitats (i.e., MPAs or areas of critical concern);
- protection of marine ecosystem from pollution (i.e., no discharge zones);
- protection from over-fishing or restoration of stock (i.e., “no take” areas);
- restoration of degraded habitats through self-healing (i.e., non-consumptive zones, in extreme cases “no access” zones for all uses other than scientific assessment of the recovery);
- reduction of gear conflicts (i.e., “no bottom trawl” zones); and
- protection of sensitive life stages (i.e., seasonal window zones).

Similar to terrestrial zoning, marine zoning is legally enforceable and penalties apply for breaches. However, because marine resources are held in trust for the public, any intrusion or limits of that public's use must be in the public interest and not be an unreasonable interference of that use. Boundary disputes, enforcement difficulties and frequent user conflict are just some of the marine zoning trials that do not generally afflict terrestrial zoning. Examples of the use of marine zoning in the United States are:

New Jersey

In March of 2001, the Tidelands Resource Council set forth a plan creating the Sedge Islands Marine Conservation Zone (MCZ). It was designed to reduce environmental effects of personal watercraft and to better manage wildlife, recreation and traditional uses of the area. The Sedge Islands support New Jersey’s largest osprey colony and contain the state’s first peregrine hacking tower. The Islands also include 715 acres of tidal wetland that serve as spawning, nursery, forage and refuge habitat for many estuarine and offshore species.

The Council authorized New Jersey's Department of Environmental Protection to manage the tidelands, thus giving the agency's Park Service and Division of Fish and Wildlife jurisdictional authority to control activities in the inter-tidal zone. This affords a more holistic approach by providing for conservation areas, "soundscapes" and "user experience" areas, which are not currently contemplated by the state's boating regulations. Use restrictions are site-specific and do not affect watercraft activities in adjacent areas.

Stakeholders were involved in the designation process, and the public has been supportive of the initiative. The designation was a joint effort by state's resource agencies, and required approval of state's Natural Resources Council in addition to that of the Tidelands Resource Council. While the review of proposed activities in the MCZ, including energy and telecommunications infrastructure, is conducted through existing regulatory authorities, MCZ staff regard marine conservation zoning as an additional effective tool for management of such infrastructure.

Florida

A more extensive marine zoning initiative is found in Florida. The goal of the state's program is to protect resources while allowing the pursuit of activities compatible with such protection. Within a limited area of the Florida Keys National Marine Sanctuary, marine zones have been designated to protect resources, conserve biodiversity, and disperse uses. Several types of "no-take" zones have been established, including small sanctuary preservation areas, wildlife management areas, special use areas and an ecological reserve. These zones comprise only 2% of the Sanctuary. Florida's marine zoning regulations complement those in existing non-zoned management areas, including the Aquatic Preserves described above.

Florida's marine zoning program has the following objectives:

- reduce stresses from human activities by establishing areas that restrict access to especially sensitive wildlife populations and habitats;
- protect biological diversity and the quality of resources by protecting large, contiguous diverse habitats that are intended to provide natural spawning, nursery, and permanent residence areas for the replenishment and genetic protection of marine life and to protect and preserve all habitats and species;
- minimize conflicting uses;
- protect Sanctuary resources and separate conflicting uses by establishing a number of non-consumptive zones in areas that are experiencing conflict between consumptive and non-consumptive uses and in areas that are experiencing significant population or habitat declines;
- eliminate injury to critical/sensitive habitats; disperse concentrated harvests of marine organisms;
- prevent heavy concentrations of uses that degrade Sanctuary resources; provide undisturbed monitoring sites for research activities by setting areas aside for scientific research, monitoring, and restoration; and

- provide control sites to help determine the effects of human activities on resources.
  - Specific activities restricted in the various no-take zones include: spearfishing, shell collecting, tropical fish collecting, fishing and other activities that result in the harvest of marine life by divers, snorkelers, and fishermen and direct physical impact to corals. Measures instituted to manage public access in wildlife management areas include idle speed only/no wake zones, elimination of access buffers, no-motor zones, and limited area closures.

International Programs

At least one other nation, Australia, has undertaken a marine zoning initiative similar in scope to that in Florida. Marine parks have been established in the states of Queensland and New South Wales which are divided into zones, most of which allow a wide range of uses. Zoning and operational plans are used to guide the protection of conservation values and to manage activities that occur within marine parks. Four zones are used in marine parks:

- sanctuary zones: highest in biological diversity, key sites for threatened or other significant species, important natural or cultural features. Examples: estuarine systems; sandy beach habitat; intertidal rocky shore; subtidal soft sediment habitats (muddy, sandy or gravely seafloor); subtidal reefs and fringe reefs.
- habitat protection zones: high in biological diversity, key sites for threatened or other significant species, important natural or cultural features. Examples: all above mentioned examples, particularly inshore areas.
- special purpose zones: special management requirements; Examples: oyster leases and scientific study sites.
- general use zones: all areas within park not subject to other zoning. Examples: deeper offshore areas.

Applicability To Long Island Sound

A wide variety of Marine Protected Areas have been established in the United States and internationally to address identified resource concerns. Within these MPAs, various uses are restricted to protect sensitive species and habitats. In many of the individual MPAs described above, energy and telecommunications infrastructure are or would be regarded as "in the public interest" and thus an exception to other restricted activities, or as a "special use" subject to review and approval in accordance with policies specific to that use and to the goals of the respective MPA. These mechanisms, while allowing the construction of energy and telecommunications infrastructure, prescribe appropriate management measures, within the context of existing regulatory policies.

Massachusetts' criteria for the determination of "public necessity" allow for more critical review of such energy infrastructure construction. In addition to the evaluation of resource impacts, the effect of the activity on existing uses and the financial and technical ability of the applicant to build and properly maintain the project are also assessed.

Similarly, Florida's "public interest" test might preclude the construction of energy and telecommunications infrastructure that does not provide a demonstrated public benefit.

There may be less imperative in Connecticut than in other states for the establishment of new MPAs. The resources of Long Island Sound are not as concentrated as the osprey colony which is protected by New Jersey's Sedge Islands Marine Conservation Zone, or as extensive as the mangroves and seagrass beds that characterize Florida's aquatic preserves. Neither do the waters of Long Island Sound constitute a resource area as sensitive as that encompassed by the Massachusetts Ocean Sanctuary contiguous with the Cape Cod National Seashore.

The state and federal programs described above offer the following additional specific mechanisms, which may be applicable to resource management, including the review of energy and telecommunications infrastructure proposals in Long Island Sound:

- ***Special Use policies***. The Connecticut Coastal Management Act and existing state and federal coastal regulatory programs contain policies and provisions pertinent to the potential disturbance of subtidal habitats resulting from, among other activities, the construction of energy and telecommunications infrastructure. However, if such activities are shown to generate unforeseen conflicts or adverse resource impacts, it may become prudent to consider the development by resource management agencies of additional management procedures such as the National Marine Sanctuaries program's Special Use policies.
- ***User fees***. This mechanism has been employed in National Marine Sanctuaries to manage the installation of oil pipelines.
- ***Public interest review***. Consideration of the consistency of private, for-profit energy and telecommunications infrastructure with the public interest, may be appropriate in Long Island Sound. In particular, public interest review might consider benefits to public safety and welfare, potential for resolution of resource and use conflicts, and the demonstration of the financial and technical ability of the applicant to build and properly maintain a proposed infrastructure project.

Marine zoning has also been used in the United States and other countries to protect sensitive resources. New Jersey's Marine Conservation Zone is the most restrictive resource management designation presently in place in nearby states. The zone enables the identification of specific sites or areas where activities such as utility infrastructure would not be allowed due to identified impacts, and where such uses would be acceptable.

The establishment of marine zoning is likely to be a long and complicated process, requiring the involvement of a wide group of stakeholders. Potential steps which may be appropriate in the consideration of such a zoning or spatial resource management system in Long Island Sound include:

1) Identify and assess existing habitats and coastal resources;
2) Identify and assess existing uses;

3) Document and map such uses and consider: a) how habitats are impacted; b) current protection methods; and c) priorities, including exceptions to prohibitions and restrictions for utility infrastructure and/or projects "necessary to the public interest";
4) Determine the spatial scale requirement for protection (i.e., how much acreage must be included to provide the necessary resource protection);
5) Determine the relative spatial percentage protection (i.e., is partial protection of a zone sufficient or is full protection of the zone required);
6) Determine the tools, technologies and human resources necessary to effectuate a zoning plan;
7) Determine interagency involvement (i.e., who gets involved where?); and
8) Identify stakeholders and solicit their input to the proposed zoning through appropriate public forums.

In summary, this analysis summarizes information regarding the use of designated Marine Protected Areas and marine zoning on the state, national and international levels for the management of activities which could potentially impact the presence and viability of natural coastal resources and existing water-dependent uses. Clearly, additional research is needed before it can be determined whether either of these mechanisms is suitable for the management of proposed energy and telecommunications infrastructure in Long Island Sound. Similarly, all stakeholders would need to be involved in the development of such initiatives, since both MPAs and marine zoning would have implications beyond the utility industry.

2.9.3 Marine Zoning - Additional Resources

Ocean Zoning for the Gulf of Maine: A Background Paper; Prepared for the Gulf of Maine Council for the Marine Environment

Bibliography related to MPAs and Zoning:
http://life.bio.sunysb.edu/marinebio/reserve.ref.html

Marine Protected Areas: http://www.nap.edu/books/0309072867/html/257.html

Improving Marine Stewardship: http://bob.nap.edu/html/striking/

Marine Fish Conservation Network:
http://www.surfrider.org/specialplaces/ocean_zoning.htm

Other Examples: Monterey Bay (CA), Marine Life Conservation Districts in Hawaii, Galapagos Island (under consideration), Cayman Islands, Philippines, Socotra, and South Africa.

Other contacts: waiting for return calls from Ocean Conservancy, Environmental Defense Fund, and Project Manager of the Florida Project.

Marine Protected Areas – Contacts:
Judy Gates, Maine Dept. of Environmental Protection, Land & Water Quality
David Hartman, New Hampshire Coastal Program
Susan Snow-Cotter, Massachusetts Office of Coastal Zone Management Program
Katie Lund, Massachusetts Dept. of Environmental Management, Areas of Critical Environmental Concern
Mike Gildesgame, Massachusetts, Ocean Sanctuaries Program
Liz Sorenson, Massachusetts Dept. of Environmental Management
Megan Higgins, Rhode Island Coastal Resources Management Center
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Karen Chytalo, New York Dept. of Environmental Conservation, Bureau of Marine Resources .
Jim Hanebury, New Jersey Dept. of Environmental Protection,
Sedge Islands Marine Conservation Zone
Mike Sole, Florida Dept. of Environmental Protection, Aquatic Preserves Program
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3 ANALYSIS OF LEGISLATIVE ELEMENTS AND CONCLUSIONS

3.1 INVENTORY AND MAPPING OF EXISTING ENVIRONMENTAL DATA ON THE NATURAL RESOURCES OF LONG ISLAND SOUND (PA NO. 02-95 SECTION 3(A))

PA No. 02-95 Section 3(A) identifies specific data to be considered in meeting the statutory objectives:

A comprehensive inventory and mapping of all existing environmental data on the natural resources of Long Island Sound including, but not limited to:

a) coastal resources defined by Section 22a-93 of the Connecticut General Statutes, including;
    - coastal bluffs and escarpments;
    - rocky shorefronts;
    - beaches and dunes;
    - migratory stopover areas;
    - intertidal flats;
    - tidal wetlands;
    - freshwater wetlands and watercourses;
    - estuarine embayments;
    - coastal hazard areas;
    - developed shorefront;
    - islands;
    - nearshore waters;
    - offshore waters;
    - shorelands;
    - significant wildlife habitat; and
    - shellfish concentration areas;

b) unusual and important submerged aquatic vegetation;

c) historically productive fishing grounds and fish habitat;

d) location, breeding and nesting areas for rare and endangered species; and

e) points of public access and use.

An inventory of the available natural resource information required under PA No. 02-95 is summarized in Table 17. This table identifies natural resource information that is available in a digital format for mapping at a 1:125,000 scale in coastal, nearshore, and offshore environments. Table 17 also identifies information that is not available in a mapped format for these environments. Table 1 in Appendix D draws a distinction between data required by PA No. 02-95 , and data that may serve purposes of planning and permitting (i.e., regulatory approval). Table D-1 in Appendix D also includes a separate listing of other available geographic, environmental, and infrastructure data that are not specifically identified in PA No. 02-95, but are useful in meeting the objectives of PA No. 02-95. In compiling this information, the Task Force consulted with the Institute of Water Resources at the University of Connecticut and the University of Connecticut Cooperative Extension Service. Much of the data presented here was developed by state and federal agencies, and is useful in generally identifying the resources of Long Island Sound. However, substantially more detailed and timely information may be required for comprehensive resource planning, and for review to make project specific assessments and site-specific determinations of resource delineation, environmental impact, and engineering constructability.

For the purposes of this data inventory, the geographic coverage of the study area includes the coastlands, estuaries, nearshore coastal waters and offshore waters of Connecticut. Data are also available from adjoining states including New York and Rhode Island, and such data may supplement or complement other data available, adding to an understanding of Long Island Sound as a regional resource. [286] Geographic coverage across state borders may, however, be incomplete or not entirely comparable in terms of scale, accuracy or other features.

Much of the data gathered to facilitate the work of the Task Force has been developed as part of GIS. The availability of GIS greatly facilitates the analysis, exchange, and use of information. Substantial valuable Long Island Sound resource data have not been digitized and thus are not available in a GIS format. Such data are nonetheless important and should not be ignored.

3.1.1 Data Needs and Gaps

Data are normally acquired for a variety of specific purposes including regional compilations for use in planning and policy formulation, and more detailed studies to support permitting. Issues of scale, accuracy and data quality, among other factors determine the appropriate application of data for purposes not related to their intended use. The Task Force has kept this in mind in applying some qualitative determinations as to the suitability of existing data for policy formulation.

Planning - Planning and policy formulation exercises may include the establishment of protected areas, corridors, or exclusion zones. Much of the mapping listed in Table 1 may be used, but are not necessarily sufficient for comprehensive planning purposes.

[286] Information on New York GIS resources is available through the Office of the New York Chief Information Officer, State Capitol, ESP, P.O. Box 2062, Albany, NY 12220-0062, Phone: 518/474-3421, Fax: 518/402-2976. James T. Dillon (cio@cio.state.ny.us). The GIS Clearinghouse web site can be found at http://www.nysgis.state.ny.us/index.html Questions on GIS data may be obtained by contacting administrators at nysgis@cscic.state.ny.us.
Information on Rhode Island GIS resources is available through the Rhode Island Statewide Planning Program, One Capital Hill, Providence, RI 02908. Contact: John Stachelhaus (rigis@admin.ri.gov), The GIS Clearinghouse web site can be found at http://www.edc.uri.edu/rigis/

<u>Permitting</u> - Permitting generally requires site-specific information. Project specific considerations that data may be called upon to address include:

- Consistency with federal, state, and local coastal zone policies and regulatory objectives;
- Identification of potentially affected resources;
- Effects on environmentally sensitive resources or protected areas;
- Timing of construction/construction methods;
- Conflict with other infrastructure;
- Mitigation (restoration/compensation); and
- Monitoring (permit compliance).

At the planning level, a number of data gaps have been identified by the Task Force with respect to the natural resources of Long Island Sound. Data gaps are summarized in Table 17 and identified in Table D-2 in Appendix D, along with suggested approaches to resolving data gaps including time frames and suggested responsibility. This includes data specifically identified under PA No. 02-95, as well as other useful data.

Table 17 – Natural Resource Mapping Pertinent to Energy Related Siting Policy in Long Island Sound[287]

Shore Region	Adequately Mapped Features	Inadequately Mapped Features
COASTAL (Above mean high water)	▪ The Trace of the Shoreline (Line of mean high water shown on U.S.G.S. Topographic Maps) ▪ Coastal Hazard Areas ▪ Coastal Topography ▪ Coastal Geology (Bedrock and Surficial) ▪ Coastal Bluffs and Escarpments ▪ Rocky Shoreline ▪ Beaches and Dunes ▪ Soils ▪ Tidal wetlands ▪ Freshwater Wetlands and Watercourses ▪ Coastal Water and Estuarine Embayments ▪ Islands ▪ Terrestrial Rare and Endangered Species ▪ Land Cover ▪ Points of Public Access ▪ Existing Transmission Infrastructure ▪ DEP Land o*nly* (Other State land not mapped) ▪ Water Quality Classifications	▪ Open Space ▪ Water Dependent Uses ▪ Developed Shoreline (Not digital unless hidden in ESI mapping) ▪ Significant Wildlife Habitats (turtles, mammals, haul-out locations) and Stopover Areas ▪ Anadromous and Catadromous Fish Runs ▪ State Land (Other than DEP Property) ▪ Areas of Special Ecological Value (e.g. Lower Connecticut River, Barn Island)

[287] List pertains to CECA-level planning decisions and Sound-wide mapping at about 1:125,000-scale.

Table 17 – Natural Resource Mapping Pertinent to Energy Related Siting Policy in Long Island Sound (Cont.)

Shore Region	Adequately Mapped Features	Inadequately Mapped Features
NEARSHORE (Mean high-water line to 30-foot water depth)	▪ Shallow-Water Bathymetry ▪ Shellfish Concentration Areas (Commercial State and Some Commercial Municipal Only) ▪ Waterfowl Concentration Areas (Reconnaissance level mapping only)	▪ Intertidal Flats ▪ Rocky Reefs ▪ Significant Wildlife Habitats (turtles, mammals, haul-out locations) ▪ Shellfish Concentration Areas (Commercial Municipal, Natural) ▪ Areas Potentially Suitable for Aquaculture ▪ Eelgrass Beds (No data on temporal variability, trends) ▪ Potential Eelgrass Habitat ▪ Submerged Aquatic Vegetation Other than Eelgrass (Kelp, grasses) ▪ Historically Productive Fishing Grounds ▪ Essential Fish Habitats ▪ Locations of Rare and Endangered Species ▪ Surficial Sediments ▪ Sedimentary Environments ▪ Sediment Quality ▪ Essential Benthic Habitats (Vertebrate and Invertebrate)

Table 17 – Natural Resource Mapping Pertinent to Energy Related Siting Policy in Long Island Sound (Cont.)

Shore Region	Adequately Mapped Features	Inadequately Mapped Features
OFFSHORE (Waters greater than 30 feet in depth)	▪ Deep-Water Bathymetry ▪ Dredged Material Disposal Sites ▪ Surficial Sediments ▪ Sedimentary Environments ▪ Sediment Quality	▪ Significant Wildlife Habitats (turtles, mammals, haul-out locations) ▪ Historically Productive Fishing Grounds ▪ Areas Potentially Suitable for Aquaculture ▪ Locations of Rare and Endangered Species ▪ Essential Fish Habitats ▪ Essential Benthic Habitats (Vertebrate and Invertebrate) ▪ Waterfowl Concentration and Migratory Stopover Areas ▪ Invertebrates That Encrust including Bryozoans and Corals ▪ Submerged Aquatic Vegetation (Kelp)

3.2 Evaluation of the Relative Importance and Uniqueness of the Natural Resources and Identification of the Most Ecologically Sensitive Natural Resources Of Long Island Sound (PA 02-95 Section 3(B))

The Task Force was charged with identifying the most ecologically sensitive natural resources of Long Island Sound. However, in reviewing the adequacy of natural resource data for Long Island Sound, the Task Force acknowledged that many regulatory agencies, including the DEP, NOAA, NMFS and USFWS have this information.[288] These agencies also review, compile, and update the data as conditions change.

The Task Force also tried to evaluate the relative importance and uniqueness of the natural resources of Long Island Sound. While resource rankings may be desirable for general planning purposes, they are most appropriately based on a detailed, scientific data set that provides a comprehensive profile of an ecosystem. As the Task Force has seen through its efforts to meet its charge to inventory and map Long Island Sound's resources, the existing Long Island Sound resource data sets, although extensive, do not represent a complete, comprehensive and current picture of Long Island Sound's ecosystem.

Further, any list identifying the relative importance and uniqueness of natural resources would be subjective, time sensitive, and based on potentially different user criteria. Such criteria may differ among recreational, commercial, and/or ecological interests. Indeed, the greatest value associated with the resources of Long Island Sound is not the relative importance or uniqueness, but the integration of these resources to function as a single ecosystem.

As a general guide, the Task Force concludes that resources discussed in Section 2.1 of the Summary of Background Information of this study and as identified by existing resource protection programs provide information related to the interrelationships, unique characteristics, and ecological sensitivity of natural resources of Long Island Sound. However, the Task Force cautions that this information is not and cannot be used as a substitute for site-specific reconnaissance for project-specific permitting, where the specific environment, users, timing and project can be used to evaluate the relative importance, uniqueness and sensitivity of natural resources.

[1] See NOAA Environmental Sensitivity Index, DEP list of Endangered, Threatened and Special Concern Species in Connecticut, the National Wetlands Inventory, the U.S. Fish and Wildlife list of Endangered and Threatened Wildlife and Plants, 50 CFR 17.11 and 17.12, and National Marine Fisheries Service Essential Fish Habitat.

3.3 Assessment of the Present Status, Future Potential and Environmental Impacts on Long Island Sound of Meeting the Region's Energy Needs that Do Not Require the Laying of a Power Line or Cable within Long Island Sound (PA No. 02-95 Section 3(C)) And an Evaluation of the Methods to Minimize the numbers and Impacts of Power Line Crossings, Gas Pipeline Crossings, and Telecommunications Crossings within Long Island Sound, Including an Evaluation of the Individual and Cumulative Environmental Impacts of any such Proposed Crossings (PA No. 02-95 Section 3(D))

Pursuant to PA No. 02-95 Sections 3(C) and 3(D), the Task Force is required to examine alternatives for avoiding or minimizing construction of energy and telecommunications infrastructure across Long Island Sound. Section 3(C) focuses on alternatives to constructing power lines or cables across Long Island Sound; Section 3(D) focuses on methods to minimize numbers and impacts of crossings. For convenience and completeness, this section combines Sections 3(C) and 3(D) and offers an evaluation of the status, potential, and environmental impact of each of the alternatives identified in Section 2.8. Alternatives to constructing energy and telecommunications infrastructure projects across Long Island Sound can be grouped under several categories:

- Alternative routes for gas pipelines that do not cross Long Island Sound;
- Alternative routes for electric cables that do not cross Long Island Sound;
- Measures to expand, reinforce, or upgrade existing generation and transmission assets in Connecticut and Long Island that do not require cables crossing Long Island Sound;
- Alternative fuels and energy sources that do not require Long Island Sound crossings;
- Measures that reduce the demand for gas and electricity through conservation, load management, and demand response programs; and
- Alternative telecommunications technologies that do not require laying of a cable across Long Island Sound.

Utilities, merchant generator and transmission companies, regulators, planners, and other stakeholders have, at one time or another over the last few years contemplated all of the alternatives inventoried in Table 18. Some alternatives, such as conservation and load management, are programs in both Connecticut and New York that have been in place for many years. Others, such as some of the interstate and international cable and pipeline projects, were proposed several years ago but have since been cancelled or are dormant. Some projects, such as new electric generation, repowering of old oil-fired plants and alternative energy programs on Long Island, are still being vigorously pursued.

However, it is important to note that not all of these proposed projects and programs will eventually come to fruition, nor may all of the alternatives identified herein be prudent and feasible to adequately provide energy reliability for the region. In addition, the alternatives identified in Table 18 will change over time, as other alternatives will be developed in response to market conditions and/or technological advances in the energy and telecommunications industries. The Task Force considered use of corridors to minimize the number and impact of crossings on Long Island Sound. However, the Task Force concluded that the use of corridors would not decrease the number of crossings and would not necessarily reduce the impact on Long Island Sound. Also, the clustering of energy and telecommunications infrastructure in corridors may be inconsistent with national security concerns (See Recommendations Section. 4.1.3).

Table 18 – Infrastructure Alternatives, Potential, Status, and Environmental Impact

Alternative	Energy Reliability Potential	Status and Engineering / Market Considerations	Environmental Impact
Alternative Routes for Gas Pipelines that do not Cross Long Island Sound			
Nova Scotia to South Shore	Slowing of natural gas exploration and development in Atlantic Canada has given rise to gas supply uncertainties.	Blue Atlantic project on hold indefinitely. No market support at this time.	Pipeline route may traverse sensitive marine environments on Scotian Shelf, productive fishing grounds in Gulf of Maine, nearshore environment on south shore of Long Island Sound. To the extent additional gas supplies to Long Island displace fuel oil; the result would be a net decrease in air emissions and reduce risk of oil spills.
New Jersey to South Shore	Proposed Cross Bay project from New Jersey to Long Beach, Long Island, would have increased gas delivery capacity on existing Transco pipeline by 0.122 Bcf/d (125,000 Dth/d) to western Long Island. However, gas deliveries to southwest Long Island might not mitigate congestion on KEDLI Facility System nor improve deliverability to Suffolk County, an area of high load growth. (Refer to Gas Pipeline Reinforcements)	Cross Bay project proposed to expand capacity by increased compression and other engineering enhancements. Cross Bay project was cancelled; no market support at this time.	Potential construction impacts to marine and terrestrial environment. Minimal impact to air quality from added compressors. To the extent additional gas supplies to Long Island displace fuel oil; the result would be a net decrease in air emissions and reduce risk of oil spills.

Table 18 – Infrastructure Alternatives, Potential, Status, and Environmental Impact (Cont.)

Alternative	Energy Reliability Potential	Status and Engineering / Market Considerations	Environmental Impact
Upstate New York Overland Route (Millennium Pipeline)	The proposed Millenium Pipeline would cross Lake Erie and extend to Westchester County, NY. If constructed, the pipeline would add 0.682 Bcf/d (700,000 Dth/d) capacity into the New York Facilities System. The pipeline would not deliver gas directly to Long Island, and shippers on Long Island would still need to rely on the KEDLI system for local delivery to and across the Island. Extension of Millenium or any other pipeline through NYC to serve Long Island has not been proposed.	Hudson River crossing has posed state regulatory issues. ROW acquisition and pipeline construction through densely populated areas of Westchester County are problematic. Does not obviate need to ship gas through congested KEDNY and KEDLI Facility System to Long Island market. No market support at this time.	Pipeline would cross Lake Erie and extend approximately 400 miles through New York, resulting in potential impacts to a variety of natural and cultural resources. To the extent additional gas supplies to the New York metropolitan region would displace fuel oil; the result would be net decrease in air emissions.
Eastchester Pipeline Project	Iroquois' Eastchester Pipeline traverses Long Island Sound between Northport, Long Island and NYC. The 35-mile marine pipeline delivers gas from Northport to the Consolidated Edison system at Hunts Point in the Bronx. Two new compressor stations and three compressor station upgrades also are part of the project.	The project is under construction and is scheduled for completion in 2003. The project is designed to provide natural gas for electric generation and to serve residential, industrial, and commercial customers in NYC.	Encountered contaminated sediments in the East River. Extensive coordination with NYSDEC, the FERC, and the ACOE to define and minimize overall environmental impacts to benthic communities, fisheries, endangered species, turbidity. Air quality impacts associated with the two new compressor stations and additions to the three existing compressor stations.

Table 18 – Infrastructure Alternatives, Potential, Status, and Environmental Impact (Cont.)

Alternative	Energy Reliability Potential	Status and Engineering / Market Considerations	Environmental Impact
Alternative routes for electric cables that do not cross Long Island Sound			
Land Route via New York City and under East River	An overland route from Connecticut to Long Island that incorporates the existing 115 kV system in SWCT and the existing Y-49 and Y-50 NYPA cables would not enhance energy reliability, because those lines are already constrained or fully subscribed. This route would need to be reinforced with new circuits to provide reliability benefits.	There is no market or regulatory support for an overland line at this time. Cost of ROW acquisition or easements would be very high and possibly prohibitive.	Overland electric lines may encounter aesthetic concerns. Environmental justice concerns. Difficulties expected in acquiring ROW in highly developed areas. Impacts to terrestrial ecology.
South Shore Route (Phase I)	The proposed NeptuneRTS Phase I project would connect capacity-rich New Jersey with Long Island, adding a 600 MW HVDC line. This project also includes a 600 MW connection from New Jersey to New York City. Expected commercial operation is 2004/2005. (Neptune RTS Phase I includes cables to New York City and to Long Island.	The NeptuneRTS Phase I merchant project is seeking to expedite issuance of the remaining permits.	Proposed NeptuneRTS Phase I cable would have a 47-mile marine segment and impact near-shore areas of New Jersey and the south Shore of Long Island.

Table 18 – Infrastructure Alternatives, Potential, Status, and Environmental Impact (Cont.)

Alternative	Energy Reliability Potential	Status and Engineering / Market Considerations	Environmental Impact
Measures to expand, reinforce, or upgrade existing generation and transmission assets in Connecticut and Long Island that do not require cables crossing Long Island Sound			
Add and/or Repower Generation in SWCT	Any new generation would require an ISO-NE system impact study for interconnection. Additional generation resources would not solve the SWCT load pocket transmission problems, but could help to reduce congestion costs for Connecticut. Voltage, stability, and short circuit problems on the existing 115 kV transmission system in SWCT would still need to be addressed.	Milford Power Project, when operational, would add 536 MW to SWCT. Construction is nearly complete, but due to contractual and legal issues, commercial operation could be delayed to late 2003 or even beyond. CL&P is contracting for temporary additional generation in 2003 to meet summer peak demand in the Norwalk-Stamford subarea, as ISO-New England did in 2002. English Station, when operational, would provide 70 MW of oil-fired peaking capacity. (Limited operation)	Some types of new generation in urban areas of SWCT raise environmental justice concerns. To the extent that gas-fired generation displaces older, less-efficient units, NOx and SO2 emissions may likely decrease on a per MW basis. However, as long as the growing demand for electricity continues to be largely met by fossil fuel fired generation, emissions will also continue to increase.

Table 18 – Infrastructure Alternatives, Potential, Status, and Environmental Impact (Cont.)

Alternative	Energy Reliability Potential	Status and Engineering / Market Considerations	Environmental Impact
Add generation on Long Island	Proposed new combined cycle generation projects on Long Island total 830 MW, and proposed simple cycle peaking units total 489 MW.	Additional gas transportation capacity to Long Island and on Long Island may be necessary to fuel new gas turbines. Not all of the proposed projects may ultimately be constructed. For example, the Kings Park project is on hold and seeking a buyer. Other projects have been cancelled.	Additional gas-fired generation may require construction of new gas pipelines; the impact of such pipeline(s) construction must be considered. To the extent that gas-fired generation displaces older, less-efficient units, NOx and SO2 emissions may likely decrease on a per MW basis. However, as long as the growing demand for electricity continues to be largely met by fossil fuel fired generation, emissions will also continue to increase.
Repower generation on Long Island	KeySpan is examining the feasibility of repowering units at Wading River and EF Barrett, adding up to 395 MW of additional generation capacity. Conversion to gas would require additional gas deliveries to these facilities, and increase Long Island's demand for gas.	Need for additional gas deliverability to repowered units requires additional analysis.	Additional gas-fired generation may require construction of new gas pipelines; impact of such pipelines must be considered. To the extent that gas-fired generation displaces older, less-efficient units, NOx and SO2 emissions may likely decrease on a per MW basis. However, as long as the growing demand for electricity continues to be largely met by fossil fuel fired generation, emissions will also continue to increase.

Table 18 – Infrastructure Alternatives, Potential, Status, and Environmental Impact (Cont.)

Alternative	Energy Reliability Potential	Status and Engineering / Market Considerations	Environmental Impact
Expand DG on Long Island	NYSERDA provides funding and technical expertise for distributed generation initiatives. Limited industry on Long Island reduces the potential for economically feasible cogeneration or self-generation. Clean DG may be contingent upon additional natural gas capacity for fuel supply.	LIPA's Energy Plan focuses on DG using alternative fuels and energy sources rather than traditional gas-fired cogeneration or self-generation.	An industrial or commercial facility with DG will still rely on the utility for power when the DG system is unavailable, so the need for expanded transmission capacity may not be reduced.
Transmission Line Improvements	Upgrades and expansions of the transmission systems can enhance system reliability, provide greater access to competitive sources of energy, increase the internal interface transfer capabilities and accommodate competition from new merchant generation. While Connecticut and New York have both proposed transmission line improvements, use of interconnections between CT and NY (ISO-NE and NY ISO) as a possible loop for power to flow may achieve better reliability.	ISO-NE has identified a 345 kV transmission expansion project that will address SWCT reliability concerns. CL&P has proposed Phase I, which will expand transmission capacity between Bethel and Norwalk, and Phase II would complete a 345 kV loop from Norwalk to Middletown. At TEAC 13, ISO-NE recommended that a 345 kV loop include a 345 kV extension from Norwalk to the Glenbrook substation in Stamford and a 115 kV line between Norwalk Harbor and Glenbrook. LIPA's transmission plan incorporates additional capacity on a number of 69 kV and 138 kV transmission lines on Long Island.	Visual and aesthetic impacts from overhead lines may be a concern. EMF impacts can be mitigated through implementation of best management practices. Impacts to air quality depend on how additional transmission affects the dispatch of electric generation. Impacts to terrestrial ecology.

Table 18 – Infrastructure Alternatives, Potential, Status, and Environmental Impact (Cont.)

Alternative	Energy Reliability Potential	Status and Engineering / Market Considerations	Environmental Impact
Gas Pipeline Reinforcements	The capacity of existing pipelines can be expanded by adding compression to boost gas pressures and deliverability, but only up to the design limits of the pipeline. This does not require addition of new pipeline segments, but does involve addition of compressor station(s). In addition, pipeline capacity can be addressed by looping which involves constructing a new parallel pipeline along certain sections of an existing pipeline system.	Pipeline capacity expansion projects are currently being pursued by Iroquois and Algonquin to enhance deliverability to Connecticut and Long Island.	Additional compressors may minimally increase air emissions. To the extent additional gas supplies to Long Island displace use of fuel oil, result would be net decrease in air emissions and a reduced risk of oil spills. Looping will require additional right-of-way, and may impact terrestrial ecology, water resources, and/or cultural resources.

Table 18 – Infrastructure Alternatives, Potential, Status, and Environmental Impact (Cont.)

Alternative	Energy Reliability Potential	Status and Engineering / Market Considerations	Environmental Impact
Alternative fuels and energy sources that do not require Long Island Sound crossings			
Fuel Oil	Connecticut currently relies on fuel oil as the primary fuel for 35% of its electric capacity. 52.4% of Connecticut households use fuel oil or kerosene for home heating.[289] Long Island substantially relies on oil for electric generation when it is economically attractive, and/or when gas pipeline capacity is fully utilized meeting other demands, particularly in winter months. All of Long Island's central station power plants except for Glenwood are either oil-fired or can co-fire oil and gas, depending on fuel price, gas availability, and emissions limits. Almost 70% of all homes and half of all business use oil heat.[290]	On Long Island, existing limited capacity of oil storage tankage limits the extent to which oil use could be expanded.	Threat of oil releases from tankers and storage tanks remains an environmental concern. Existing fleet of oil-fired generation is less efficient and has higher emissions than new gas-fired combined cycle plants. Continued use of oil for residential and commercial heating will also not reduce emissions from these units.

[289] The New England Gas Association, July 2002, based on U.S. Census data year 2000.
[290] Oil Heat Institute of Long Island www.ohili.org/index.shtml.

Table 18 – Infrastructure Alternatives, Potential, Status, and Environmental Impact (Cont.)

Alternative	Energy Reliability Potential	Status and Engineering / Market Considerations	Environmental Impact
LNG	LNG is natural gas that has been cooled to minus 260 degrees F for shipment and/or storage as a liquid. The advantages of LNG allow long-distance transport of LNG by ship across oceans and local distribution by trucks onshore. The storage advantages allow for use of LNG to meet peak demand needs, however, LNG is generally not economic as a year-round substitute for natural gas. No new import facilities have been proposed or announced in the Northeast. Deliveries were interrupted following 9/11 due to homeland security concerns.	LNG facilities, including the shipping terminal in Everett, MA and remote storage facilities throughout New England and New York are important in meeting peak winter demand needs of local gas utilities. The 1,550 MW New Mystic Station under construction in Everett, MA, has signed a full requirements supply arrangement with the LNG terminal operator, Distrigas. LNG Mystic Station is uniquely situated to receive vaporized deliveries directly from Distrigas. A 2 Bcf LNG storage/production facility is proposed in Waterbury, CT by Yankee Gas Service Company. The project is before the CT DPUC, with a decision expected in July. Regulatory approvals are being obtained; local land use approvals have been issued. Ground breaking is projected in 2004 with a likely in-service date of 2007.	Air quality benefits are the same as natural gas. Despite an excellent safety record, safety and security of tanker deliveries and transportation of LNG remain a concern.

Table 18 – Infrastructure Alternatives, Potential, Status, and Environmental Impact (Cont.)

Alternative	Energy Reliability Potential	Status and Engineering / Market Considerations	Environmental Impact
Resource Recovery	Expansion of resource recovery plants is limited. In addition it is difficult to site new resource recovery plants.	Long Island has 116 MW of on-Island capacity produced from resource recovery plants. Connecticut has 159 MW of capacity produced from resource recovery plants.[291]	Hazardous air pollutants from the combustion of municipal waste are a concern. State and federal standards govern emissions. Beneficial utilization of municipal waste reduces need for landfill capacity.
Wind	Wind power has the potential to provide significant energy resources under the right wind and economic conditions, although projects are speculative at this time.	LIPA is seeking bidders to construct a 100-140 MW offshore wind turbine farm, for operation as early as 2007. In response to this RFP, Winergy LLC is evaluating five wind farm sites in New York waters off the south shore of Long Island, ranging from 12 to 295 MW. Connecticut does not have, nor are there proposals to develop utility-scale wind energy facilities in the state.	Renewable energy source with no emissions of pollutants or greenhouse gases. In the Northeast, most of proposed projects are offshore wind farms, requiring construction of towers and connecting cables in the marine environment and may have aesthetic and marine impacts. Impacts on bird migration and other environmental effects are under study. Impacts on competing uses of marine resources must also be considered.

[291] Connecticut Siting Council 2002 Ten-Year Forecasts of Loads and Resources.

Table 18 – Infrastructure Alternatives, Potential, Status, and Environmental Impact (Cont.)

Alternative	Energy Reliability Potential	Status and Engineering / Market Considerations	Environmental Impact
Photovoltaics	High capital cost of photovoltaics is presently the limiting factor for solar power technology. Systems require considerable surface area and amenable climate conditions.	Under LIPA's Solar Pioneer program 252 photovoltaic roof systems have been installed through 2002. To date more than 900 kW of installed PV capacity has been installed. The U.S. Department of Energy has a Million Solar Roofs (MSRI) initiative to install solar energy systems on one million U.S. buildings by 2010.	Renewable energy source with no emissions of pollutants or greenhouse gases.
Fuel Cells	Most fuel cells are used in cogeneration applications in industrial and institutional facilities to maximize efficiency. Fuel cells for residential applications are currently still in demonstration phase.	LIPA installed a $7M, first-of-kind fuel cell program in West Babylon, sufficient to power 100 homes. LIPA has deployed 17 5-kW systems at commercial and academic locations across the Island, and intends to deploy fuel cells at residential locations through 2003. LIPA is currently evaluating proposals for a 10-MW fuel cell substation deployment program. Fuel cell manufacturers located in Connecticut include: Fuel Cell Energy Inc., UTC Fuel Cells, Acumentrics Corporation, and Proton Energy Systems, Inc. The installed capacity of fuels cells in Connecticut is approximately 2 MW.[292]	Fuel cells running on hydrogen derived from a renewable source will emit nothing but water vapor. The waste heat from a fuel cell can be used to provide hot water or space heating for high efficiency, potentially displacing fossil fuel consumption. High efficiency use of natural gas.

[292] Review of Connecticut Siting Council information including Docket 171, Petitions 376, 482, 553, and 598.

Table 18 – Infrastructure Alternatives, Potential, Status, and Environmental Impact (Cont.)

Alternative	Energy Reliability Potential	Status and Engineering / Market Considerations	Environmental Impact
Measures that reduce the demand for gas and electricity through conservation, load management, and demand response programs			
C&LM: Connecticut	Conservation and load management programs, including demand response programs, offered by utilities and ISO-NE have the potential to reduce or defer the need for additional generation to meet peak load.	CL&P and UI's conservation and load management programs reduced load in 2002 by 116 MW state-wide[293]. Reallocation of the Conservation and Load Management Fund would adversely affect C&LM programs. As of March 31, 2003, there were 88 assets signed up for ISO-NE's current load response program in Connecticut providing 133.1 MW of potential load relief.[294]	ISO-NE calculates that each MWh of generation conserved reduces New England's emissions of NOx by 1.7 lbs, of SO_2 by 4.9 lbs and of carbon dioxide by 1,394 lbs on an annual average.[295] State-specific data are not available.
C&LM: New York	LIPA's conservation and demand-side programs are designed to produce energy and load impacts that reduce or defer the need for new generating resources. Compared with other parts of New York, Long Island has a relatively smaller proportion of commercial and industrial load, limiting the potential for demand-side programs.	LIPA's Clean Energy Initiative has resulted in 138 MW of peak energy savings to date.	LIPA estimates the following reductions to date attributable to the Clean Energy Initiative: NOx: 395 tons SO_2: 993 tons Carbon Dioxide: 270,377 tons

[293] DPUC Docket 02-04-12.
[294] http://www.iso-ne.com/Load_Response/main.html.
[295] ISO New England *2001 NEPOOL Marginal Emission Rate Analysis*, December 2002. http://www.iso-ne.com/Planning_Reports/Emissions/Marginal%20Emissions%20Analysis%202001.doc.

Table 18 – Infrastructure Alternatives, Potential, Status, and Environmental Impact (Cont.)

Alternative	Reliability Potential	Status and Engineering / Market Considerations	Environmental Impact
Alternatives to telecommunications cables across Long Island Sound			
Wireless communications	Wireless communications reduce the need for infrastructure crossings of Long Island Sound	Wireless carriers provide mobile or cell phone, wireless internet, and paging. Demand for communications services has quadrupled in the last ten years.	Visual impacts of cell phone towers may be a concern. Impact to bird migrations is under study.
Overland Routes	Existing optical fiber system has full redundancy. No new cross-Sound telecommunications lines are currently proposed.[296]	The only telecommunications infrastructure addition expected in next few years will be cell phone towers and distribution level infrastructure for DSL and cable.	Overhead cables may have aesthetic and visual impacts. Many municipalities have introduced ordinances that require utilities to bury all new facility installations.

[296] Use of satellites has generally replaced the need for additional fiber optic cables crossing Long Island Sound.

3.4 Inventory of Current Crossings of Long Island Sound and an Evaluation of the Current Environmental Status of those Areas that have Crossings (PA 02-95 Section 3(E))

Five energy and telecommunications facilities presently link Connecticut and Long Island via crossings of Long Island Sound. These include:

- Two electric transmission cable systems:
  - The 1385 Line cable system (AC), which is jointly owned by CL&P and LIPA and consists of seven cables that link Norwalk, Connecticut and Northport, Long Island; and
  - Cross-Sound Cable's system (DC), consisting of a bundle of two solid dielectric cables and a fiber optic telecommunications cable, which traverses between New Haven and Brookhaven, Long Island (1,800 feet of cable has not been installed to depths required by permits).
- One natural gas pipeline (the Iroquois pipeline), which extends across Long Island Sound from Milford, Connecticut to Northport, Long Island.
- Two telecommunications cables:
  - AT&T's fiber optic cable, which traverses from East Haven to Shoreham, Long Island; and
  - MCI's fiber optic cable, which extends from Madison to Rocky Point, Long Island.

In addition to these interstate energy and telecommunications facilities, a variety of other submarine facilities traverse portions of Long Island Sound, typically to provide mainland utility services to certain of the state's inhabited islands (e.g., the Thimble Islands), as well as to islands that have lighthouses and Fishers Island, New York. These facilities provide electricity, telecommunications service, and potable water to the islands, as well as power to lighthouses used in navigation.

Further, four other major submarine energy and/or telecommunication facilities traverse Long Island Sound, but are located entirely in New York. These facilities, which are in the central and western portions of Long Island Sound, consist of:

- Two 345 kV electric transmission lines between Westchester County and Long Island; the Y-49 line, owned by the New York Power Authority, and the Y-50 line, owned by LIPA and Con Edison;

- Iroquois' recently constructed Eastchester natural gas pipeline, which extends 35 miles from Northport, Long Island to the Bronx; and

- The Flag's fiber optic cable, which was installed within the last five years and which extends from Northport, Long Island, eastward through Long Island Sound to Europe.

This inventory focuses on the five energy and telecommunications facilities that cross Long Island Sound between Connecticut and Long Island. These facilities are separated both spatially (none of the five facilities are located in close proximity) and temporally (none of the five facilities were constructed within the same time frame).

Information for this section was drawn in part from project status reports that the Task Force requested from the owners of the crossings.[297,298,299,300,301] Other data were compiled from presentations made by project proponents and regulators to the Task Force. In addition, reports, permits, and regulatory decision-making documents relevant to the five crossings were reviewed.

3.4.1 The 1385 Line

The 1385 Line cable system traverses approximately 11 miles from the Norwalk Harbor Substation on Manresa Island in Norwalk, across both the seabed of Sheffield Harbor and Sheffield Island, to the Northport Substation in Northport, Long Island. The 138 kV cable system, which is owned by CL&P in Connecticut and LIPA in New York, was installed in 1969 and commenced operation in 1970. The system consists of seven separate three-inch-diameter fluid-filled cables, each containing a single hollow core copper conductor surrounded by paper insulation, a lead covering, and outside armoring. To serve as an effective insulator, the paper is impregnated with dielectric fluid maintained under pressure.

Construction of the 1385 Line cable system pre-dated the promulgation of requirements for comprehensive baseline environmental studies and post-construction environmental monitoring. As a result, there is no pre- and post-installation environmental data that can be used to compare the present condition of the cable area to that immediately after the completion of the project over 35 years ago.

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[297] Iroquois Gas Transmission System L.P., Existing Pipeline "Project Status Update", received February 28, 2003.
[298] Cross-Sound Cable Company, LLC, Letter to Joel Rinebold from Jeffrey A. Donahue dated February 5, 2003.
[299] Islander East Pipeline Company. Letter to Joel Rinebold from Gene H. Muhlherr dated July 24, 2002.
[300] Northeast Utilities System Company (NUSCo). Letter to Joel Rinebold from Paula M. Taupier dated February 5, 2003.
[301] The Task Force requested information from AT&T and MCI, but did not get a response and was unable to acquire information other than that contained in the DEP permits, issued for these two projects.

Since the mid-1990s, environmental monitoring has been conducted primarily to evaluate the effects of dielectric fluid releases caused by anchors or other objects hitting and damaging the cables. The most recent such damage occurred in November 2002.

CL&P has reported these accidental releases to DEP and other regulatory agencies in accordance with applicable requirements, including the Consent Orders issued to CL&P and LIPA in 1995/1996 and 1998 by DEP and the NYSDEC. Impact assessments also were conducted in accordance with these Consent Orders.

Except as displaced by anchor drag or other accidents and associated repairs, the existing 1385 Line cables have remained approximately where they were first installed. Certain portions of the cables that were not originally buried have settled into the silt on the seabed or have been covered by drifting sediments.

The Whitlatch/OSI studies concluded that there were no discernible differences in sediment type or biological communities between habitats over the existing cables and those not over the cables[302]. Based on these studies, CL&P concluded that despite the relatively crude construction techniques (compared to those available today) used to install the 1385 Line, benthic productivity in the impact area recovered over time.

However, in one area -- the shallow portions of the sheltered cove north of Sheffield Island – researchers did find fewer numbers of species and individuals in depressions located over the buried cables. Researchers could not determine whether this reduction was related to differences in bottom topography or the dense accumulations of macroalgae found in these depressions.

Since the cables commenced operation in 1970, there have been approximately 55 instances resulting in the release of alkylbenzene-containing dielectric fluid into the marine environment. In response to Consent Orders issued in the mid-1990s, areas that were subject to dielectric fluid leaks were studied for impacts to shellfish and sediments Remediation of fluid releases was not required. According to the reports, alkylbenzene levels in sediment and shellfish near the cables were found to be consistent with background levels for Long Island Sound.

John Volk, then Director of the Department of Agriculture, Bureau of Aquaculture, noted in a presentation to the Task Force that some trenches are still evident after 30 years.[303] He also noted that while alkylbenzene is relatively inert, the state required closure of a shellfish bed following one of the incidents.

[302] Norwalk, Connecticut to Northport, New York Submarine Cable Replacement Project; Benthic Habitat Mapping & Shellfish Enumeration, Sediment Dispersion Modeling, and Simulations of Sediment Transport and Deposition Long Island Sound-Connecticut; CL&P May 2002.

[303] Presentation by Mr. John Volk, then Director of the Department of Agriculture, Bureau of Aquaculture, to the Long Island Task Force Meeting of September 19, 2002. John Volk retired from the Department of Agriculture in May 2003.

3.4.2 Cross-Sound Cable

In accordance with the state-approved benthic monitoring plan, Cross-Sound Cable completed the first post construction (six-month) monitoring in November 2002.[304] A similar pre-installation survey was completed in May 2002. Cross-Sound Cable reports that the results of the post-installation survey indicate the following:

- The only observable change in the seabed geomorphology from the pre--installation report is a shallow, localized, linear depression representing the path of cable installation. The depressions range from 0.5 to 3 feet deep, and 2 to 8 feet wide.

- The six benthic habitat types identified in the pre-installation survey are still detected in the post installation surveys. Based on video imagery and sediment profile images, the only visible changes in substrate characteristics is in the Federal Navigation Channel. In this area is a patchy, thin, 1 to 2 cm sediment layer comprised of fine sandy silt. This feature was not observed in any of the other survey areas.

- The types and diversity of bottom dwelling organisms and macroalgae observed in the video imagery remained consistent between the pre- and post-installation surveys. Prominent organisms observed in remote video images obtained over the cable centerline were comparable to those observed in video obtained along survey lines offset from the cable area. More disturbance of sediment layers by biological activity was evident in the post-installation survey conducted in October/November compared to the pre-construction April/May survey, presumably due to seasonal conditions. The biological activity confirms recruitment of organisms into the installation area.

- Sediment oxidation depths, a marker for the quality of the benthic habitat in estuaries like Long Island Sound, were consistent between pre- and post-installation surveys. This measurement combined with the other parameters measured through sediment profile imagery suggests that the installation of the cable did not adversely impact habitat quality for benthic communities.

3.4.3 Iroquois Gas Transmission System

The principal issues raised with regard to the Iroquois pipeline pertain to impacts to the benthic environment, including shellfish lease areas. No documented issues were identified with respect to depth of cover over the pipeline.

In addition to the use of the drag beam to smooth the nearshore areas affected by

[304] Six-Month Post Installation Benthic Monitoring Survey for the Cross-Sound Cable Project, New Haven CT, to Shoreham, NY. October 14 to November 20, 2002. Prepared by Ocean Surveys Inc. The survey protocol was approved by DEP with consultation with Department of Agriculture, Bureau of Aquaculture, NMFS, and the Army Corps of Engineers.

dredging activities, Iroquois implemented various measures to mitigate shellfish-related concerns. These ranged from pre-construction route modifications to compensation to the shellfish leaseholders.

Iroquois surveyed the pipeline route in 1993 and again in 1999.[305] Based on the results of these surveys, Iroquois concluded that natural sediment transport and infilling covered the offshore portion of the pipeline within a year or two of installation in those areas where the pipeline was installed by plowing in clay sediments. During that period, the sediment slopes across the trench in general were naturally reduced on the order of 5 to 20 degrees. In the nearshore area, the seabed was observed to be smooth, with little or no bottom relief.

Iroquois also conducted surveys along the pipeline route in the shellfish lease areas off Milford. These surveys were conducted in February/March 1991 (pre-construction) and July 1991 (post-construction), and involved comparisons of oysters per square yard at monitoring points ranging from 100 feet to 4,250 feet from the pipeline centerline. In general, the results of the surveys showed that compared to pre-construction conditions, the number of oysters decreased after construction at distances of 100 to 400 feet from the pipeline centerline, but increased after construction at distances greater than 1,270 feet from the centerline of the pipeline.

In addition Iroquois performed a water quality monitoring program using live oysters. Six monitoring stations were established near the pipeline in March 1991. The oysters were recovered in July 1991. At each of the six locations, the oysters appeared normal in color and no offensive odor was detected.[306]

The Bureau of Aquaculture was extensively involved in monitoring the impacts of the Iroquois project on shellfish resources.[307] Bureau of Aquaculture staff reported that anchors associated with the construction equipment disturbed bottom substrate as far as 2,000 feet on either side of the pipeline centerline, creating long-term impacts to oyster habitats. Bureau of Aquaculture staff also have noted that despite attempts to level the bottom, depressions left by the anchors have filled in with fine-grained sediments and presently have low or no productivity. In the short-term, oysters are particularly vulnerable to suffocation from sediments that are suspended and redeposited during construction. During construction, the width of the sediment plume appeared to extend out as much as 4,000 feet from the construction area. As it takes two to four years for oysters to grow to harvestable size, such effects can result in long-term disruption of the harvest.

Commercial shellfishermen provided the Task Force with personal, anecdotal evidence of

[305] Observations of Pipeline Corridor from 1999 High Resolution Multibeam Survey, Construction Details from 1991 Long Island Sound Pipeline.

[306] Summary of Data concerning Shellfish Resources in Milford Harbor Before and After Construction of the Iroquois Natural Gas Pipeline. Prepared by Andrew W. Rehm, Ph.D., September 1992.

[307] Presentation by Mr. John Volk, then Director, Bureau of Aquaculture, Connecticut Department of Agriculture to Long Island Task Force Meeting of September 19, 2002. John Volk retired from the Department of Agriculture in May 2003.

disruption of oyster aquaculture operations from construction of the Iroquois pipeline.[308] They attested that construction resulted in an impact area as much as 400 feet on either side of the pipeline. They suggested that the use of the drag beam to level the trench has proved only partially effective, and portions of the trench may be as much as 6 feet deep. The steep slopes along the trench have interfered with the use of oyster dredges. Oysters do not appear to have returned to areas within the trench, although the area was recolonized with hard-shell clams. The shellfishermen also noted that anchor scar drag marks, some 800 to 900 feet long, persist several hundred feet outside of the primary impact area. These anchor scars likewise affect harvesting.

The identification of definitive data concerning the impacts of the Iroquois construction on shellfish resources is further complicated by the lack of pre- and post-construction shellfish productivity data for the affected leases.[309] Shellfishermen have indicated to the Task Force that such productivity data is not recorded. In the 12 years subsequent to the installation of the Iroquois pipeline, three new shellfish leases have been created directly along the pipeline route (i.e., these leases were established over the pipeline route, in areas where no such leases existed previously). This indicates that at least some areas in the vicinity of the pipeline route remain economically viable for shellfish production.

3.4.4 AT&T

The DEP permit required that the cable be installed using HDD for 3,500 feet waterward of the high tide line, approximately 8 to 50 feet beneath the sediment surface, in order to avoid impacts to oyster beds. From the drilling exit point, the permit required that the cable be installed using the jet plow trenching process, to a depth approximately 10 feet below the sediment surface, except for an anchorage area where the burial depth was required to be 20 feet.[310]

Construction monitoring chiefly focused on potential releases of HDD drilling fluid, and appropriate containment measures for drilling fluids were required. The monitoring plan did not require AT&T to collect post-construction environmental data.

No further information on the environmental status of the AT&T cable was provided to the Task Force.

3.4.5 MCI

The DEP permit required MCI to install approximately 1,600 linear feet of the cable using HDD to a depth of 50 to 75 feet NGVD. Beyond the HDD exit hole, the permit

[308] Presentation by Mr. Larry Williams and Mr. David Hopp (independent shellfish farmers). LIS Task Force meeting of March 12, 2003.
[309] Presentation by Mr. David Warman, Vice President of Engineering – Iroquois, Long Island Sound Task Force meeting of September 12, 2002.
[310] Despite a request from the Task Force, AT&T and MCI did not provide additional information.

required the cable to be installed to a depth of three to six feet beneath the sediment surface using a jet cable plow method.

The permit also imposed time-of-year restrictions, barring in-water construction between June 1 and September 30, to protect spawning shellfish in the area. However, the cable did not directly cross any shellfish concentration areas or leases, according to Department of Agriculture, Bureau of Aquaculture maps that were included in the permit.

MCI was also required to notify Connecticut licensed lobster fishermen who fish in the area of the jet plowing of the need to temporarily remove gear during construction.

Monitoring for accidental releases of HDD drilling fluid was required, and MCI was required to post a performance bond to secure the performance of the work in accordance with permit conditions.

No baseline or post-construction environmental monitoring was required under the permit, and no such information was available to the Task Force.

3.5 Evaluation Of The Reliability And Operational Impacts To The State And The Region Of Proposed Crossings Of Long Island Sound And An Evaluation Of The Impact On Reliability By Recommended Limitations On Such Crossings (PA No. 02-95 Section 3(F))

Identifying and addressing electric system reliability issues is the responsibility of ISO-NE in New England, and LIPA and NYISO on Long Island. These authorities assess the current bulk grid security, forecast future demands, and identify current and anticipated problems by applying industry standard reliability criteria. Because of the convergence of gas and electric issues, these authorities have also been studying the adequacy of the gas pipeline infrastructure.[311]

In the Assessment Report Part 1, the Task Force has investigated and is aware of electric reliability problems, including deficiencies and load pockets within SWCT and Long Island. The transmission constraints that affect both SWCT and Long Island threaten reliability and increase costs to consumers.

In the Assessment Report Part 1, and in this report, the Task Force outlined recommendations for the creation of the Connecticut Energy Coordinating Authority (CECA) to oversee the creation of an energy plan for Connecticut that includes a consideration of the needs of the region for the delivery of reliable power and natural gas.

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[311] ISO-NE, *Steady-State Analysis of New England's Interstate Pipeline Delivery Capability, 2001-2005* (January 2001); *Steady-State and Transient Analysis of New England's Interstate Pipeline Delivery Capability, 2001-2005* (February 2002), prepared by Levitan & Associates, Inc.
NYSERDA, *The Ability to Meet Future Gas Demands from Electricity Generation in New York*, (July 2002), prepared by Charles River Associates.

The Task Force emphasizes that such a plan must consider the dynamic nature of the marketplace, while protecting the environment of Long Island Sound.

In other sections of this report outlining conclusions complying with the requirements of PA No. 02-95, the Task Force examined existing potential alternatives for avoiding or minimizing construction of energy and telecommunications infrastructure within Long Island Sound. The Task Force also focused on alternatives to constructing power lines or cables within Long Island Sound; and methods that would minimize numbers and impacts of crossings. Again, the Task Force emphasizes the dynamic nature of this compendium.

The Task Force recognizes the convergence of gas deliverability and electric generation capacity. Nearly all electric generation projects that have been constructed or proposed since 1999 are gas-fired.[312] The commercialization of efficient and low-cost gas turbine technologies, the promise of new sources of gas from Atlantic Canada, and the environmental benefits of natural gas, among other factors, have led to the development of substantial new and proposed gas-fired electric generation in New York and New England. This growth in merchant gas-fired generation has led to pipeline expansion projects throughout the region, but has also led to predicted congestion on gas pipelines during the 2005 winter heating season,[313] when the merchant generators compete for pipeline capacity with the LDCs who must meet their core heating loads. These predictions, however, involve substantial assumptions, which must be continually re-examined in response to often unpredictable market dynamics and changes in technology. These factors present a substantial planning challenge in today's partially unregulated environment. As a recent example, the Iroquois' Eastern Long Island Extension natural gas proposal was recently withdrawn because of market reasons.

Reliability issues associated with meeting the region's energy needs are complicated and dynamic. They involve interrelationships among a number of national, regional, state, and local entities. The Task Force recognizes the complexity of a number of interrelated tasks, the completion of which will help ensure the delivery of reliable energy to Connecticut consumers. These include predicting the interrelationship between natural gas supplies and reliable power generation; consideration of regional transmission system interconnections; minimizing vulnerability to terrorism;[314]; and avoiding the potential over dependence on one fuel source. The Task Force also recognizes that modern planning methods using statistical modeling and simulation techniques require substantial investments of resources.[315]

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312 See, for example, ISO-NE's 2003 CELT Report

313 ISO-NE, *op cit.*

314 Making the Nation Safer: The Role of Science and Technology in Countering Terrorism. National Academy Press. p.302.

315 http://www.nyserda.org/press/2001/sept05_01.html and http:// levitan.com/WhatsNewMain.html (In 2001, the NYSERDA and the NYISO awarded Charles River Associates $738,500 for such a comprehensive study).

The Task Force therefore believes that selecting alternatives that ensure reliable power and natural gas delivery must be a goal of a transparent regional energy planning process that uses preferential environmental standards for the protection of Long Island Sound. The Task Force anticipates that this process would include the FERC, ISO-NE, NYISO, state agencies (e.g., CEAB, DPUC, and CECA), and the public.

3.5.1 Electric Cable Crossings

The 1385 Line between Connecticut and New York is operated so that it can instantly respond to a reliability contingency on either side of the interstate interconnection, and as such it allows power to flow to either Connecticut or Long Island to meet peak loads and maintain reliability. This fluid-filled cable system, consisting of seven cables, has been susceptible to numerous breaks over the years, and is proposed to be replaced with three solid dielectric cables with the same power rating.

The flow of electricity on the Cross-Sound Cable is expected, in the near term, to be predominantly from the ISO-NE bulk power grid to Long Island, where additional generation capacity is needed. The Cross-Sound Cable's 330 MW HVDC line would be controllable and could interrupt flows to Long Island during Connecticut peak demand periods, and could be used to import power from Long Island when required.

3.5.2 Natural Gas Pipeline Crossings

One interstate pipeline (Iroquois) presently crosses Long Island Sound between Milford, Connecticut and Northport, Long Island connects to KEDLI's natural gas distribution system.

Long Island has historically had inadequate natural gas transportation capacity and therefore has been heavily dependent on fuel oil for power generation and core residential heating. With the exception of Hawaii, Long Island has the highest percentage of fuel oil consumption anywhere in the U.S. Recent gas transportation studies have indicated that, if the ability to burn oil is substantially diminished, more pipeline capacity will be needed to support the needs of electric generators on Long Island. Similarly, if pipeline capacity is not expanded, the ability to burn oil will remain critical for meeting electricity demands, particularly during the winter heating season.[316] Consequently, Long Island is expected to continue burning substantial amounts of fuel oil for electric generation during winter months. New gas pipeline capacity to Long Island could reduce the amount of fuel oil consumed, which would provide regional air quality benefits that would be enjoyed by Connecticut, and could reduce the risk of oil spills into Long Island Sound as a result of fuel oil deliveries.

[316] NYSERDA, *op cit*, p.5.

Additional pipelines or expansion of existing ones to Long Island could also allow fuel oil use to be reduced, as well as provide backup deliverability in the event of an interruption on any existing pipeline, facilitate gas deliveries to rapidly growing portions of Suffolk County, and provide Long Island with access to a competing source of natural gas from Atlantic Canada, as dictated by market forces.

The integrated use of new, well-planned, and environmentally preferred infrastructure projects to provide market access to clean energy supply will reduce air emissions associated with obsolete and emergency generating facilities, which could possibly reduce costs to consumers. The certification and permit proceedings for facilities proposed to cross Long Island Sound should consider alternatives to ensure that both state and regional reliability needs are met with the least adverse impact on the environment.

3.6 Recommendations for Providing For Regional Energy Needs While Protecting Long Island Sound to the Maximum Extent Possible (PA No. 02-95 Section 3(G))

The Task Force makes the following recommendations, in no particular order, to ensure energy reliability and provide for regional energy needs, while protecting the natural resources of Long Island Sound:

3.6.1 Interstate Coordination and Integrated Resource Management

<u>Expanded Role of CECA</u>

- Expand the role of the CECA to coordinate and facilitate communication with counterparts in New York and Rhode Island that share an interest in interstate energy and infrastructure projects.[317] The CECA and its counterparts in neighboring states may consider mechanisms for coordination, including but not limited to, undertaking a Memorandum of Understanding (MOU) that seeks: consistent and compatible standards to determine public need and environmental preference standards for the protection of Long Island Sound; consideration of benefits and alternative solutions for energy reliability and energy facilities of regional significance; to set goals and encourage the collection of marine and coastal resource data; and to interact with the FERC and other agencies.

[317] A possible counterpart for New York could be the New York Energy Research and Development Authority (NYSERDA), which is currently responsible for developing New York's energy plan, or the Long Island Power Authority (LIPA), which is currently developing an energy plan for Long Island.

Application of Environmental Preference Standards for the Protection of Marine and Coastal Resources

- CECA should incorporate environmental preferences when reviewing and evaluating the environmental impacts of a project; the concepts of avoidance, minimization, mitigation, and compensation should be taken in that respective order.

Potential Planning Mechanisms for Long Island Sound

- Connecticut should continue to work toward completing detailed resource data sets and mapping for Long Island Sound. With completion of detailed resource data sets and mapping for Long Island Sound, which is an essential step and requires a significant level of additional financial, personnel and time commitment, the legislature can then evaluate and, as appropriate, implement, or otherwise further the implementation of, specific planning mechanisms for Long Island Sound. Such resource protection based mechanisms may include the designation of marine protected areas, and/or the adoption of marine zoning.

Natural Resource Performance Bond Levels

- Regulatory agencies should continue the practice of requiring performance bonds for projects that may affect Long Island Sound. Performance bonds levels are presently and should continue to be based on a site-specific and project-specific estimation of potential damage, remediation, and monitoring.

3.6.2 Other Legislative and Administrative Changes to the Siting Process

Application Guide for Electric and Fuel Transmission Line Facilities for Marine Projects

- The Siting Council should adopt the revised Application Siting Guide for Electric and Fuel Transmission Line Facilities for Marine Projects, as a guidance document for applicants.

Certification Criteria: Need versus Benefit Standard

- The Connecticut legislature should revise CGS Section 16-50p to replace "benefit" with "need" for the regulation of electric transmission lines that are substantially underwater[318], including in Long Island Sound and adjacent estuaries.

[318] For purposes of this recommendation, underwater is defined as coastal, nearshore, and offshore waters; estuarine embayments; wetlands and watercourses including both tidal and freshwater; intertidal flats; and floodplains.

Project Scoping Process

- Enhance the scoping process during the pre-application consultation period to ensure that the project proponent is fully informed regarding the concerns of the public, the CECA, and individual resource agencies.

Independent Study

- Relevant issues that are not adequately addressed should be studied and analyzed by resource experts, or independent consultants, commissioned by the Siting Council, to further the development of reliable data.
- The Siting Council should develop mechanisms to better communicate to the public the existing process and provisions for the independent study of issues.

Public Availability of Siting Council Documents

- Establish and maintain docket records readily accessible to the public through the Siting Council's web site. At a minimum, the web site should contain a docket management system that allows information to be searched by docket number, date, and keyword. Require the electronic filing of specified materials from the applicant, parties, and intervenors.

3.6.3 Other Legislative and Administrative Changes

Centralized Data Repository for Energy and Environmental Data within Long Island Sound

- Designate the Long Island Sound Resource Center at the University of Connecticut, Avery Point and/or the Map and Geographic Information Center (MAGIC) at the Homer Babbidge Library, University of Connecticut, Storrs as the repository for the Task Force's GIS (energy and environment) database, and other Long Island Sound information as developed.

Submerged Lands Leasing Program

- The Connecticut legislature should investigate the viability of and structure for a comprehensive and expanded submerged lands leasing program.

3.7 Recommendations on Natural Resource Performance Bond Levels to Insure and Reimburse the State In The Event That Future Electric Power Line Crossings, Gas Pipeline Crossings or Telecommunications Crossings Substantially Damage the Public Trust in the Natural Resources of Long Island Sound (PA No. 02-95 Section 3(H))

PA No. 02-95, Section 3, (H) directs the Task Force to issue recommendations on natural resource performance bond levels to insure and reimburse the state in the event that future electric power line crossings, gas pipeline crossings or telecommunications crossing substantially damage the public trust in the natural resources of Long Island Sound.

The Task Force recognizes the value of natural resource performance bonds or other financial sureties as mechanisms to ensure that a proposed energy or infrastructure project is constructed as permitted, and that remediation of environmental damage associated with incomplete construction is undertaken without undue delay or cost to the public. The Task Force acknowledges that bonds and other financial sureties, which may be required by the DEP and the Siting Council, are and should continue to be calculated based upon site-specific and project-specific estimation of potential environmental impacts. Uniform bond levels may not ensure that performance bonds are appropriate, based on the requisite relationship between the amount of the performance bond and the activity being bonded, to adequately protect the resources of Long Island Sound.

The Task Force also recognizes that there could be certain instances of damage to the public trust where performance bonds may not provide funding in a timely or appropriate manner to adequately address such damage. Consequently, the Task Force concluded that there may be a benefit to affording state agencies access to enhanced funding to address other impacts not attributable to a specific project. The Task Force identified an expanded submerged lands leasing program as a possible means to enhance such funding.

Regulatory agencies should continue the practice of requiring performance bonds for projects that may affect Long Island Sound. Performance bonds levels should be based on a site-specific and project-specific estimation of potential damage, remediation, and monitoring.

The Connecticut legislature should investigate the viability of and structure for a comprehensive and expanded submerged lands leasing program.

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4 DISCUSSION OF ISSUES AND RECOMMENDATIONS

In PA No. 02-95, the General Assembly directed the Task Force to develop recommendations that will protect and preserve the valuable natural resources of Long Island Sound and at the same time ensure reliability and provide for regional energy needs. The Task Force is confident that Connecticut's commitment to environmental stewardship can and *must be* integral to wise, pro-active, and transparent planning of energy and telecommunications infrastructure.

On January 1, 2003, the Working Group and Task Force jointly issued Part I of the Comprehensive Assessment and Report. This report recommended measures to improve state and regional energy planning and to implement environmental values and preference standards for comparative review of competing energy projects and solutions. In this Part II of the Comprehensive Assessment Report, the Task Force offers recommendations that are consistent with and reinforce conclusions and recommendations issued jointly by the Working Group and the Task Force in the Part I Report. Further, the Task Force proposes additional measures to enhance Connecticut's current energy and telecommunications infrastructure project review and permitting process, to reinforce best practices for protecting the public interest in Long Island Sound, and to identify preferential standards for protecting Connecticut's critical marine and coastal resources and public trust lands that may be affected by energy and telecommunications infrastructure proposals. The Task Force recommends that the Connecticut Energy Coordinating Authority (CECA), proposed in the joint Working Group / Task Force Part I Report, take a leadership role to ensure that environmental preference standards issued in the Part I Report for land-based projects, and in this Part II report for Long Island Sound projects, be integrated in the CECA's planning and decision-making, and in its recommendations to the Siting Council. In addition, a central location for the management and dissemination of environmental and energy resource information would be helpful to regulators, industry, and the public for the planning and analysis of proposals.

The Task Force's recommendations are intended to accomplish the following key goals:

- Protect Long Island Sound by identifying preferential standards for the review and permitting of energy and telecommunications infrastructure projects that have the potential to impact its valued natural resources.
- Promote interstate cooperation and coordination among Connecticut, New York, and Rhode Island with respect to energy and telecommunication energy and telecommunication infrastructure projects in Long Island Sound.
- Endorse the creation of CECA to coordinate Connecticut's participation in regional energy planning and related facilities planning, and promote interstate cooperation and coordination for the protection of environmental resources of Long Island Sound.
- Enhance opportunities and support for public participation in energy and telecommunications infrastructure siting proceedings with timely access to data, opportunity to voice public concerns, and transparent scoping of project studies.

- Compile, maintain, and make publicly available baseline information on the resources of Long Island Sound for planning and analysis of proposals.
- Develop a process and provisions for expression of the State's private property rights, research into impact avoidance and restoration techniques, and remediation of environmental perturbations.

Consistent with the statutory directive of PA No. 02-95, the specific recommendations offered by the Task Force are organized in the following three sections: recommendations that are asked for under Section 3(G), recommendations in response to Section 3(H), and other recommendations that are a general outgrowth of the assessments, evaluations, and data inventories documented in prior sections of this Assessment Report.

4.1 Providing for Regional Energy Needs While Protecting Long Island Sound to the Maximum Extent Possible (PA No. 02-95 Section 3(G))

4.1.1 Expanded Role of the CECA

The Part I Assessment Report recommended the creation of a CECA, which would be charged with the planning, coordination, and public review of energy strategies and associated environmental issues among state agencies, and with representing Connecticut's coordinated energy policy and needs before ISO-NE (or successor entity) in the regional energy planning process. The CECA would also review energy proposals of regional significance and issue an advisory report with recommendations, during the 60-day pre-application consultation period, pursuant to CGS Section 16-50l(e), to the Siting Council, and/or other regulatory agencies or decision-making entities regarding the consistency of such proposals with the State Energy Plan, Conservation and Development Policies Plan for Connecticut, and state environmental policy.

The Task Force recommends that CECA's advisory role be extended to facilitate cooperation and encourage an institutionalized working relationship between the CECA and its counterparts in other states and the federal government. Coordination among Connecticut, Rhode Island, and New York would be particularly beneficial in the planning and review of energy and telecommunications infrastructure projects of regional significance within Long Island Sound.

<u>Recommendation</u>: Expand the role of the CECA to coordinate and facilitate communication with counterparts in New York and Rhode Island that share an interest in interstate energy and energy and telecommunication infrastructure projects.[319] The CECA and its counterparts in neighboring states may consider

[319] A possible counterpart for New York could be the New York Energy Research and Development Authority (NYSERDA), which is currently responsible for developing New York's energy plan; the Long

mechanisms for coordination, including but not limited to, undertaking a Memorandum of Understanding (MOU) that seeks: consistent and compatible standards to determine public need and environmental preference standards for the protection of Long Island Sound; consideration of benefits and alternative solutions for energy reliability and energy facilities of regional significance; to set goals and encourage the collection of marine and coastal resource data; and to interact with the FERC and other agencies.

Objective: Promote interstate cooperation and coordination for energy planning, and the protection of environmental resources of Long Island Sound.

Through its interstate coordination role, the CECA could provide a mechanism for promoting and implementing energy solutions that avoid or minimize the numbers and impacts of energy and telecommunications infrastructure projects crossing Long Island Sound. Such solutions depend on the cooperation of all states that border Long Island Sound. Other interstate functions could include fostering the coordination of participating State energy plans consistent with regional goals of energy reliability and environmental protection; providing a voice for Connecticut in regional energy planning forums for the protection of Long Island Sound and the provision of reliable energy; and interacting with other regional planning initiatives, including initiatives by ISO-NE and NYISO, EPA Region 1 and 2, Northeast States for Coordinated Air Use Management (NESCAUM), and the Ozone Transport Assessment Group (OTAG).

Among other benefits, the interstate coordination role of the CECA has the potential to:

- Encourage the interstate coordination of environmental protection programs, including the development of consistent environmental preference standards for Long Island Sound;
- Improve regional air quality and reduce greenhouse gases;
- Improve regional energy reliability and security; and
- Consider energy costs to consumers.

Implementation: The CECA should be established by Legislation, and its charter should incorporate the functions recommended by the Working Group and the Task Force.

4.1.2 Application of Environmental Preference Standards for the Protection of Marine and Coastal Resources

The waters of Long Island Sound and its coastal resources, including tidal rivers, streams and creeks, wetlands and marshes, intertidal mudflats, beaches and dunes, bluffs and

Island Power Authority (LIPA), which is currently developing an energy plan for Long Island; or a group comprised of energy and environmental stakeholders.

headlands, islands, rocky shorefronts and adjacent shorelands form an integrated natural estuarine ecosystem, which is both unique and fragile. It is a general goal and policy of Connecticut to ensure that the development, preservation or use of the land and water resources of the coastal area proceeds in a manner consistent with the capability of the land and water resources to support development, preservation or use without significantly disrupting either the natural environment or sound economic growth. It is also the public policy of Connecticut to avoid siting energy and telecommunications infrastructure projects in Long Island Sound, where there is a prudent and feasible alternative. Initially, as part of a regional planning process with opportunities for meaningful state and public input, there is a "determination of public need and public comparison of system alternatives" which will establish whether the crossing of Long Island Sound can be totally avoided[320]. It is anticipated that CECA will further the planning process in reliance on a comprehensive state-wide energy plan. This energy plan must be consistent with the Connecticut Coastal Management Act (CMA) as required by CGS Section 22a-100. This process, as well as any project application process, must be transparent, public and consistent with market forces. When evaluating the environmental impacts of a project, the concepts of avoidance, minimization, mitigation and compensation should be taken in that respective order.

Recommendation: CECA should incorporate environmental preferences when reviewing and evaluating the environmental impacts of a project; the concepts of avoidance, minimization, mitigation, and compensation should be taken in that respective order.

Objective: Apply environmental preferential standards for the review and regulation of proposed energy and telecommunications infrastructure projects within Long Island Sound.

Avoidance:

- Avoid crossing Long Island Sound when a prudent and feasible alternative exists.

Minimization:

- Minimize adverse impacts to coastal resources (as defined in CGS Section 22a-93(7)), such as shellfish concentration areas, intertidal flats, islands, tidal wetlands, and threatened and endangered species of special concern (as defined in CGS Section 26-304).
- Minimize short-term adverse impacts and avoid long-term impacts to water dependent uses (as defined in CGS Section 22a-93 (16)).

[320] To the extent that the Federal Energy Regulatory Commission (FERC) has primary jurisdiction regarding natural gas pipeline siting and need determination, the applicability of these preferential standards in particular projects may differ.

- Minimize adverse environmental impact of energy and telecommunications infrastructure attributable to size, length, number, installation method and timing of construction of energy and telecommunications infrastructure.
- Minimize adverse environmental impacts to near shore environments by using technology such as horizontal directional drilling, where technologically feasible.
- Minimize installation in areas where geologic or other subsurface constraints would result in adverse environmental impacts associated with either larger energy and telecommunications infrastructure or more intrusive installation techniques.
- Minimize adverse environmental impacts of proposed projects by giving careful consideration to utilization of/upgrades to existing energy and telecommunication infrastructure as an alternative to totally new construction.
- Minimize physical impediments to migration of living marine resources.

Mitigation:

- Mitigate any adverse environmental impacts that cannot be minimized.

The concept of compensation is a step of last resort, is not an appropriate step to be considered at the planning level, and will be considered during the project-specific permitting process.

Implementation: Legislative policy direction to regulatory agencies and the CECA to incorporate environmental preferences when reviewing and evaluating the environmental impacts of a project.

4.1.3 Potential Planning Mechanisms for Long Island Sound.

Long Island Sound is a broad, diversified estuarine ecosystem, characterized by a myriad of physical and biological resources. These coastal, nearshore, and offshore resources are both dynamic and interdependent, as evidenced by the linked relationships between marine food webs and their supporting habitat; the migratory nature of many of the marine and coastal bird and fish species; the differences from year-to-year in productivity on established shellfish lease beds; and climatic variability.

In accordance with Section 3(A) of PA No. 02-95, the Task Force has inventoried and prepared maps of the available existing data concerning the natural resources of Long Island Sound. (See Appendix C.) The Task Force's map compendium of Long Island Sound resources represents a valuable tool for researchers, for policy planners, and for energy and telecommunications infrastructure companies seeking to conduct preliminary assessments of potential locations for facilities in Long Island Sound. However, the maps may not reflect the universe of resources to be considered by applicants for projects in Long Island Sound. Thus, for example, for energy and telecommunications infrastructure project siting purposes, the Task Force recognizes that while the natural resource maps may represent a starting point for planners, each project will be different and must be considered not only in the context of site-specific coastal, nearshore, and offshore resources, but also in light of the potential impacts, taking into consideration the particular construction techniques proposed for the project and the technology available at the time. Coordinating with the involved regulatory agencies (e.g., the Siting Council, DEP, the FERC, Corps, NMFS, EPA, Connecticut Historical Commission [for marine archaeological resource evaluations]; and counterparts in New York), any applicant proposing an energy or energy and telecommunication infrastructure project in Long Island Sound must continue to be responsible for conducting detailed resource studies and analyses specific to their project area. Such analyses are a requisite of state and federal permit and certification processes.

The Task Force recommends that Connecticut continue to work toward completing detailed resource data sets and mapping for Long Island Sound, coordinating in particular with New York and the federal government to assure that comparable data are compiled and maintained not only for areas under Connecticut jurisdiction, but also for Long Island Sound's entire ecosystem. Such efforts are ongoing through programs such as the Long Island Sound Study and the U.S. Fish and Wildlife Service's Long Island Sound stewardship/biological reserve program.

The Task Force reviewed the feasibility of using the available resource mapping and data sets as a foundation for planning for the development of energy and telecommunications infrastructure facilities in Long Island Sound through such a mechanism as ocean zoning or marine protected areas (MPAs), and corridors. These programs may merit consideration in the future. However, at this point in time, additional research is needed first to better define Long Island Sound's resources and then to determine the particular objectives of a resource protection program. Moreover, any program must not be driven solely by energy and telecommunications infrastructure planning, but rather must seek the input of the broad range of stakeholders involved in the use, protection, and enjoyment of Long Island Sound.

There are locations within the United States and internationally where MPAs have been established to address identified resource concerns. Within these MPAs, various uses are restricted to protect sensitive species and habitats. In many of the individual MPAs reviewed by the Task Force, energy and telecommunications infrastructure projects are regarded as being "in the public interest" and have not been precluded from the MPA, or have been designated as a "special use" subject to review and approval in accordance with policies specific to that use and to the goals of the respective MPA. These mechanisms, while allowing for the construction of energy and telecommunications infrastructure projects, prescribe appropriate resource management measures applicable to these uses, within the context of existing regulatory policies.

Currently available information supports a conclusion that the resources of Long Island Sound are more varied and homogeneously distributed than would be found in a typical area designated as a MPA. Recognizing the diversified nature of Long Island Sound's estuarine ecosystem, the Task Force observed that the objectives behind the establishment of MPAs in Long Island Sound will require careful study and must be driven by resource protection goals. Should MPAs be pursued for Long Island Sound, it should be noted that such a designation, while useful, could be atypical.

In areas of the United States and internationally, marine zoning has also been used to protect sensitive resources. Zoning allows for the identification of specific sites or areas where activities such as utility energy and telecommunications infrastructure would not be allowed due to identified impacts, and where such uses would be acceptable. However, the Task Force observed the establishment of marine zoning is likely to be a long and complicated process, requiring the involvement of a wide group of stakeholders.

Potential steps, which may be appropriate to consider for marine zoning or MPAs in Long Island Sound, include:

1) Identify and assess existing habitats and coastal resources;
2) Identify and assess existing uses;
3) Document and map such uses and consider: a) how habitats are impacted; b) current protection methods; and c) priorities, including exceptions to prohibitions and restrictions for utility energy and telecommunications infrastructure and/or projects "necessary to the public interest";
4) Determine the spatial scale requirement for protection (e.g., how much acreage must be included to provide the necessary resource protection);
5) Determine the relative spatial percentage protection (e.g., is partial protection of a zone sufficient or is full protection of the zone required);
6) Determine the tools, technologies and human resources necessary to effectuate a zoning plan;
7) Determine interagency involvement (e.g., who gets involved where); and
8) Identify stakeholders and solicit their input to the proposed zoning through appropriate public forums.

The Task Force also considered the designation of energy and telecommunications infrastructure corridors as a mechanism to further the objective of protection of Connecticut's resources in Long Island Sound. The Task Force is not recommending the use of corridors as a resource protection based mechanism. Rather the Task Force developed a comprehensive listing of issues of potential relevance when considering the location of new utility energy and telecommunications infrastructure in Long Island Sound in proximity to existing utility energy and telecommunications infrastructure. This listing appears below:

- The inherent difficulty in delineating the area of any such corridor;
- National security concerns with placing multiple utility energy and telecommunications infrastructure in a common area;

- Operational concerns associated with utility facilities in proximity to each other, e.g., increased likelihood of electrolytic corrosion and an increased potential for third party damage;
- Substrate types and water depth can affect construction techniques and corridor width;
- Repair, inspection and maintenance considerations;
  - Minimum separation distances required for safety;
  - Distance affords protection from construction/excavation equipment;
  - Avoid as much as possible crossing of cables/pipes to assure adequate access;
- Impacts on utility energy and telecommunications infrastructure insurance requirements;
- Liability considerations in connection with construction and post-construction activity relating to utility energy and telecommunications infrastructure;
- May minimize right-of-way needs if assume finite number of utility energy and telecommunications infrastructures and/or no significant change in technology for installation and repair;
- Could benefit efficiency of siting process if the corridor is identified;
- May or may not facilitate avoidance or minimization of impact on discrete sensitive resources;
- May increase cumulative environmental impacts, albeit within an identified area;
- Use of a Long Island Sound corridor may increase adverse terrestrial environmental impacts in connection with the concentration of related utility energy and telecommunications infrastructure;
- May require energy and telecommunication infrastructure in Long Island Sound to be longer in total length thereby impacting, among other things, the energy and telecommunications infrastructure cost and the extent of needed right of way;
- Any corridor proposed for Long Island Sound would require the concurrence of New York;
- Current lack of data adversely impacts a conclusive decision on location; and
- Establishing a common corridor will result in repeated impacts in the same areas and will likely result in long-term effects.

The Task Force concluded that additional research, coordination and evaluation are needed before there can be a determination of the suitability of any of these planning mechanisms for proposed energy and telecommunications infrastructure projects in Long Island Sound. Further, all stakeholders would need to be involved in the development of any of these initiatives, since MPAs, marine zoning and the delineation of corridors would clearly have implications well beyond the utility industry.

<u>Recommendation</u>: Connecticut should continue to work toward completing detailed resource data sets and mapping for Long Island Sound. With completion of detailed resource data sets and mapping for Long Island Sound, which is an essential step and requires a significant level of additional financial, personnel and time commitment, the legislature can then evaluate and, as appropriate, implement, or otherwise further the implementation of, specific planning mechanisms for Long Island Sound. Such resource protection based mechanisms may include the designation of marine protected areas, and/or the adoption of marine zoning.

Objective: Provide a means to better identify and understand the resources of Long Island Sound in the context of the ecosystem and then evaluate appropriate planning mechanisms for Long Island Sound.

The planning effort required for Long Island Sound spans state boundaries and requires continued coordination among Connecticut, New York, Rhode Island, and key federal resource agencies such as EPA, the Corps, USFWS, and NMFS. Most importantly, it also requires substantial financial commitments to further an understanding of Long Island Sound's resources through research studies~~;~~ and to maintain and update resource databases.

Significant additional research is needed first to better define Long Island Sound's resources and then to determine the particular objectives of a resource protection program. The overall management of Long Island Sound must not be driven solely by energy and telecommunications infrastructure planning, but rather must seek the input of the broad range of stakeholders involved in the use, protection and enjoyment of Long Island Sound.

Implementation: Through the legislative process and continued coordination with federal agencies and other states, including New York and Rhode Island, additional funding and initiatives can be identified that will further the development of specific planning mechanisms for Long Island Sound that incorporate appropriate resource protection.

4.2 Natural Resource Performance Bond Levels (PA No. 02-95 Section 3(H))

PA No. 02-95 Section 3,(H) charged the Task Force with producing recommendations on natural resource performance bond levels to insure and reimburse the state in the event that future electrical power line crossings, gas pipeline crossings or telecommunications crossings substantially damaged the public trust in the natural resources of Long Island. DEP and the Siting Council have available today a number of tools to address these instances of damage. They include:

- Performance bonds or other financial sureties
- Permit/Certificate terms and conditions

- Statutory provisions[321]

<u>Recommendation</u>: Regulatory agencies should continue the practice of requiring performance bonds for projects that may affect Long Island Sound. Performance bonds levels are presently and should continue to be based on a site-specific and project-specific estimation of potential damage, remediation, and monitoring.

Objective:

- Confirm that mechanisms exist to ensure that a proposed project is constructed as permitted.
- Ensure that resources are available to remediate environmental impacts associated with the construction or operation of energy or telecommunications infrastructure projects.

The Siting Council and DEP have authority to require performance bonds or other financial surety as a condition of a license, a certificate or a permit. DEP routinely requires performance bonds to ensure that specific steps are taken by a permittee, for example, completion of closure of a landfill and resource restoration or compensation activities. Performance bonds or other financial sureties are also used to ensure that DEP can take prompt action in response to a situation, if a permittee fails to act. The Task Force believes that existing authority for performance bonds or other financial sureties is sufficient to address anticipated events.

A salient example of DEP's use of performance bonds or other financial sureties can be found in the Cross-Sound Cable, LLC (Cross-Sound Cable) permit (3220102720-MG issued on March 17, 2002.) That permit required that Cross Sound post two performance bonds or other financial sureties, one for $1,800,000 and another for $1,000,000. The larger bond was required for the 1,800 linear feet of horizontal direction drilling proposed by Cross-Sound Cable and can be released with DEP's written approval after completion of the work. The amount of the bond was established by multiplying 1,800 feet by $1,000, a conservative estimate of a cleanup cost per foot of a bentonite frac-out. If Cross-Sound Cable failed to respond in a manner acceptable to DEP, these bond monies could be accessed by DEP to hire a contractor. The $1,000,000 bond was required in order to ensure that funds are available to secure emergency repair of the cable, or to remove or relocate the cable if determined necessary by DEP. The amount of the bond was set based on an estimate of the cable removal cost, and the bond can only be released upon permanent removal of the cable.

Permit terms and conditions are also used to address potential damage to the public trust. For example, the Cross-Sound Cable permit requires that Cross-Sound Cable conduct extensive pre-installation monitoring and three rounds of post-installation monitoring of a

[321] See, e.g., CGS Sections 22a-7 (cease and desist orders), 22a-430 (order to abate pollution), 22a-432 (order to correct potential source of pollution), 22a-435 (referral to Attorney General for injunction) and 22a-438 (referral to Attorney General for penalties), 16-50u (Enforcement of certificate and standards requirements).

shellfish bed, at six month intervals. The purpose of the monitoring is to determine the rate of sediment reconsolidation and biological recolonization of the disturbed substrate. In addition, the permit requires that Cross-Sound Cable conduct three years of monitoring of the electric and magnetic fields, temperature, sediment chemistry, habitat disturbance and species impacts along the cable route. If DEP determines that the results of either monitoring indicate that mitigation and/or restoration is necessary to address adverse impacts, the permit requires that Cross-Sound Cable develop and implement a plan subject to DEP approval.

Pursuant to existing law, if the Commissioner of DEP finds that any person is maintaining any facility or condition, which reasonably can be expected to create a source of pollution to the waters of the state, he may issue an order to such person to take the necessary steps to correct such potential source of pollution[322].

However, the Task Force recognizes that there could be certain instances of damage to the public trust where the above-referenced options may not provide funding in a timely or appropriate manner to address adequately such damage. (Please refer to Section 4.4.2)

Implementation: Regulatory agencies should be encouraged to exercise their existing authority to require performance bonds.

4.3 Recommendations for Other Legislative and Administrative Changes to the Siting Process

4.3.1 Application Guide for Electric and Fuel Transmission Line Facilities for Marine Projects

The Part I Assessment Report recommended that the Siting Council revise the Application Siting Guide for Electric and Fuel Transmission Line Facilities. The intent of that recommendation was to assure that each application to the Siting Council incorporates all the information that the Siting Council will need to conduct a diligent and sufficient environmental project-specific review. Projects that are largely underwater present unique technical challenges and environmental concerns. The current version of the Application Guide is not oriented specifically toward marine projects. Such projects are sufficiently distinct from terrestrial projects that a separate application guide for marine projects has been developed and should be adopted.

Recommendation: The Siting Council should adopt the revised Application Siting Guide for Electric and Fuel Transmission Line Facilities for Marine Projects, as a guidance document for applicants.

[322] CGS Section 22a-432. (Formerly Sec. 25-54k). Order to correct potential sources of pollution.

Objective: Provide prospective applicants with a guidance document to identify information that should be included in an application to the Siting Council, with a focus towards marine issues.

The current application guide for Electric and Fuel Transmission Line Facility was used to develop the Application Siting Guide for Electric and Fuel Transmission Line Facilities for Marine Projects. The Application Siting Guide for Electric and Fuel Transmission Line Facilities for Marine Projects represents a logical method for organizing the information that the Siting Council would reasonably use in evaluating projects with a marine component. The Application Siting Guide for Electric and Fuel Transmission Line Facilities for Marine Projects follows the standard structure of typical environmental impact studies: a description of the project, a description of each of the natural and cultural resources potentially affected, and a discussion of the potential impacts. The revised Application Guide for Electric and Fuel Transmission Line Facilities for Marine Projects also provides guidance for minimum data quality requirements.

The Application Siting Guide for Electric and Fuel Transmission Line Facilities for Marine Projects is necessarily generic. Each project application must be tailored to address site-specific project attributes. Additional site-specific information needs may be identified by the project proponent, the potentially affected municipality(s), and the public during the pre-application consultation period and recommended project scoping process, discussed below. The project proponent then has the option of incorporating such site-specific information in the initial application, or, if further study is required, of submitting a supplemental study as documentary evidence during the proceedings. All such studies and reports shall become part of the record of the proceeding.

In developing this recommendation, the Task Force completed an initial proposed Application Siting Guide for Electric and Fuel Transmission Line Facilities for Marine Projects, included as Appendix E of this Assessment Report. This Application Guide for Electric and Fuel Transmission Line Facilities for Marine Projects identifies information that a prospective applicant should provide in order to evaluate the potential impacts to the aquatic resources of Long Island Sound. This guide may be used separately or merged with the revised terrestrial "Electric Transmission Line Facility" application guide, produced by the Working Group, as determined most efficient and productive by the Siting Council.

Implementation: Through the public hearing and review process, the Siting Council may seek to adopt the revised Application Siting Guide for Electric and Fuel Transmission Line Facilities for Marine Projects.

4.3.2 Certification Criteria: Need versus Benefit Standard

CGS Section 16-50p prescribes the criteria that the Siting Council must consider in issuing a certificate. The criteria for siting overhead energy and telecommunications infrastructure is different from the criteria applied to electric transmission lines (69 kV and above) that are substantially underground and underwater. An overhead electric transmission line (or an intrastate underground gas transmission line) can not be approved without a finding of "public need" and the "public need" must outweigh the cumulative adverse effect on the natural environment, ecological balance, public health and safety, scenic, historic and recreational values, forests and parks, air and water purity and fish and wildlife. (CGS Section 16-50p(c)(2)). In contrast, an electric transmission line that is substantially underground or underwater shall not be approved unless the Siting Council finds a "public benefit" for the facility, and this "public benefit" outweighs the cumulative adverse environmental effects of the project. A "public benefit" exists if the facility "is necessary for the reliability of the electric power supply of the state or for the development of a competitive market for electricity." (CGS Section 16-50p(c)(2)).

Recommendation: Revise CGS Section 16-50p to replace "benefit" with "need" for the regulation of electric transmission lines that are substantially underwater[323], including in Long Island Sound and adjacent estuaries.

Objective: Develop a regulatory standard consistent with State goals to protect the environmental resources of Long Island Sound, while providing for energy reliability and regional energy needs.

Traditionally, the concept of public need stems from utilities' obligation to "provide adequate and reliable services at the lowest reasonable cost to consumers" (CGS Section 16-50(g)), and from utilities' ability to recover the prudent cost of such service from ratepayers. To meet the need test, a service provider generally must demonstrate that the proposed transmission expansion or reinforcement project addresses an electric security or reliability problem. Generally accepted industry standards determine system reliability of the interconnected electric systems and the need for electric transmission reinforcement, based on the following two industry standards: 1) Adequacy - The ability of the electric systems to supply the aggregate electrical demand and energy requirements of their customers at all times, taking into account scheduled and reasonably expected unscheduled outages of system elements; and 2) Security - The ability of the electric systems to withstand sudden disturbances such as electric short circuits, unanticipated loss of system elements, or cascading failures.

The statutory "public need" standard for overhead transmission lines can be perceived by some to be more stringent than the "public benefit" standard applied to transmission lines that are substantially underwater. The proposed change to the statute is intended to create consistency with the state's desire to protect its aquatic and marine resources as diligently as its terrestrial resources.

Implementation: A legislative change to the statute would be required.

[323] For purposes of this recommendation, underwater is defined as coastal, nearshore, and offshore waters; estuarine embayments; wetlands and watercourses including both tidal and freshwater; intertidal flats; and floodplains.

Throughout the course of the Working Group and Task Force meetings and deliberations, members heard from experts, stakeholders, and other interested parties about a need to enhance public input and public participation in Connecticut's energy and telecommunications infrastructure proceedings. The Working Group's concerns were addressed, in part, by recommending the creation of the CECA, which would review energy proposals of regional significance and issue an advisory report with recommendations, during the 60-day pre-application consultation period, pursuant to CGS Section 16-50l(e), to the Siting Council, and/or other regulatory agencies or decision-making entities.

Opportunities for public input and participation in a Siting Council process currently exist through the following mechanisms:

- A 60-day pre-application consultation period with the potentially affected municipalities;
- Provisions for public notice of the application to property owners abutting the proposed site(s) included in the electric utility bills of customers in the project area (for electric transmission facilities), and published in newspapers;
- Party and Intervenor participation;
- Pre-hearing conference(s) and pre-hearing discovery;
- Public field reviews;
- Public hearing, with mandatory evening hearing;
- Advocacy from the Office of Consumer Counsel and the Office of the Attorney General;
- Required consultation with State agencies; and
- Public notice of final decision, with an opportunity for administrative appeal and judicial relief.

In addition, opportunities for public participation in regulatory review processes may exist for projects in Long Island Sound within the DEP, ACOE and the FERC.

While Connecticut's mechanisms for public input and participation in siting processes are substantial and exceed those of many other states, there are opportunities to enhance the Siting Council procedures. The Task Force has identified practices that would improve the transparency and accessibility of siting processes. Each of these recommended practices is discussed below.

4.3.3 Project Scoping Process

Per CGS Section 16-50l(a), the project proponent shall submit an application "containing such information as the applicant may consider relevant and the council or any department or agency of the state exercising environmental controls may by regulation require…." The Task Force has recognized that the application process would benefit from more specificity, and accordingly, the Task Force has proposed a revision to the Application Siting Guide for Marine Projects. However, the Application Siting Guide for Marine Projects is generic rather than site or project-specific. Consequently, the Task Force seeks to enhance the opportunity for the public and affected groups to identify issues for in-depth project-specific study and evaluation at an early stage in the application process, through a formal scoping process.

Scoping is intended to ensure that potential issues are identified early, that significant issues are properly studied, that issues of little significance do not consume time and effort, and that the application, to be submitted to the Siting Council, is thorough and balanced. The scoping process should identify public and agency concerns, clearly define the environmental issues and alternatives to be examined by the Siting Council, and identify state and local agency requirements, which should be addressed.

Recommendation: Enhance the scoping process during the pre-application consultation period to ensure that the project proponent is fully informed regarding the concerns of the public, the CECA, and individual resource agencies.

Objectives:

- Enhance the mechanism for the project proponent to further assure early and meaningful feedback from the CECA, state and local agencies, the potentially affected municipality(s), and the public;
- Allow for meaningful and early input from interested parties, as project proponents prepare the application to the Siting Council;
- Identify potentially relevant environmental impact studies;
- Identify potentially viable alternatives that the applicant should consider; and
- Identify natural resources of concern, environmental preferences, and evaluation factors specific to the proposed project.

An independent entity, assigned by the Siting Council should also hold a meeting for the scoping/identification of issues regarding a proposal of regional significance, during the pre-application consultation period. The independent entity, assigned by the Siting Council should notice and facilitate the scoping meeting at a time and location to be determined by the Siting Council. The independent entity, assigned by the Siting Council should solicit participation from the project proponent, the CECA, state and local agencies, the potentially affected municipality(s), and the public. The independent entity, assigned by the Siting Council should issue a summary report of the scoping meeting to the project proponent, the CECA, and each municipality in attendance at the scoping meeting within a reasonable time, but no later than the conclusion of the 60-day pre-application consultation period. The project proponent may either address the problems and issues identified at the scoping meeting within the initial application, or in subsequent reports to the Siting Council, which will become part of the record of the proceeding.

Implementation:
Legislative change recommended.

The following process would begin after a project proponent[324] has compiled sufficient information regarding an energy and energy and telecommunication infrastructure project of regional significance (PRS) to commence the pre-application consultation with the municipality.[325]

Note: Text identified in bold font reflects recommended enhancements to the existing regulatory process.

Table 19 – Enhanced Regulatory Process

Action	Responsible Party/Timing
Project proponent makes statutorily required contact with the municipality(s) and provides each with technical reports.	Project proponent; minimum of 60 days prior to submission of application to the Siting Council.
Advisory review of PRS for consistency with the State Energy Plan, Conservation and Development Policies Plan for Connecticut, state environmental policy, and/or environmental preferences.	**CECA; to be undertaken during pre-application consultation period.**
Facilitate a meeting for scoping and identification of issues with participation by the project proponent, the CECA, state and local agencies, the potentially affected municipality(s), and the public.	**An independent entity, assigned by the Siting Council; to be undertaken during pre-application consultation period.**
Make available a Scoping Summary Report with an outline of significant issues regarding the PRS.	**An independent entity, assigned by the Siting Council; to be undertaken during pre-application consultation period.**
May recommend issuance of a solicitation (request for solutions) for open season to RTEP through TEAC. CECA may also issue an open season request for solutions for non-regulated (i.e., **merchant) projects.**	**CECA; to be undertaken during, but prior to the conclusion of, the pre-application consultation period.**
Application filed with the Siting Council.	Applicant; following the pre-application consultation period.
Issue an advisory report with recommendations to the Siting Council, and/or other regulatory	**CECA; to be issued when the application is filed.**

[324] CGS Section16-50l Application for certificate. Notice. Application or resolution for amendment of certificate.
[325] CGS Section 16-50l(e).

Action	Responsible Party/Timing
agencies or decision-making entities.	
Filing of all materials provided to the municipality, and a summary of the consultations with the municipality including all recommendations issued by the municipality, with the Siting Council.	Applicant; no later than 15 days after filing an application.
Filing of the Scoping Summary Report with the Siting Council.	**Applicant; no later than 15 days after filing an application.**
Completeness review and development of schedule; consideration for the need for independent studies.	Connecticut Siting Council.
Consultation/solicitation of state agency comments.	Connecticut Siting Council.
Pre-hearing discovery.	Connecticut Siting Council, applicant, parties and intervenors; to be undertaken after receipt of application, but prior to close of evidentiary hearing(s).
Request the Connecticut Siting Council for an independent study.	**Any person; to be undertaken generally during pre-hearing discovery, and prior to the commencement of evidentiary hearing(s).**
Independent studies completed.	**Consultants; reports must be received and made available prior to evidentiary hearing(s), or as required by the Siting Council.**
State agency comments due.	State agencies; must be received and made available prior to evidentiary hearing(s).
Hearing(s) with cross-examination of all verified and accepted testimony, including the independent study(s).	Connecticut Siting Council, applicant, parties and intervenors; to be held no sooner than 30 days, nor later than 150 days after receiving application.
Public comments, briefs, and proposed Findings of Fact due.	Applicant, parties and intervenors; prior to the close of the record.
Close of record.	Connecticut Siting Council; 30 days after the close of the last hearing.
Decision.	Connecticut Siting Council;

Action	Responsible Party/Timing
	within 12 months of receipt of an application, extendible by 180 days upon consent of applicant.
Petition for reconsideration of agency decision. Administrative appeal.	As provided by law.
Appeal to Superior Court.	As provided by law.
Appeal from final judgment of Superior Court.	As provided by law.

4.3.4 Independent Study

In cases where there is stakeholder interest in issues that exceed the scope of studies conducted by the applicant, some states have chosen to implement mechanisms to provide for further study. Some venues, such as Rhode Island, have a dedicated environmental advocate in the state Attorney General's office. This environmental advocate intervenes on behalf of conservation interests in all siting proceedings, and may have the resources to direct studies and bring in technical experts. Other venues, such as New York[326], utilized intervenor funds. Intervenor funds are monies set aside to aid citizen participation in areas of public interest. The Task Force has considered both options and recommends that Connecticut recognize the advocacy provided by Connecticut's Office of the Attorney General and the Office of Consumer Counsel. In addition, the Task Force supports the Siting Council's exercise of its discretion pursuant to its existing authority to commission independent studies and analysis of issues. The Siting Council currently has the authority to commission independent studies pursuant to CGS Section16-50n(e).[327]

<u>Recommendation:</u> Relevant issues that are not adequately addressed should be studied and analyzed by resource experts, or independent consultants, commissioned by the Siting Council, to further the development of reliable data.

The Task Force has also discussed the establishment of Intervenor Funds as a mechanism to fund and commission studies, mechanisms for appeal of agency decisions to not fund independent studies, use of subpoenas for expert testimony, use of agency staff for expert

[326] Article X *of the New York Public Service Law* pertained to generation facilities with a capacity of 80 MW or larger, has sunset, and is now being debated by the New York General Assembly for reenactment.

[327] Per CGS Section 16-50n(e), "Upon receipt of the application, the council may employ one or more independent consultants to study and measure the consequences of the proposed facility on the environment. The council shall direct such consultant or consultants to study any matter that the council deems important to an adequate appraisal of the application. Any such study and any report issued as a result thereof shall be part of the record of the proceeding."

testimony, and judicial relief. The Task Force also recognizes legislative initiatives in the 2003 session, and the debate on this issue. [328]

Recommendation: The Connecticut Siting Council should develop mechanisms to better communicate to the public the existing process and provisions for the independent study of issues.

Objective:

Objectivity of Data:

- All commissioned studies and analysis shall be administered by the Siting Council, consistent with the provisions of CGS Section 16-50n(e), in a manner to protect the independence and integrity of the information provided to the record.

Representative of Public Interests:

- All commissioned studies and analysis shall be restricted to areas that provide information necessary for the public interest to be adequately represented in a proceeding for a proposed project.

Transparency of Process:

- While a public scoping process would be used to initially identify issues to develop studies and analyses; study and analysis of additional issues shall not be precluded, even if not initially identified during the scoping process, if found to be necessary and in the public interest.

Reliability of Data:

- A qualified witness for all studies and analyses must be available for cross-examination by all parties and intervenors.

Implementation: The Siting Council shall administer the program as follows:

- The Siting Council has agreed to communicate to the public, and use its discretion to exercise the provisions of CGS Section 16-50n(e), and that an independent analysis may be required[329].
- All studies and analyses shall be entered into the official record as evidence, subject to public inspection and cross-examination through responsible and qualified witness(es).

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[328] The Task Force recognizes that the Connecticut General Assembly is considering House Bill Number 6508 that includes provisions for a municipal participation fee.

[329] CGS Section 16-50v (c) The fee for each application for a certificate for a facility described in subdivisions (1) to (4), inclusive, of subsection (a) of section 16-50i, shall be used to meet the expenses of the council in connection with the review of, hearing on and decision on the application, including the expenses of any consultant employed by the council…"

- Studies and analyses shall be subject to appropriate audit authorized by law.
- The final report of any study or analyses shall be made public before the public hearing, and made part of the official record.
- The Siting Council may pre-qualify state and federal resource experts, consultants, and others to undertake the independent study and analyses of issues. Pre-qualification and selection of resource experts and consultants should be undertaken with review and input from the public.
- The commissioning of independent studies and analyses, by the Siting Council, is funded by an assessment on the applicant.

4.3.5 Public Availability of Siting Council Documents

The siting process in Connecticut encourages public involvement and provides opportunities for interested parties to participate in each proceeding. Parties meeting certain criteria may participate with formal Party Status or Intervenor Status; any other interested party may file a written statement that becomes part of the record. While project developers and well-organized intervenors accustomed to the siting process may have the time and resources to attend hearings and review the complete record at the Siting Council's office, some interested parties may rely on information that is readily available over the Internet. The Connecticut Siting Council's web site (http://www.ct.gov/csc/site/default.asp) contains an updated schedule of Siting Council proceedings, links to the relevant statutes and regulations, application siting guides, the Annual Forecast of Loads and Resources, Siting Council membership, and general information on the Siting Council process. Information on an individual docket is limited to the Opinion, and Decision and Order issued by the Siting Council. Applications, technical reports, interrogatories, and responses to interrogatories, transcripts of hearings, Findings of Fact, and other relevant documents are not always provided to the Siting Council electronically, and consequently are not available on the Siting Council web site. Some projects, but not all, sponsor web sites where interested parties can find application documents, press releases, some technical studies, and general project information. These are helpful but incomplete records of the Siting Council proceedings.

<u>Recommendation</u>: Establish and maintain docket records readily accessible to the public through the Siting Council's web site. At a minimum, the web site should contain a docket management system that allows information to be searched by docket number, date, and keyword. Require the electronic filing of specified materials from the applicant, parties, and intervenors.

Objective: Facilitate public access to Siting Council proceedings and enhance public involvement in such proceedings.

Implementation:

- Subject to the exclusions below, the Siting Council has agreed to require the electronic filing of information associated with regulatory proceedings by an applicant, and parties and intervenors. The Siting Council has also agreed to post information, or identify links to information associated with regulatory proceedings on the Siting Council's web site, including the application, schedules, notices, reports, interrogatories, responses to interrogatories, Findings of Fact, Opinion, Decision and Order, progress reports, and monitoring reports (pre- and post-construction), as technically and practically possible.

- The Siting Council should maintain an up-to-date index that identifies all active dockets, their status, owner/developer, and location.
- Revise Section 16-50j-12 of the Regulations of Connecticut State Agencies to require the electronic filing and posting of documents in a proceeding.

Certain information may be excluded if determined to be a security risk or proprietary, or determined by the Siting Council to be consistent with legal standards for protective orders and/or protocol for homeland security. In addition, certain information may be excluded if it is in a non-reproducible format, if such information is referenced or cited and available by alternate means.

4.4 Recommendations for Other Legislative and Administrative Changes

4.4.1 Centralized Data Repository for Energy and Environmental Data within Long Island Sound

As part of the legislative mandate under PA No. 02-95, the Task Force has assembled readily accessible environmental data required under Section 3(A), including information regarding Connecticut's natural resources identified under CGS Section 22a-93. Much of this information had previously been developed and/or compiled by DEP. The Task Force augmented these data with other relevant information from a variety of sources, including information regarding Connecticut's aquaculture and fisheries resources, and energy and telecommunication infrastructure on land and crossing Long Island Sound. These available data are now in a geographic information system (GIS) accessible platform. This GIS database can serve as an important resource for state and municipal planners, environmental organizations, investors / project developers, project intervenors, scientists, educators, and other researchers, and other interested parties. The Task Force recognizes that some of the information, such as detailed locations of energy and telecommunication infrastructure, is sensitive and general dissemination of such information would violate security guidelines established by transmission owners, system operators, and regulators.

<u>**Recommendation:**</u> **Designate the Long Island Sound Resource Center at the University of Connecticut, Avery Point and/or the Map and Geographic Information Center (MAGIC) at the Homer Babbidge Library, University of Connecticut, Storrs as the repository for the Task Force's GIS (energy and environment) database, and other Long Island Sound information as developed.**

Objective: Allow for the Long Island Sound database to be maintained, updated, and made accessible to all interested parties, while maintaining the security and timeliness of the database.

Incorporate the Task Force's work product with existing DEP and MAGIC data. Ensure that access to the GIS database is open to the general public, and, as technology allows, available through the Internet. Sensitive information shall be de-sensitized so that precise locations of energy and telecommunication infrastructure are protected.

Implementation: Designation of the Long Island Sound Resource Center at the University of Connecticut, Avery Point and/or the MAGIC site at the University of Connecticut, Storrs as the central state repository for environmental and energy resource data.

- Scientific studies associated with regulatory proceedings should be maintained by respective agencies for public dissemination until resources are available for retention in a central repository.
- Legislative appropriation and funding will be needed to support database management, updates, and expansions. The estimated costs to establish and maintain a repository for the collection and dissemination of environmental and energy resource data for Long Island Sound would be approximately $100,000 per year.

4.4.2 Submerged Lands Leasing Program

In reviewing the effectiveness of natural resource performance bond levels to insure and reimburse the state for substantial damage to the public trust in natural resources of Long Island Sound, the Task Force concluded that existing regulatory tools can effectively address adverse impacts attributable to a specific project (Section 4.2). The Task Force also concluded that there may be a benefit to affording state agencies access to enhanced funding to address other impacts not attributable to a specific project. The Task Force concludes that such funding could be used to pay for general Long Island Sound resource restoration and research activities. The Task Force identified an expanded submerged lands leasing program as a possible means to enhance funding. Specific reference was made to submerged lands leasing programs in some other states, including New York.[330] Connecticut's existing submerged lands leasing program, as currently administered by the Department of Agriculture, applies to shellfish grounds in Long Island Sound within the state's jurisdiction.

In its discussion of an expanded submerged lands leasing program for Connecticut, the Task Force discussed at length the breadth and scope of issues for such a program. However, there was not consensus on how such a program could be applied objectively and without discrimination, consistent with existing state law. The very nature and composition of this Task Force limit its activities to consideration of the reliability of

[330] Information on New York's program is available at: www.ogs.state.ny.us/rppu/landunder/default.asp.

regional energy systems and environmental impacts associated with the placement of electric power lines, natural gas pipelines, and telecommunications cables in Long Island Sound. Other activities in Long Island Sound make use of public submerged lands and may have long-term and unanticipated environmental impacts; the Task Force identified certain of these activities, but did not consider them further. Further evaluation of a submerged lands leasing program, comprehensive in nature, requires the involvement of additional stakeholders including, but not limited to, recreational, industrial, commercial fisheries and shellfisheries, and shipping. Such an effort is beyond the charge and scope of this Task Force.

Recommendation: The Connecticut legislature should investigate the viability of and structure for a comprehensive and expanded submerged lands leasing program.

Objective: Provide a means to realize a public benefit from the private use of public submerged lands of Long Island Sound to fund a mechanism to be used by the state to enhance its management of public submerged lands, including potentially reimbursement of costs incurred by the state for long-term remediation in Long Island Sound, payment for restoration of resources in Long Island Sound and research to further protect the resources of Long Island Sound.

The use of a comprehensive, expanded public submerged lands leasing program may be consistent with the interests the state has in these lands and the interest the state and the public have in protecting and maintaining the valued resources of Long Island Sound.

Implementation: The Connecticut legislature could determine to further evaluate the viability of and structure for a comprehensive public submerged lands leasing program. Such an effort could involve users, stakeholders, federal officials and state officials from Connecticut, New York and Rhode Island. Authorization could be by statute or Executive Order.

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GLOSSARY

115 kV: 115 kilovolts or 115,000 volts

345 kV: 345 kilovolts or 345,000 volts

AC: Alternating current; an oscillating electric current that reverses its direction of flow 60 times a second (60 cycles or 60 hertz) in the U.S.

ACOE: Army Corps of Engineers

Algonquin: Algonquin Gas Transmission Company, a Duke Energy company

anadromous fish: Fish, such as salmon or alewives, that hatch in fresh water, migrate to and mature in the ocean, and return to fresh water as adults to spawn

anthropogenic: Changes made by human activity

anoxia: Low levels (<0.2 mg/L) of dissolved oxygen in the environment

azoic: Lacking animals and plants

bathymetry: Measurement of depths of water in oceans, seas, and lakes

Bcf: Billion cubic feet (of natural gas)

benthic community: Aquatic organisms and plants that live on the ocean bottom such as algae, worms, snails, and crustaceans.

bentonite: An absorptive and colloidal clay used especially as a filler.

biomass: The amount of living material per unit area or volume.

biota: The animal and plant life of a particular region considered as a total ecological entity

BOSTON: Boston, an RTEP sub-area

C&LM: Conservation and load management

cable: More than one electrical conductors within an envelope of insulation used for transmitting energy or data

capacity: The ability to generate, transmit or distribute electric power expressed in watts or volt-amperes

carapace: (1) Shield of exoskeleton covering part of the body (several segments) of some Arthropoda, e.g., crabs. (2) Dorsal part of 'shell' of Chelonia, specific to turtles, consisting of exoskeletal plates fused with ribs and vertebral column

CARES: Conservation and Retrofit Energy Services

catadromous fish: Fish, such as American eels, that hatch in the ocean, migrate to fresh water to mature, and return to the ocean as adults to spawn

CCMP: Comprehensive Conservation and Management Plan (Long Island Sound)

CEAB: Connecticut Energy Advisory Board

CECA: Connecticut Energy Coordinating Authority

CELT: NEPOOL annual Capacity, Energy, Load and Transmission report

Cetacea(n): Order of aquatic mammals (whales, porpoises, dolphins).

CGS: Connecticut General Statutes

CGT: Gravels, cobbles and boulders with sand

CHC: Connecticut Historical Commission

CHP: Combined heat and power, also referred to as cogeneration

circuit: A system of conductors through which an electric current flows

circuit breaker: A switch that automatically disconnects power to the circuit in the event of a fault condition; usually located in substations

CL&P: The Connecticut Light and Power Company, a subsidiary of NU, the electric utility that serves most of Connecticut

CLIC: Connecticut Long Island Cable project, proposed by NU

CMA: Connecticut Coastal Management Act

Columbia: Columbia Gas Transmission Corporation

conductor: A metallic busbar or wire, usually cyclindrical in shape, used as a path for the flow of electric power

conduit: A pipe, usually made from PVC plastic, polystyrene or steel, used to house, insulated electrical conductors or cables for both above and underground applications

CSC: Connecticut Siting Council

cultch: Material (as oyster shells) laid down on oyster grounds to furnish points of attachment for the spat

CT: Connecticut, an RTEP sub-area

DC: Direct current; electricity that flows continuously in one direction, often used at high voltages for point-to-point power transmission

Deficient Load Pocket: A sub-area of an electrical system in which peak demands cannot be met by local generators indicating reliance on transmission import capability, and possibly resulting in voltage disruptions and power outages

demand: The total amount of electricity required at any given time by a utility's customers

demersal: Living near, deposited on, or sinking to the bottom of the sea (~ fish, ~ fish eggs)

DEP: Connecticut Department of Environmental Protection

DFO: Distillate fuel oil

DG: Distributed generation; small-scale generation, typically less than 5 MW and often located at commercial or industrial sites that can be tied into the local distribution grid

DHS: Connecticut Department of Health Services

dielectric fluid: Insulating fluid (alkylbenezene and polybutene are most common)

displacement: Substitution of gas through exchange or backhaul

distribution (line or system): The cables or facilities that transport electrical energy, natural gas, or data from the transmission system to the utility's customers

DO: Dissolved Oxygen

DOT: Connecticut Department of Transportation

DPUC: Connecticut Department of Public Utility Control

DSL: Digital Subscriber Line

DSM: Demand Side Management

Dth: Decatherm, equal to MMBtu

ECMB: Energy Conservation Management Board

EECG: Energy Efficiency Collaborative Group

EFH: Essential Fish Habitat

EIS: Environmental Impact Statement

ELIE: Eastern Long Island Extension, a proposed Iroquois pipeline project (recently withdrawn from consideration)

EMF: Electric and magnetic field

EPA: (U.S.) Environmental Protection Agency

epibenthic megafauna: Macroscopic fauna living on the surface of the bottom.

epifauna(l): Benthic fauna living on the substrate (as a hard sea floor) or on other organisms

ESA: Endangered Species Act (federal)

estuarine: Semi-enclosed coastal waters with freshwater input bounded seaward by a salinity front

eutrophication: The process by which a body of water becomes (naturally or by pollution) rich in dissolved nutrients and often develops a deficiency of dissolved oxygen

fault: A failure or interruption in an electrical circuit

fauna: Animal life, especially the animals characteristic of a region, period, or special environment

FERC: Federal Energy Regulatory Commission

geomorphology: The systematic examination of landforms and their interpretation as records of geologic history

GIS: Geographic Information System

glacial till: Non-stratified sediment carried or deposited by glaciers

ground wire: A conductor or cable which usually runs above and parallel to the conducting wires on transmission structures, and serves to shunt lighting strikes to earth

HDD: Horizontal Directional Drilling

hp: Horsepower

HVAC: High-voltage alternating current, a type of electric transmission line

HVDC: High-voltage direct current, a type of electric transmission line

hypoxia: Low levels (<3 mg/L) of dissolved oxygen in the environment.

Hz (Hertz): A unit of electrical frequency: 1 Hz. = 1 cycle per second

ICAP: Installed Capacity

infaunal: Benthic fauna living in the substrate, especially the soft sea bottom.

insulators: Ceramic or polymer devices used in electrical isolation of overhead electric, power-carrying conductors from the structures that support them

Iroquois: Iroquois Gas Transmission System, L.P.

ISE: Institute for Sustainable Energy at Eastern Connecticut State University

Islander East: Islander East Pipeline Company, L.L.C.

ISO: Independent system operator

ISO-NE: ISO New England, Inc., New England's independent system operator

KEDLI: Keyspan Energy Delivery Long Island

KEDNY: Keyspan Energy Delivery New York

KES: Keyspan Electric Services

kV: Kilovolt, or 1000 volts; a measure of electric potential

kW: Kilowatt, or 1,000 Watts; a measure of electric power

kWh: Kilowatt-hour, or 1,000 Watt-Hours; a measure of electric energy

LAI: Levitan & Associates, Inc.

LDC: Local distribution company providing gas service

LILCO: Long Island Lighting Company

line: A group of overhead or underground transmission wires or cables suspended on a single row of structures or part of a single underground or marine installation that provide transmission or distribution service

LIPA: Long Island Power Authority

LISS: Long Island Sound Study; a cooperative program instituted by the federal government, Connecticut, and New York in 1985

LNG: Liquefied natural gas

load: Amount of electrical energy required by customers

load pocket: A transmission area that has insufficient transmission import capacity and must rely on out-of-merit order local generation

LOLE: Loss of Load Expectation; a measure of bulk power system reliability

LRP: Load Response Program

MAOP: Maximum Allowable Operating Pressure

M&N: Maritimes and Northeast Pipelines, a Duke Energy company

magnetic field: A closed-loop field that surrounds the electric current which produces it. Magnetic flux density, measured in Tesla or Gauss, is often referred to as the "magnetic field"

merit order: The order in which power plants are dispatched to minimize operating costs

mg/L: milligrams per liter

mill: One-tenth (1/10) of a cent; 1 Mill / kWh = $ 1 / MWh

MMcf: Million standard cubic feet of gas

MMcf/d: Million standard cubic feet per day

MMPA: Marine Mammal Protection Act of 1972

monopole: Transmission structure consisting of a single tubular steel column with horizontal arms to support insulators and conductors

morphology: (1) A branch of biology that deals with the form and structure of animals and plants; (2) the external structure of rocks in relation to the development of erosional forms or topographic features

MPA: Marine Protected Areas

MSW: Municipal Sold Waste

MVA: A unit of total electric power. Megaa-Volt-Ampere or 1 MVA = 1 million Volt-Amperes

MW: A unit of real electric power. Megawatt or 1 million watts

MWh: A unit of electrical energy. Megawatt-hour or 1million watt-hours

NDDB: National Diversity Data Base

NEPA: National Environmental Protection Act

NEPOOL: New England Power Pool

NeptuneRTS: Neptune Regional Transmission System

NERC: North American Electric Reliability Council

NESCAUM: Northeast States for Coordinated Air Use Management

NGA: Natural Gas Act

NHPA: National Historic Preservation Act of 1966

NMFS: National Marine Fisheries Service

NU: Northeast Utilities, parent company of CL&P as well as Western Massachusetts Electric, Public Service of New Hampshire, Yankee Gas, and other subsidiaries

NY: New York, an RTEP sub-area

NYISO: New York Independent System Operator

NYPA: New York Power Authority

NYSDEC: New York State Department of Environmental Conservation

NYSDOS: New York State Department of State

NYSERDA: New York Energy Research and Development Agency

NYSHPO: New York State Historic Preservation Office

NY Siting Board: New York Board on Electric Generation Siting and the Environment (NY Siting Board)

NYSPSC: New York Public Service Commission

OLISP: Connecticut Office of Long Island Sound Programs

OPM: Connecticut Office of Policy and Management

overhead: Electrical facilities installed above ground, usually relying on the air for insulation

PA No. 02-95: Connecticut Public Act No. 02-95, Act Concerning the Protection of Long Island Sound

PA No. 98-28: Connecticut Public Act No. 98-28, the Electric Restructuring Act

Peak Load (or Peak Demand): The maximum customer demand, typically over a one-year period

pelagic: Living or occurring in the water column of the open sea

Phase I: A transmission expansion that would extend the 345 kV transmission line from the Plumtree Substation in Bethel to the Norwalk Substation in Norwalk

Phase II: A transmission expansion that would extend the 345 kV loop from Norwalk to Beseck junction in Wallingford

photic zone: The depth zone in the ocean where sunlight penetrates, permitting photosynthesis

phytoplankton: Microscopic plants occurring mainly near the surface of the water where suitable illumination occurs; of great importance as a food source for zooplankton, fish and whales

PJM: The Pennsylvania-New Jersey-Maryland ISO control area

planktonic: Microscopic plants or animals living in the water column.

ppt: parts per thousand

PTF: Pool Transmission Facilities

PUESA: Public Utilities Environmental Standards Act (Chapter 277a_of the CT General Statutes)

PV: Photovoltaic; semiconductor device that converts sunlight into DC electricity

RD&D: Research Development and Demonstration

reconductor: Replacement of existing conductors with new conductors, but with little if any replacement or modification of existing structures

reinforcement: Any of a number of approaches to improve transmission system capacity, including rebuild, reconductor, conversion, and bundling methods

RFO: residual fuel oil

RFP: Request for Proposal

Rip-rap: A permanent, erosion-resistant groundcover constructed of large, loose, angular or subangular rounded stone

ROW: Right-of-way, a corridor for transmission or other facilities

RTEP: Regional Transmission Expansion Plan prepared by ISO-NE

S-ME: Southern Maine, an RTEP sub-area

salmonid: Of or belonging to the family Salmonidae, which includes salmon, trout, and whitefishes

SBC: System Benefits Charge

SCFF: Self-contained fluid-filled; a hollow-core cable with fluid-impregnated insulation under pressure used primarily for submarine electric transmission installations

sedimentology: The study of rocks formed from transported fragments deposited in water

SHPO:State Historic Preservation Office

silt curtains: A geotextile material designed to contain suspended sediments within a designated area

Siting Council: Connecticut Siting Council

SMD: Standard Market Design, proposed by FERC to standardize rules among ISOs

spawning: The reproductive process for aquatic organisms that involves producing or depositing eggs or discharging sperm

sublittoral: Below tidal influences

substation: A fenced-in yard containing switches, transformers and other equipment buildings and structures to monitor and adjust transmission and distribution flows

substrate: Surface area of solids or soils used by organisms to attach

SUNY: State University of New York

SWCT: Southwestern Connecticut, an RTEP sub-area

SWCT (geographic): SWCT consists of the following 52 towns and municipalities: Branford, Bridgeport, Darien, Easton, Fairfield, Greenwich, New Canaan, Norwalk, Redding, Ridgefield, Stamford, Weston, Westport, Wilton, Ansonia, Branford, Beacon Falls, Bethany, Bethel, Bridgewater, Brookfield, Cheshire, Danbury, Derby, East Haven, Hamden, Meriden, Middlebury, Milford, Monroe, Naugatuck, New Fairfield, New Milford, New Haven, Newtown, North Branford, North Haven, Orange, Oxford, Prospect, Roxbury, Seymour, Shelton, Southbury, Stratford, Trumbull, Wallingford, Waterbury, Watertown, West Haven, Woodbridge, and Woodbury

SWCT (electrical): The area served by the four 115 kV busses in Bethel, Watertown, Southington, and New Haven

TEAC: Transmission Expansion Advisory Committee

TE-CSC: Cross-Sound Cable project, owned by TransEnergie US

Tennessee: Tennessee Gas Pipeline Company, an El Paso Energy company

Texas Eastern: Texas Eastern Transmission Corporation, a Duke Energy company

tidal regime: A pattern of tidal movement

TMDL: Total Maximum Daily Load

Transco: Transcontinental Gas Pipeline

transformer: A device used to transform voltage; a step-up transformer increases the voltage while a step-down transformer decreases voltage

transmission line: Any line that functions to connect electric generators to distribution systems (and large individual loads), generally operating at 69 kV or above

turbidity: An indicator of the amount of sediment suspended in water. It refers to the amount of light scattered or absorbed by a fluid. In streams or rivers, turbidity is affected by suspended particles of silts and clays, and also by organic compounds like plankton and microorganisms. Turbidity is measured in nephelometric turbidity units

UI: United Illuminating, the electric utility that serves the greater New Haven and Bridgeport areas

upgrade: Any of a number of approaches to improve transmission system capacity, including rebuild, reconductor, conversion, and bundling methods

USFWS: U.S. Fish and Wildlife Service

USGS: U.S. Geological Survey

voltage: A measure of the force that transmits electricity

wire: See Conductor**XLPE:** Cross-linked polyethylene; a type of underground or submarine cable insulation

Yankee Gas: Yankee Gas Service Company