PSEG Long Island
Case Name: PSEG LI - Rate Case 2015
Docket No(s): Matter No. 15-00262

Response to Discovery Request: CITY-0002
Date of Response: 03/11/2015
Witness: CAPITAL BUDGETS

Question:
Please provide the latest version of the storm hardening program that is being implemented for LIPA's electric transmission and distribution system. Please include in your response the following information:

a. a comprehensive description of the projects, measures, and/or initiatives that PSEG and/or LIPA is implementing to harden the Authority's system against future climate events;

b. the location where each project, measure or initiative identified in (a) will be implemented;

c. amounts budgeted for, and spent on, the storm hardening program in calendar years ("CY") 2013 ("CY13"), CY14, and CY15, including a summary of budgets and expenditures within each operating area;

d. the storm hardening projects commenced and/or completed in CY13 and CY14;

e. the storm hardening projects planned for CY15;

f. amounts budgeted for storm hardening projects in Rate Year 1 ("RY1"; i.e., January 1, 2016 through December 31, 2016), RY2 (i.e., January 1, 2017 through December 31, 2017), and RY3 (i.e., January 1, 2018 through December 31, 2018); and

g. the storm hardening projects planned for RY1, RY2, and RY3.

Attachments Provided Herewith: 4
CITY_0002_Appendix_A_June_11_2009.pdf
CITY_0002_2013 Storm Hardening.pdf
CITY_0002_LIPA_Board_Presentation_2013_June_27.pdf
CITY_0002_2014 Storm Hardening.pdf

Response:
For the latest version of storm hardening program, please see the attached documents that highlight past programs and efforts

- LIPA Draft Electric Resource Plan -2009-2018: June 2009
- Presentation to LIPA Board – June 27th 2013

At this time, specific storm hardening efforts are being undertaken on existing equipment compromised during Super Storm Sandy. For new installations, the appropriate measures are being included in the design to address Category 3 wind impact and, where applicable, storm surge flood impacts.

a. Since Super Storm Sandy, LIPA and now PSEG LI have been concentrating efforts in three major areas:
   a. Substations:
      1) Hardening those substations that were damaged during the storm, e.g., raising equipment to prevent future flooding.
      2) New substations are designed to meet stronger design criteria.
   b. Transmission System
      1) New transmission lines are designed to meet stronger design criteria.
      2) The upgrade of transmission lines that cross critical infrastructure such as the Long Island Expressway, the numerous parkways and the Long Island Railroad.
   c. Distribution System
      1) Upgrading of distribution lines associated with the FEMA Grant (approximately 1000 miles)
      2) The installation of additional sectionalizers/reclosers associated with the FEMA Grant.

   See also response to CITY-0009

b. New substation installations are being designed to a higher strength to withstand higher level wind speeds up to 130 mph. Some examples are the new planned Kings Highway, Berry Street, Middle Island and Old Bethpage substations and the expansion of Cedarhurst, Malverne, New South Road, Syossett and South Manor stations. The future locations are identified in Exhibit CBP-2.

c. No specific costs are available for the incremental storm hardening cost components when substations were worked on. They are included as part of the overall project cost. Similarly, the storm hardening components associated with line construction are not specifically identified, and they are embedded in the overall project costs.

d. Projects commenced and/or completed in 2013 and 2014 include:
   - Arverne Substation 13 kV Switchgear #1 & 2 Replacement
   - Barrett Substation - Replace 1/2 switchgear a/w Bank 7 & 8
   - Rockaway Beach Substation 13 kV #3 & 4 Switchgear
   - Far Rockaway Substation 13 kV #7 & 8 Switchgear
   - Park Place Substation 13 kV #1 Switchgear
   - Woodmere Substation 13 kV #1 &2 Switchgear

e. Projects planned for 2015 include:
   - Arverne Substation 33 kV Switchgear
   - Barrett Substation - Replace 1/2 switchgear associated with Bank 8
   - Woodmere Substation Replace Control House

- Long Beach Substation - Replace first and second 1/2 switchgears & control cables
- Far Rockaway Substation - Replace 33kV Switchgear, Control Wiring and Control Panels
- Far Rockaway Substation - Replace 69kV inter- panel wiring & control cables
- Far Rockaway Substation - Replace Distribution Switchgear 2 & 11

f. Amounts budgeted for projects that relate to raising and repairing damage from Super Storm Sandy are included in Exhibit CBP-2 and in the table below:

In Flight - Reliability	2016	2016	2016
Rockaway Beach - Replace 4kv Banks & Swgr 1&2	**$3,600,000**		
Barrett - Replace 1/2 switchgear a/w Bank 7 and 1/2 switchgear a/w Bank 8 & Bank 11	**$1,500,000**		
Arverne - Replace 33kv Switchgear, control wiring and control panels	**$3,000,000**		

New Reliability	2016	2017	2018
Long Beach - Replace first and second 1/2 switchgears & control cables	**$6,700,000**		
Woodmere Replace Control cables (Note 1)			
Far Rockaway - Replace 33kV Switchgear, Control Wiring and Control Panels	**$5,500,000**		
Far Rockaway Replace 69kV inter- panel wiring & control cables (Note 2)		**$600,000**	
Far Rockaway Replace Dist Swgr 2&11	**$5,700,000**		

Note 1 Scope includes replacement of control cables which is scheduled for completion in 2015. However to optimize efficiencies, certain control cables will carryover in the following years as part of the Transmission Breaker Replacement program.

Note 2 Scope of this project is a work in progress and may include the advancement of Control House replacement in the 2016 – 2018 timeframe.

g. See f. above.

Long Island Power Authority

Draft Electric Resource Plan
2009 - 2018

June 11, 2009

Final Report
Appendix A, Technical Report

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List of Exhibits

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1 Overview

LIPA has organized the Electric Resource Plan and supporting documentation as follows:

- *The Electric Resource Plan*, provides a summary description of LIPA's plan for the period 2009 through 2018;
- *Appendix A, Technical Report*, provides detailed information regarding LIPA's plan, the planning process and the planning methodologies used to create the Electric Resource Plan;
- *Appendix B, Energy Primer*, offers readers an overview of energy related information, including a background on LIPA, and the current state of the energy industry;
- *Appendix C, Response to Comments*, summarizes the comments received during the public hearing process and provides LIPA's responses to commentators; and
- *Appendix D, Technical Appendices*, provides additional details on studies, methodologies, and criteria used in the planning analysis.

This document is Appendix A, Technical Report. It provides detailed information regarding the content and development of LIPA's Electric Resource Plan. Section 2 of the report provides an overview of the initiatives associated with the plan followed by a more detailed description of these elements in Section 3. Sections 4 through 9 provide a detailed description of how the plan was developed, identify results obtained in the planning process, and offer key observations and conclusions about Long Island's future energy requirements. The key conclusions articulated in this document form the backbone of the LIPA's Electric Resource Plan. Sections 4 and 5, respectively, offer the analysis behind the Energy Efficiency and Fuel Management portions of the plan. Sections 6 through 9 provide analyses that support the development of the integrated resource plan, incorporating energy efficiency, renewable technologies, conventional generating technologies and transmission concerns. Section 6 covers the major assumptions behind the Resource Planning Analysis followed by the assessment of need in Section 7. Section 8 outlines the screening of over 80 technology options, and finally, Section 9 covers the analysis of the different planning approaches that were evaluated during the development of the Electric Resource Plan.

The Electric Resource Plan is the culmination of an extensive and ongoing planning process that addresses both resource adequacy and infrastructure development for a 10-year planning horizon. Based on the current resource situation, the anticipated reserve requirements, and the available options to meet those requirements, LIPA has developed a flexible Electric Resource Plan that allows it to respond and adapt to changing conditions in the industry and in the market. The plan is a multi-faceted approach designed to address both short and long-term requirements.

LIPA intends to achieve its Mission through the five Strategic Objectives previously described in the Electric Resource Plan. These objectives include (1) promoting a healthy environment through leadership in energy efficiency and renewable resources, (2) balancing the objectives of the Electric Resource Plan against the impacts they have on customer bills, (3) maintaining high reliability of the bulk power system, (4) maintaining high reliability of the distribution system, and (5) positioning LIPA with the ability to respond rapidly to changes as a way of managing risk. For each of these five objectives, the plan identifies key goals and, in many cases, short-term targets to serve as milestones in measuring the success of the plan. Additionally, the plan identifies the means or recommendations for achieving the stated goals. Throughout this appendix, these initiatives are established with increasing specificity, so that they are appropriately tailored on an actionable basis to the level of the plan being discussed.

As shown in Exhibit 1-1, LIPA's Recommended Electric Resource Plan relies on the adoption of four key strategies: (1) committed investment in energy efficiency (2) acquisition of renewable generation resources, (3) maintaining and upgrading the existing fleet of resources, and (4) improving transmission interconnections to enhance our ability to deliver power to the island. The plan elements are characterized as either committed to, planned, or under study as defined in the text box to the right.

Committed, Planned and Under Study

Committed to **elements are either under firm contract, have approved funding, or are currently available;**

Planned **elements are those still under active discussion, negotiation, or development. While the intention is to proceed with these projects, LIPA may adjust the timing, size or design of the element as conditions change. For example, if LIPA has decided to issue a Request For Proposals (RFP) for power supply, transmission service, or DSM, the element is considered planned;** and

Under study **elements are those that are under discussion or in early stages of development, with no contractual commitment from LIPA. If, as an example, LIPA is considering the issuance of an RFP for power supply, transmission service, or DSM, but has not finalized the timing, or characteristics of the RFP, the element would be considered under study.**

LIPA's commitment to energy efficiency is demonstrated by the announcement of Efficiency Long Island (ELI), an enhanced program that builds upon LIPA's previous conservation efforts which concluded at the end of 2008. LIPA's ELI investment will encourage its customers to conserve by investing in the equipment, appliances, and installation and construction methods they utilize in their businesses and homes so that the most efficient technologies and practices available are adopted. ELI will offer prescriptive solutions such as appliance efficiency rebates, as well as customized approaches, such as helping customers to assess the appropriate technologies that result in lower energy consumption, to working with trades and contractors to ensure that they are aware of and trained in state of the art energy efficiency methods and practices. LIPA is committed to investing in this initiative over the next ten years. LIPA is further evaluating its ability to meet its efficiency goal by enhancing its internal generation and transmission system efficiencies, reducing energy losses, introducing smart meters through which customers may further modify their usage, and investigating in the use of efficient electro-technologies.

To address the second strategy, LIPA has endorsed adoption of a renewable portfolio standard (RPS) program such that LIPA would contribute its share toward the Statewide goal of having 25 percent of the states energy requirements provided by renewables by the year 2013. LIPA is investigating an increase in this goal to a level of 30% by 2015.

LIPA will issue both on and off-Island RFPs periodically to solicit cost-effective renewable technology resources. In addition, LIPA is also offering a net metering program for customers who install renewable systems and expanding the solar rebate to offer a backyard wind program and the solar entrepreneur program for businesses and municipalities to install solar at their facilities.

The third strategic element is to continue investigating enhancements to the existing fleet of resources through approaches such as examination of repowering opportunities, retirement potential, and the introduction of new resources through competitive procurement. LIPA continues to consider the ability to repower current generation resources cost-effectively, and to that end commissioned a study to evaluate the potential for and costs of such an effort at the Northport and Port Jefferson facilities. In parallel, LIPA is assessing the potential to repower the Barrett Station.

The final strategy in this balanced electric resource plan is the continuing effort to improve LIPA's interconnections. LIPA investigates and supports upgrades to existing interconnections where economic. LIPA has increased its ability to bring power in from New England and New Jersey through undersea cables and strengthened the interties with the NYISO. LIPA is moving forward with upgrades to the NUSCO cable to Connecticut to increase the capacity of that interconnection to bring power into Long Island. LIPA has access to the Pennsylvania, New Jersey and Maryland Interconnection (PJM) and the New York Independent System Operator (NYISO) and participates in technical meetings at each of these ISOs as well as ISO-New England (ISO-NE). In the past LIPA has evaluated which ISO offers the greatest benefit to its customers. LIPA continues to consider the advantages of various ISO memberships, and in the event that one ISO appears more favorable than another, a deeper investigation into the possibilities of new cable construction to enhance the interconnection to that ISO will be undertaken.

Exhibit 1-1 LIPA's Recommended Electric Resource Plan

1. Energy Efficiency
- Endorse adoption of a LIPA 15 x 15 plan
  - End-use efficiency
    - ELI
    - Additional DSM to close remaining gap
  - Generation efficiency
  - T&D efficiency
  - Smart Meters
  - Efficient Electro-Technologies

2. Renewable Resources
- Endorse adoption of a LIPA RPS program that supports statewide goal of 30% renewables by 2015
- Off-Island Renewable RFP
- On-Island Resources
  - Wind (regional and backyard)
  - PV 50 MW RFP and successors
  - Net Metering Program
  - Expansion of Solar Rebate
- Utilize renewables to enhance fuel diversity

3. Upgrade Existing Fleet
- Repower older plants to address environmental and efficiency issues
- Competitive procurement of green field plants and repowering/retirement
- Retire some of older steam plants
- Study best site for Peaking Unit retirements
  - Issue RFP for new 10-minute reserve
  - Retire targeted units

4. Improve Interconnections & Reliability
- Proceed with NUSCO Upgrade
- Study to examine membership in NYISO, PJM, or ISO-NE
- Target new interconnections with best ISO System
- SmartGrid System

Legend: Committed Planned Under Study

In this Electric Resource Plan, LIPA identifies a number of actions designed to facilitate achievement of the strategies enumerated as part of its Recommended Plan. LIPA intends to address sustainability within this plan while balancing the cost of actions with potential benefits. Our investments in sustainable solutions, like for example, the Governor's 45 x 15 initiative, must consider the implications for customer bills.

These recommendations are summarized below and are grouped into the four strategies under which the Plan was formulated. In addition, the recommendation number is shown beside each recommendation, which identifies the section of this document in which it is more fully described and identifies whether the recommendation is committed, planned or under study. We have highlighted the environmental goals first followed by the four key resource plan strategies.

1) Continue to Provide Responsible Environmental Stewardship on Long Island
   a) Monitor Emerging Air Regulatory Initiatives for Potential Implications, 4.1, Committed
   b) Minimize Impacts Associated with the Generation of Electricity, 4.2, Committed
   c) Undertake a Biofuels Assessment, 4.3, 7.4, Under Study
   d) Study Air Pollution Control Technologies, 4.4, Committed
   e) Minimize Impacts from Transmission and Distribution System Operations, 4.5, Committed
   f) Enhance Natural Habitat, 4.6, Committed
   g) Offer Recreational Trails on LIPA Grounds, 4.7, Under Study
   h) Report Greenhouse Gas Inventory, 4.8, Planned
   i) Emission Data Availability, 4.9, Planned
   j) Water Use Reduction Assessment, 4.10, Under Study
   k) Sustainability Improvements through Energy Efficiency, 4.11, Committed
   l) Sustainability Improvements through Renewable Resources, 4.12, Committed
   m) Encourage Economic Development Through Green Jobs, 4.13, Committed

2) Address Sustainability Improvements and Resource Need through Increased Investment in Energy Efficiency
   a) Customer End-Use Efficiency
      i) Invest in Efficiency Long Island Plan, 5.1, Committed
      ii) Monitor Performance of Efficiency Programs to Ensure Value is Achieved, 5.2, Committed
      iii) Ongoing Investigation of Cost-Effective and Targeted Energy Efficiency and Load Management Programs that meet the Overall Resource Planning Strategies, 5.3, Committed
      iv) Consider Smart Grid Systems, 5.6, Under Study
      v) Implement Smart Metering, 5.7, Planned
      vi) Study Cost Effective Ways of Meeting the 15 x 15 Goal, 5.8, Under Study
      vii) Invest in Electro-Technologies, 5.8, Under Study
   b) T&D System Efficiency
      i) Investigate and Invest in T&D System Efficiencies, 5.4. Committed
   c) Generation Efficiency
      i) Investigate and Invest in Generation System Efficiencies, 5.5, Committed

3) Support Sustainability Improvements and Resource Need through Investment in Renewable Resources
   a) Endorse the Adoption of a LIPA RPS program that supports the NYS goal of 30% renewables by 2015, 8.1, Planned
   b) Investigate Utilizing Transmission Inter-ties to Import Cost-Effective Renewable Energy from Off-Island Sources, 8.2. Planned
   c) Study Regional Wind Development, 8.3, Under Study
   d) Incentivize Backyard Wind, 8.4, Committed
   e) Solar PV RFPs, 8.5, Planned/Under Study
   f) Adopt Net Metering Program, 8.6 Committed

g) Expand the Solar Rebate Program, 8.7, Committed

4) Upgrade Existing Fleet
   a) Adopt Renewable Energy Resources to Reduce Fuel Price Volatility and Shortages, 7.1, Planned
   b) Continue to Maximize Fuel Diversity Opportunities, 7.2, Under Study
   c) Investigate Potential for Repowering Generation Units, 7.2, 8.7, Committed
   d) Issue a Competitive RFP to Address Potential Greenfield, Repowering or Retiring Existing Facilities, 8.8, Planned
   e) Continue Structured Hedging Program, 7.3, Committed
   f) Utilize RPS as a Means to Diversify Fuel Supply, 7.5, Committed
   g) Develop a Long Term Fuel Supply Plan for the Caithness Project, 7.6, Committed
   h) Joint Investigation of Deteriorating Fuel Supply Infrastructure on Long Island by LIPA and NYSERDA, 7.7, Planned
   i) Determine the Best Site for Peaking Unit Retirement, 8.9, Under Study

5) Improve Interconnections and Reliability
   a) Comply with T&D Regulatory Requirements, 6.3, Committed
   b) Maintain High Reliability Through System Infrastructure,6.1, Committed
   c) Adopt Customer Satisfaction Plan, 6.2, Committed
   d) Ensure T&D System Financial Performance, 6.4, Committed
   e) Explore Transmission Projects through Regional Planning Partnerships, 6.5, Under Study

6) Balance Investment with Impact on Customer Bills
   a) Explicitly include cost impacts in each analysis and decision for investment or policy changes, Committed

2 Action and Policy Plans

Flexibility is a key element of this plan. By actively encouraging the development of numerous alternatives and by selecting only the most reliable and cost-effective alternatives when needed, LIPA is able to maximize the value and minimize the risk of its energy portfolio.

LIPA's short term plan includes energy efficiency programs, contracts for merchant power, demand side management initiatives, renewable generation and other supply alternatives. In addition, specific plans and budgets have been developed for improvements and expansions of the transmission and distribution systems.

LIPA's long term plan uses a higher level approach that strives to maintain flexibility by investing in a multitude of areas, such as improving customer programs, measuring the impact of new technologies, encouraging the development of generation alternatives like new merchant plants and additional transmission import capability, and evaluating the options associated with enhancing existing power supply resources versus building new ones. Simultaneously, LIPA analyzes and assesses the risks of various courses of action and prepares for possible contingencies by preparing alternative plans and responses. This approach requires a vigilant and continuous scrutiny of the physical system and of ever-changing market conditions, but is rewarded by the flexibility brought about by maintaining multiple alternatives.

LIPA's Electric Resource Plan consists of five plan components identified as follows:

1. Environmental Plan - promotes a healthy environment through leadership in renewable technologies and emissions mitigation.

2. Efficiency Plan - explores ways to use energy more efficiently, by reducing load peaks, by improving the efficiency of energy usage via customer programs, and by updating generating technologies to increase operating efficiency.

3. Transmission and Distribution Plan - ensures that future electric generation can depend on a reliable and efficient electric grid. The Transmission and Distribution Plan, in part, discusses initiatives to enhance external interconnection tie-lines, which act in consort with the elements of the Environmental, Efficiency, and Power Supply Plans. The balance of the Transmission Plan and the Distribution Plan act to support LIPA's goal of providing reliable delivery of power to Long Island customers.

4. Fuel Management Plan - ensures that current and future generating technologies will have the fuel supply necessary to provide electricity to the grid. The Fuel Management plan explores the challenges of procurement, scheduling, delivery, and storage of multiple fuel sources, as well as the adequacy of the Long Island's fuel infrastructure.

5. Power Supply Plan - pulls all the plans together, as well as incorporates supply-side options such as renewable energy technologies, transmission interconnections, and possible retirement and/or repowering of traditional generating resources.

The main document of the Electric Resource Plan contains 45 recommendations, found throughout all five plans. Within this section of Appedix A, Technical Report, each of these plans is presented again individually, with their committed, planned, and under study initiatives outlined in tabular format. These tables include the names of each of the initiatives that addresses LIPA's strategic objectives, the associated recommendation number that each initiative is linked to in the Electric Resource Plan document, the respective in-service years in which each of these initiatives are projected to begin, and finally, the key goals these initiatives aim the achieve. Exhibit 2-1 depicts the organization and appearance of these subsequent plan summary tables. The initiatives outlined in these tables, and detailed further in Section 3, are organized according to whether they are committed, planned, or under study, as they are previously defined in Section 1 of this appendix. The initiatives described are organized in this same order in Section 3 of this appendix, where they are described in more detail.

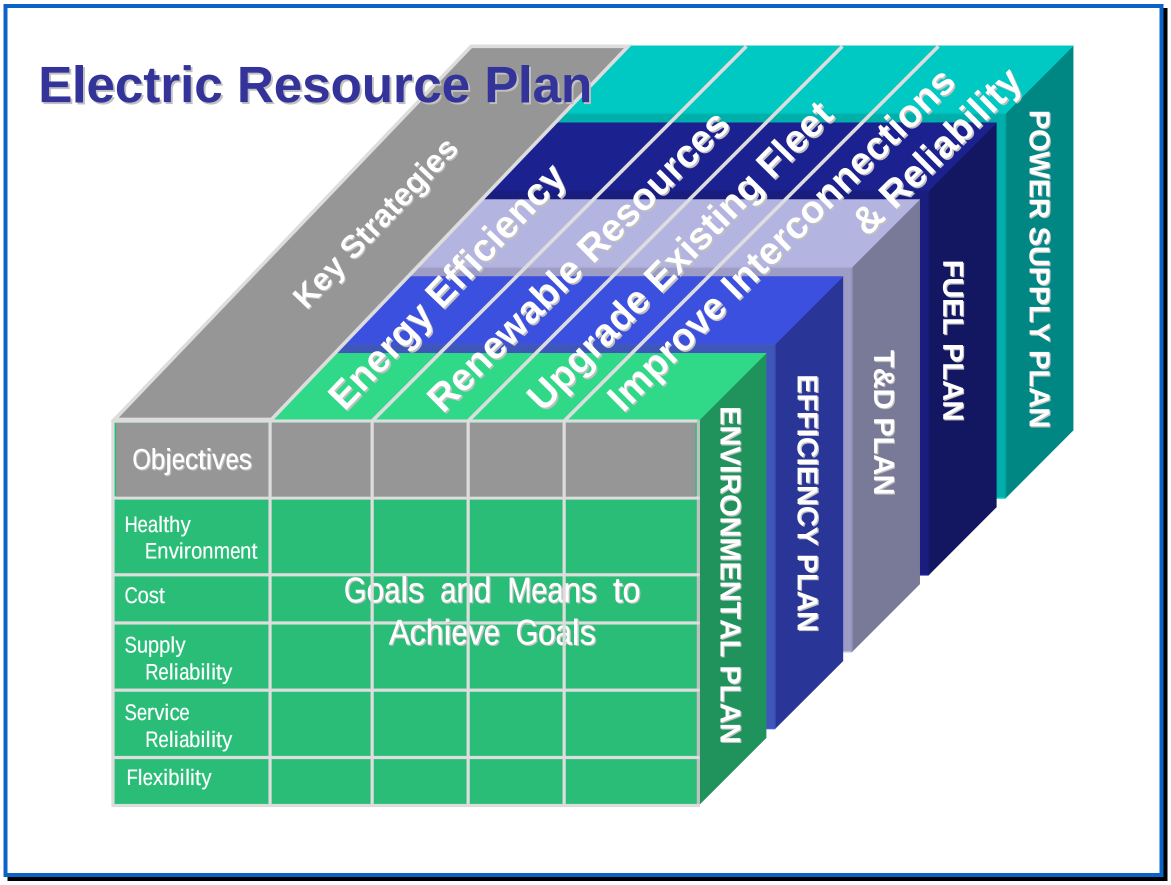
Exhibit 2-1 Component Plan Tables Format

Initiative	Recommendation Reference	Projected In-Service Year	Key Goals
Committed Initiatives			
Planned Initiatives			
Initiatives Under Study			

The multi-dimensional planning process that LIPA uses to address each of the components of the Electric Resource Plan is represented in Exhibit 2-2. The five strategic objectives are shown along the left side. These objectives, such as supporting a healthy environment, drive each of the component plans that make up the Electric Resource Plan and support the development of recommended actions. Across the top of the graphic the four key strategies of the Electric Resource Plan are depicted, including energy efficiency, renewable resources, upgrading the existing fleet, and improving interconnections. These four strategies were developed to support the organization's objectives, and drive the recommended actions in the Electric Resource Plan. On the right side of the graphic, each box represents an element, or component plan, of the Electric Resource Plan, for example the T&D Plan.

This graphic will reappear as each of the component plans are described in this appendix. Checkmarks are place in the matrix on the front-face, and are used to identify those areas in which the plan's recommended initiatives correspond to both LIPA's overall strategic objectives, and the resource plan's key strategies. This reoccurring graphic aims to provide readers with a high level summary of each individual component plan, while also to tie each of LIPA's initiatives to the strategic objectives and key strategies of the Electric Resource Plan.

Exhibit 2-2 LIPA's Integrated Plans



2.1 Environmental Plan

The Environmental Plan is focused on ensuring LIPA meets its objective of promoting a healthier environment. Programs focus on implementing environmentally responsible practices and strategies for the operation and maintenance of all components of the electric generation, transmission, and distribution system on Long Island. Renewable energy technologies, as well as emission reductions are but a few of the environmental concerns that LIPA acts to address with its Electric Resource Plan. A summary of LIPA's Environmental Plan is shown in Exhibit 2-3, below. A detailed discussion of specific Environmental Plan initiatives and ways to measure them is provided in Section 3.1 of this appendix.

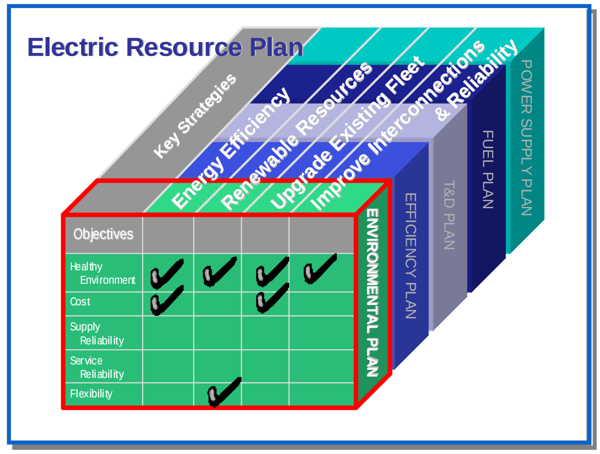


Exhibit 2-3 Environmental Plan

Initiative	Recommendation Reference	Projected In-Service Year	Key Goals
Committed Initiatives			
Emerging Air Regulatory Initiatives	4.1	Ongoing	• Plan to meet requirements of CO_2 emission reduction programs • Plan to meet Ozone Transport Commission High Energy Demand Days requirements • Plan for new Clean Air Interstate Rule regulations
Minimize Impacts Associated with Generation	4.2	Ongoing	• Ensure all new units have state-of-the-art emission control equipment • Optimize fuel mix to balance environmental requirements with customer costs
Study Air Pollution Control Technologies	4.4	2009	• Evaluate the use of lower sulfur fuel oil • Install efficiency improvement projects at Northport and Port Jefferson to improve fuel economy and cut CO_2 and NO_X emissions

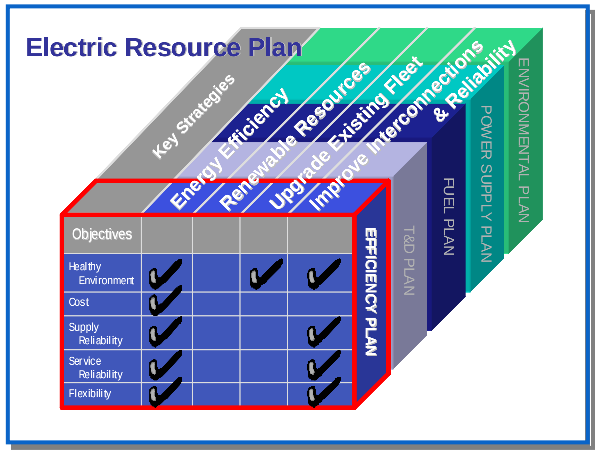
Exhibit 2-3 Environmental Plan (cont.)

Initiative	Recommendation Reference	Projected In-Service Year	Key Goals
Committed Initiatives			
Minimize Impacts from T&D System Operations	4.5	Ongoing	• Minimize dielectric fluid spills • Reduce impacts of construction in sensitive areas • Minimize the use of herbicides for vegetation control • Minimize the release of greenhouse gases from electrical transformers • Minimize the visual impacts of lines • Minimize the generation of waste • Minimize the noise from operating equipment • Exceed ground and surface water protective requirements in new substation construction
Habitat Enhancement	4.6	2010	• Create bird habitats along rights-of-way • Restore natural habitats on rights-of-way
Sustainability Improvements through Energy Efficiency	4.11	2009-2018	• Please refer to additional details found in the Efficiency Plan in Sections 2.2 and 3.2 of this appendix
Sustainability Improvements through Investment in renewables	4.12	2009-2018	• Please refer to additional details found in the Power Supply Plan in Sections 2.5 and 3.5 of this appendix
Encourage Economic Development (Green Collar Jobs)	4.13	Ongoing	• Creating jobs that support the advancement of a clean-energy economy on Long Island
Planned Initiatives			
Report Greenhouse Gas Inventory under recognized protocol	4.8	2010	• Achieve greenhouse gas reductions • Recognize past reductions

Exhibit 2-3 Environmental Plan (cont.)

Initiative	Recommendation Reference	Projected In-Service Year	Key Goals
Planned Initiatives			
Expand Availability of Emission Data	4.9	2010	• LIPA Web site link to public air emissions data for National Grid generating plants on Long Island
Initiatives Under Study			
Biofuels Assessment	4.3	2010	• Assess the viability of using biofuels in existing and new plants
Recreational Trails	4.7	2010	• Study the installation of recreational trails along LIPA transmission rights-of-way
Water Use Reduction Assessment	4.10	2011	• Assess the viability of using an innovative, patented system to improve efficiency and reduce water use impacts
Reduce CO_2 footprint	4.14	2009 2009-2030	• Establish CO_2 carbon footprint reduction goals • Study Cost-Effective Ways of Reducing Power Supply CO_2 Footprint Emissions to a Level 10% below 2005 Emission Levels by 2020 and a Level 20% below 2005 emission levels by 2030

2.2 Efficiency Plan



Energy Efficiency and Demand Side Management (DSM) programs play a key role in LIPA's overall energy strategy for Long Island. When implemented, such programs can mitigate the effect of peak demand on the operation and reliability of the electric system and ensure that expansion is accomplished in the most energy efficient manner possible.

One of LIPA's key strategies since 1999 has been to reduce customer bills through energy efficiency programs. LIPA has achieved significant savings through the Clean Energy Initiative implemented from 1999 through 2008. One of the key environmental recommendations is to continue and expand investment in energy efficiency. This section describes LIPA's new approach for the next phase of energy efficiency and peak reduction that will save consumers money while reducing the need for new generation.

LIPA has offered customers several alternative approaches to save on their energy bills since its inception. The first major program – the Clean Energy Initiative - was designed to be offered from 1999 through 2008. This ten year program demonstrated LIPA's commitment to the Demand Side Management (DSM) market, which included customers, distributors, and energy service companies, so that appropriate delivery markets would develop in support of the initiative. As this Initiative has come to its intended close at the end of 2008, LIPA is now implementing the Efficiency Long Island (ELI) program as it embarks on the next generation of efficiency initiatives.

To support program analysis, LIPA utilizes a team of outside experts to assist in developing efficiency programs and plans. LIPA also participates in various national and regional groups focused on developing the next generations of energy efficient products and programs. These groups include the Consortium for Energy Efficiency, the National Action Plan, and the Northeast Energy Efficiency Partnership. These teams of highly regarded and recognized industry experts work to develop guidelines and recommendations for the effective adoption of and implementation of long term efficiency goals across the United States. LIPA's internal experts in efficiency worked with a team of outside efficiency experts to develop the ELI plan.

This section describes LIPA's recommendations for investigating system efficiencies at its facilities and addresses the investigation of new efficiency opportunities for potential adoption throughout the planning horizon. Finally, LIPA's integrated approach to addressing New York State's 15 x 15 goal is also described.

Exhibit 2-4 Efficiency Plan

Initiative	Recommendation Reference	Projected In-Service Year	Key Goals
Committed Initiatives			
Invest in Efficiency Long Island Plan	5.1	2009-2018	• Reduce dependence on fossil fuels • Reduce emissions • Strengthen the Long Island Economy • Defer the need for new generation resources
Monitor Performance of Efficiency Programs to Ensure Value is Achieved	5.2	2009-2018	• Develop and enhance LIPA's monitoring and reporting systems

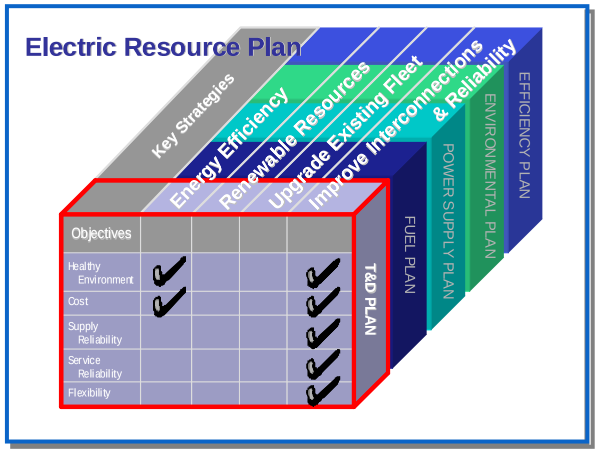
Exhibit 2-4 Efficiency Plan (cont.)

Initiative	Recommendation Reference	Projected In-Service Year	Key Goals
Committed Initiatives			
Ongoing Investigation of Cost-Effective and Targeted Energy Efficiency and Load Management Programs that Meet the Overall Resource Planning Strategies	5.3	Ongoing	In order to maintain a suitable and up to date portfolio of programs, the ongoing analytical process will, on a two year cycle, involve each of the following steps: • Review current and past programs to identify promising opportunities • Assess and incorporate new products and technologies as potential investment opportunities • Develop new customer targeted programs • Assess the level of savings from adoption by customers for each program • Analyze potential program combinations through the use of a portfolio screening tool to assess and compare the cost-effective and achievable savings potential • Evaluate and recommend the appropriate portfolio of options considering objectives and needs • Generate the inputs necessary for incorporation into the Electric Resource Plan
Investigate and Invest in LIPA T&D System Energy Efficiencies	5.4	Ongoing	• Please refer to the Transmission and Distribution Plan in sections 2.3 and 3.3 of this Appendix for additional information
Investigate and Invest in LIPA Generation System Energy Efficiencies	5.5	Ongoing	• Please refer to the Power Supply Plan in Section 2.5 and 3.5 of this Appendix for additional information

Exhibit 2-4 Efficiency Plan (cont.)

Initiative	Recommendation Reference	Projected In-Service Year	Key Goals
Planned Initiatives			
Implement Smart Metering System	5.7	2009	• Review ability to support open standards, flexibility, scalability • Obtain input from commercial and residential customers; needs, requirements, expectations
Initiatives Under Study			
Consider SmartGrid System	5.6	2009	• Investigate the benefits of and use of Smart Grid technology on the LIPA system
Study Cost-Effective Ways of Meeting the 15 x 15 Goal	5.8	2009	• Implementation of the Program by pursuing a 15% energy reduction by the year 2015

2.3 Transmission and Distribution Plan



Since taking over the electric system on Long Island in 1998, LIPA has made significant investments in updating and improving the reliability of the T&D system. Electric system reliability is measured by standard industry metrics for frequency and duration of outages. LIPA regularly leads all other New York overhead utilities in these standard reliability metrics and is regularly in the first quartile when compared with utilities nation wide. While, on average, electric system reliability is very good, some challenges that do persist include:

- Pockets of customers that have poorer reliability,
- Geographic difficulty in serving peninsula and neck areas of Long Island,
- Exposure to major hurricanes,
- High mature tree density in certain areas combined with high customer density,
- Limited space for transmission corridors and substation sites, and
- First and second generation aging infrastructure that is coming to the end of its useful life.

To address these challenges, while also maintaining the existing high reliability, LIPA both has in place and is currently developing programs that address four strategic areas:

1. Technical Performance;
2. Customer Satisfaction;
3. Compliance with Regulatory Requirements; and
4. T&D System Financial Performance.

It is important to note that several of these programs have been formulated intentionally to have overlapping effects in several of the four strategic areas. Programs within each of these strategic areas will be discussed in more detail throughout this document.

2.3.1 Technical Performance

While electric system reliability remains a primary focus of LIPA's strategies, those strategies have been expanding to include consideration of several additional elements. It is LIPA's overall goal to be among the industry leaders in managing and balancing the technical performance of the electrical T&D network. Several of the key elements include understanding equipment failure causes, equipment failure rates, equipment end of life, maintenance effectiveness, and success of system designs, system storm performance, and planned replacement of aging infrastructure.

Exhibit 2-5 provides the ongoing T&D Technical Performance (TP) Plan elements that are either committed to, planned, or under study.

Exhibit 2-5 T&D Technical Performance Plan Elements

Initiative	Recommendation Reference	Key Goals
Committed Initiatives		
TP1.1 Reliability: Distribution Tree Trim Program	6.1	• Improve system reliability at the customer level by undertaking a scheduled and on-demand vegetation control program near overhead electric lines
TP1.2 Reliability: Circuit Improvement Program	6.1	• Improve performance of least reliable circuits; (i.e. those that are likely to cause customer interruptions) and identify where reliability improvement measures are needed
TP1.3 Reliability: Infrared Scans of Distribution Lines	6.1	• Improve reliability by examining overhead distribution line equipment in order to replace or repair a component before its' failure causes an outage
TP1.4 Reliability: Distribution Automation and Automatic Sectionalizing Unit Installation Program	6.1	• Improve reliability by decreasing outage restoration times and limiting the number of customers interrupted when a mainline distribution system fault occurs
TP1.5 Reliability: Underground Cable Testing and Replacement Program	6.1	• Improve reliability through prioritized replacement of distribution circuit cables based on their condition, and reducing likelihood of failure which may cause customer interruptions
TP1.6 Reliability: Secondary Network Cable Replacements	6.1	• Maintain the highest degree of service reliability to customers served from aging underground secondary network facilities

Exhibit 2-5 T&D Technical Performance Plan Elements (cont.)

Initiative	Recommendation Reference	Key Goals
Committed Initiatives		
TP1.7 Reliability: Overloaded Distribution Transformer and Fuses Upgrades	6.1	• Improve reliability by reducing customer interruptions through continued implementation of the transformer upgrade program, which identifies overloaded distribution transformers that may contribute to increased customer interruptions during periods of peak summer usage
TP1.8 Reliability: Transmission and Distribution Pole Replacements and Reinforcements	6.1	• Maintain reliability of overhead distribution lines by maintaining the structural integrity of the overhead pole infrastructure
TP1.9 Reliability: Blackout Mitigation Program – Regional Standards and EIPP Project	6.1	• Improve reliability through implementation of stringent regional standards and faster detection of operating conditions leading to outages
TP1.10 Reliability: Blackout Mitigation Program – Upgrade of Oil Cable Systems	6.1	• Improve reliability by ensuring that cable pump back-up generator is in working order during a power outage
TP2.2 Aging Assets: Knowledge Management and Loss of Expertise	6.1	• Maintain high level of system performance through effective management of knowledge and best practices
TP3.1 Efficiency and Losses: Distribution Transformer Efficiency Program	6.1	• Continue reduction of system losses by proactive replacement and purchase of transformers that meet and exceed DOE transformer efficiency requirements
TP3.2 Efficiency and Losses: System Efficiency Improvement – “15/15 Program”	6.1	• Reduction of system losses in accordance with the NY State Energy Savings Initiative

Exhibit 2-5 T&D Technical Performance Plan Elements (cont.)

Initiative	Recommendation Reference	Key Goals
Committed Initiatives		
TP4. Technical Performance: System Adaptability	6.1	• Ensure long-range system performance by optimizing backbone infrastructure to support wide range of long term scenarios for power injections, load growth, and load distributions
TP5.1 Short Range Planning: Short Range Studies	6.1	• Ensure system performance by providing capacity to reliably serve load through short term (1-10 years) projects in adherence to long range strategy in order to minimize overall cost in long term
TP5.2 Short Range Planning: Load Forecasting	6.1	• Provide accurate and timely load forecast to ensure additional capacity will be available to effectively serve electric demand of existing and new distribution customers
TP5.3 Short Range Planning: Capacity to Serve the Load	6.1	• Timely support load growth in all load areas and load pockets with reliability of service consistent with performance targets
TP5.4 Short Range Planning: Enhancements to Improve Import Capability	6.1	• Increase the power import and export capability of the LIPA electric system
TP5.5 Short Range Planning: Service Voltage	6.1	• Maintain transmission and distribution voltages within design criteria limits and standards
TP5.6 Short Range Planning: Short Circuit Analyses	6.1	• Maintain system performance by ensuring system and equipment operation within design limits
TP5.7 Short Range Planning: Power Quality	6.1	• Provide quality power to LIPA customers.
TP7.1 System Improvement: Multi Purpose Use of Smart Protection Systems	6.1	• Improve system reliability and public and employee safety by leveraging latest technology of smart protection relays
TP7.2 System Improvement: Rapid Recovery and Readiness	6.1	• Improve system performance by more effective recovery from system events

Exhibit 2-5 T&D Technical Performance Plan Elements (cont.)

Initiative	Recommendation Reference	Key Goals
Committed Initiatives		
TP7.3 System Improvement: Storm Hardening	6.1	• Reinforce electric system to minimize impact of having a "Category 3" Storm land on LIPA's service territory
TP7.4 System Improvement: Outage Management Optimization	6.1	• Maintain and improve Reliability Performance Levels including CAIDI, SAIDI and SAIFI
TP7.5 System Improvement: Overhead vs. Underground Strategy and Design Criteria	6.1	• Performance improvement through optimum under grounding of distribution system
TP7.6 System Improvement: Load Pocket Optimization	6.1	• Enhance customer service reliability in constrained portions of the network
TP7.10 System Improvement: High Voltage Superconductor Cable Project	6.1	• Evaluate and demonstrate high capacity transmission cables in superconductor technology • Evaluate technology and potential for reduction in number of cables required in right of way
TP8.1 Risk and Risk Mitigation: Capital Budgeting with Performance Modeling	6.1	• Optimum use of LIPA capital spending and available resources for reliability and overall performance improvement
TP9.1 Process Effectiveness: Maintenance and Reliability Center Maintenance	6.1	• Improve system performance and reliability by reducing equipment failures through effective maintenance
TP9.2 Process Effectiveness: Planning and System Operation Improvement	6.1	• To improve System Operation by using sophisticated Planning tools in near-real-time mode to make better and faster system operation decisions

Exhibit 2-5 T&D Technical Performance Plan Elements (cont.)

Initiative	Recommendation Reference	Key Goals
Committed Initiatives		
TP10.1 Major Causes: Root Cause Failure Analysis	6.1	• Ensure effective performance improvement by identifying major root causes of failures
TP10.2 Major Causes: Misapplied and Outdated Assets	6.1	• To ensure system reliability and performance by timely replacement and upgrades of asset reaching their operating limits and/or end of life based on current and projected operating requirements
TP11. Technical Performance: Physical Security Assets	6.1	• Physical security and availability of critical assets in normal and emergency operating conditions
TP12.1 Public and Employee Safety: Safety Education Programs	6.1	• System operation with no, or minimum possible, risk for safety of public and employees
Planned Initiatives		
TP2.1 Reliability: Aging Physical Assets and Risk Modeling	6.1	• Maintain high reliability over long-term through continuous optimization of maintenance and replacement programs of aging physical assets.
TP5.8 Short Range Planning: Changing Nature of Customer Load	6.1	• Understand and adopt to changing nature of customer load
TP6.1 Improved Situation Awareness: Real Time Performance and Outage Monitoring	6.1	• Improve system performance and outage restoration by providing real-time information of system performance and outage management
TP7.7 System Improvement: Advanced Metering Infrastructure (AMI)	6.1	• Evaluate customer responsiveness and acceptance of time based rate structures

Exhibit 2-5 T&D Technical Performance Plan Elements (cont.)

Initiative	Recommendation Reference	Key Goals
Planned Initiatives		
TP8.2 Risk and Risk Mitigation: Risk Focused Asset Management	6.1	• Improve customer satisfaction, technical and financial performance, and regulatory compliance through implementation of new concepts enabling continuous performance and risk asset assessment
TP10.3 Major Causes: Design and Criteria	6.1	• Maintain system reliability by strictly complying y with LIPA T&D Design Criteria
TP10.4 Major Causes: Failure Rates and Statistics	6.1	• Improve reliability and technical performance by improving data collection and availability of failure statistics of key assets
Initiatives Under Study		
TP1.11 Reliability: Distribution Vision (DV) 2010	6.1	• Improve reliability by developing and implementing new Distribution Automation technology
TP5.9 Short Range Planning: Changing Nature of Generation Mix	6.1	• Reliably support load growth in all areas and load pockets consistent with performance target by timely adopting to changing nature of generation mix
TP6.2 Improved Situational Awareness: Improved Visualization for System Operation	6.1	• Improve near-real-time assessment of system reliability for system operators
TP7.8 System Improvement: IntelliGrid and Smart Grid Infrastructure	6.1	• Help develop 'Smart Grid' Technologies • Promote the development and adoption of open and non-proprietary standards • Lower the cost of implementing the 'Smart Grid' concepts
TP7.9 System Improvement: Universal Distribution Transformer	6.1	• Evaluate Intelligent Universal Transformer Technology for LIPA performance goals

Exhibit 2-5 T&D Technical Performance Plan Elements (cont.)

Initiative	Recommendation Reference	Key Goals
Initiatives Under Study		
TP10.5 Major Causes: End of Life Asset Modeling and Forecasting	6.1	• Improve reliability and technical performance by improving end-of-life assessment for key assets.
TP10.6 Major Causes: Process Effectiveness	6.1	• Improve performance by improving key asset management processes.

2.3.2 Customer Satisfaction

LIPA is an integral part of the Long Island community and has a primary interest providing service that satisfies its customers. The way that the T&D system is designed, constructed, maintained, and operated influences customer perception and satisfaction. While not all-inclusive of the range of customer satisfaction initiatives that LIPA is pursuing, several important initiatives directly concern the T&D system. These include power quality (PQ), outage management, billing accuracy, customer field contacts, storm management, storm performance, and customer communications.

Exhibit 2-6 provides the ongoing T&D Customer Satisfaction (CS) Plan elements.

Exhibit 2-6 T&D Customer Satisfaction Plan Elements

Initiative	Recommendation Reference	Key Goals
Committed Initiatives		
CS1. Customer Satisfaction	6.2	• Improve customer satisfaction by implementing programs aimed at reducing frequency and duration of outages experienced by customers
CS2. Customer Satisfaction: Power Quality	6.2	• Improve customer satisfaction by maintaining power quality and providing effective customer support
CS3. Customer Satisfaction: Support in Resolving Customer Power Quality Issues	6.2	• Improve customer satisfaction by providing expeditious review and resolution to customer Power Quality issues.
CS4. Customer Satisfaction: Service Quality	6.2	• Improve customer satisfaction by improved and proactive communication to customers and timely addressing customer concerns

Exhibit 2-6 T&D Customer Satisfaction Plan Elements (cont.)

Initiative	Recommendation Reference	Key Goals
Committed Initiatives		
CS5. Customer Satisfaction: O/H vs. U/G Criteria and Strategy	6.2	• Improvement of performance and customer satisfaction through optimum strategy and criteria for selective under grounding
CS6. Customer Satisfaction: Outage Management	6.2	• Improve customer satisfaction through better experience and communication during customer outage

2.3.3 Compliance with Regulatory Requirements

Compliance with applicable regulations is a prerequisite in LIPA's daily activities. Applicable regulations include reliability standards, environmental regulations, state and federal permitting requirements and emerging state and federal energy policies. LIPA examines the requirements of each applicable regulation and will often adapt its own, stricter or customized standard for performance. LIPA is also active in the creation of important environmental and reliability regulations.

Exhibit 2-7 provides the ongoing T&D Regulatory Compliance (RC) Plan elements.

Exhibit 2-7 T&D Regulatory Compliance Plan Elements

Initiative	Recommendation Reference	Key Goals
Committed Initiatives		
RC1.1 Reliability Standards: NERC/ERO Standard Compliance	6.3	• Comply with National Electric Reliability Council Planning Standards
RC1.2 Reliability Standards: NYSRC Standards Compliance	6.3	• Comply with New York Independent System Operator (NYISO) and New York Reliabiilty Council (NYSRC) and Northeast Power Coordinating Council (NPCC) Planning Standards
RC2.1 Planning Compliance: ISO Planning Process Compliance	6.3	• Comply with NYISO Planning Process

Exhibit 2-7 T&D Regulatory Compliance Plan Elements (cont.)

Initiative	Recommendation Reference	Key Goals
Committed Initiatives		
RC2.2 Planning Compliance: LIPA Additional Planning Criteria	6.3	• Provide capacity to serve customer load within compliance and with optimum solution for overall performance • Deliver power from new plants or interconnections across the system in compliance with standards with optimum solution for overall performance
RC3.1 Environmental Protection: Oil Containment Upgrades	6.3	• Comply with Suffolk County Health Services Code
RC3.2 Environmental Protection: Standards Compliance	6.3	• Comply with all applicable environmental laws and regulations • As a company, live up to high environmental standards and responsibilities
RC4. Article VII Permitting	6.3	• Improve system reliability by installing new transmission lines • Obtain public (customer) input and create goodwill for new transmission facilities 125kV and above
RC5. Regulatory Compliance – Energy Policy Act Issues	6.3	• Comply with Energy Policy Act requirements • Obtain public (customer) input and create goodwill

2.3.4 T&D System Financial Performance

LIPA aggressively manages the cost and financial performance of the T&D system. Capital expenditures traditionally come from reliability programs, increasing capacity of the system to serve new electric load, planned replacement of aging equipment, and updating of substandard equipment. The portfolio of capital projects is managed so that synergies between otherwise separate projects are realized whenever possible. The capital planning process evolves and improves from year to year. In recent years, additional emphasis has been placed on projects that reduce bottlenecks in the system, which can cause uneconomical generation resources to be operated. Given the anticipated direction on public policy, it is expected that development of SmartGrid technologies and improvement of the T&D system efficiency will become a dominant theme during the term of this energy plan.

Exhibit 2-8 provides the ongoing T&D Financial Performance (FP) Plan elements.

Exhibit 2-8 T&D System Financial Performance Plan Elements

Initiative	Recommendation Reference	Key Goals
Committed Initiatives		
FP1. Cost Effectiveness – Multidisciplinary Projects	6.4	• Improve financial performance through ensuring that synergies between otherwise separate projects are realized whenever possible
FP2. Risk and Risk Mitigation – Project Selection and Prioritization	6.4	• Improve performance by selecting the most efficient projects • Stay within limits of LIPA capital spending plan
FP3. Capital Forecasts	6.4	• Avoid placing upward pressure on rates whenever possible while maintaining system performance
FP4. Cost Effectiveness – Must Run Generation	6.4	• Improve cost effectiveness by reducing the use of non-economic generation
FP5. Cost Effectiveness – Life Cycle Cost Management	6.4	• Improve financial performance by optimizing long term and life cycle cost of assets
FP6. Cost effectiveness – Long range Plan and Infrastructure	6.4	• Improve financial performance by optimizing short term investment decisions with long term needs and system infrastructure development
FP7. End of Contract Risks	6.4	• Improve financial performance by optimizing short term investment decisions with long term needs and system infrastructure development

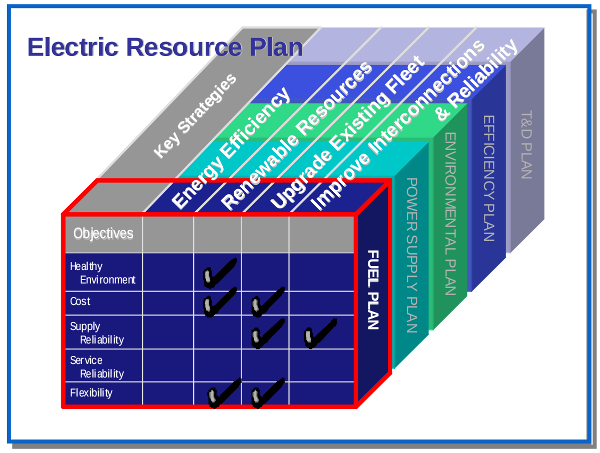
2.3.5 New York State Transmission Assessment and Reliability Study (STARS)

The New York Transmission Owners acting under the sponsorship of the NYISO Operating Committee, have commissioned the STARS. This initiative is intended to identify potential transmission projects that may help meet the transmission needs of New York State in the long-term.

Exhibit 2-9 New York State Transmission Assessment and Reliability Study

Initiative	Recommendation Reference	Key Goals
Initiatives Under Study		
Support STARS Transmission Infrastructure Study	6.5	• Participate in the STARS initiative as a Transmission Owner • Evaluate, as part of the STARS initiative, was of improving the transfer of upstate New York and Canadian power to Long Island including a potential project that could follow the Iroquois natural gas pipeline right of way to a landfall located at the Port Jefferson power station.

2.4 Fuel Management Plan



The Fuel Management Plan aims to address the concerns of future fuel supplies and delivery practices. This plan is necessary to support the other plan components of the Electric Resource Plan, such as the Environmental, Efficiency, and Power Supply Plans. A Fuel Management Plan allows for the consideration of future fuel types and fuel supplies, as well as the planning of future deliveries to generating resources on Long Island and in New York State.

Below is a summary table of the plan elements that make up the Fuel Management Plan. A detailed discussion of specific Fuel Management Plan elements is provided in Section 3.4 of this Appendix.

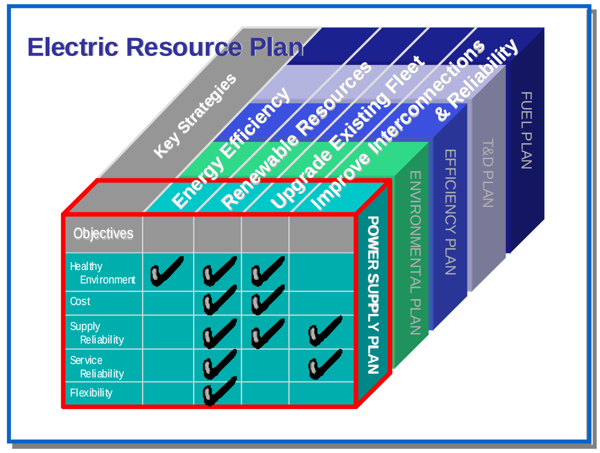
Exhibit 2-10 Fuel Management Plan

Initiative	Recommendation Reference	Projected In-Service Year	Key Goals
Committed Initiatives			
Continue Implementing a Structured Hedging Program	7.3	Ongoing	• Structured, yet flexible implementation program that achieves effective fuel hedging goals
Utilize RPS as a Means to Diversify Fuel Supply	7.5	Ongoing	• Continue to issue RFPs for renewable energy sources for the purpose of further diversifying LIPA's fuel supply mix
Long Term Fuel Supply and Fuel Management Plan for the Caithness Project	7.6	2010	• Draft a fuel supply and management plan to support the Caithness Power plant • Contract a fuel management services vendor by way of RFP • Contract for Natural Gas Supply by way of RFP

Exhibit 2-10 Fuel Management Plan (cont.)

Initiative	Recommendation Reference	Projected In-Service Year	Key Goals
Planned Initiatives			
Adopt Renewable Energy Resources to Reduces Risk of Fuel Price Volatility and Shortages	7.1	2009-2018	• Bring an increased amount of renewable energy options to Long Island
Address the Deteriorating Fuel Supply Infrastructure on Long Island	7.7	2011	• Assess the infrastructure capability, condition, and expectations
Initiatives Under Study			
Continue to Maximize Fuel Diversity Opportunities	7.2	2010	• Assess the feasibility of repowering existing units • Feasibility of fuel diversity options • Dual fuel capabilities at existing facilities
Investigate the Economics of Biofuel Projects	7.4	2009-2018	• Provide long term benefits from alternative fuel options on Long Island; • Reducing CO_2 emissions on Long Island

2.5 Power Supply Plan



The Power Supply Plan provides a balanced mix of generation resources that meet LIPA's objectives for competitive cost, minimal environmental impact, high reliability, and flexibility. This balanced portfolio of resources includes a mix of renewable alternatives and new, repowered and existing conventional resources in order to maximize the value from each:

- *Competitive costs* are assured by securing resources through a competitive selection process,
- *Environmental impact* is minimized by the use of primarily gas-fired supply options and renewable resources such as the development of an off-shore wind project,
- *Reliability* is enhanced through investments in existing facilities, the use of emerging and proven technology, and

The specific elements of the Power Supply Plan are summarized in Exhibit 2-11. A detailed discussion of specific Power Supply Plan elements, including both traditional generating and renewable resources is provided in Section 3.5 of this appendix.

Exhibit 2-11 Power Supply Plan

Initiaive	Recommendation Reference	Projected In-Service Year	Key Goals
Committed Initiatives			
Investigate Utilizing Transmission Inter-Ties to Import Cost-Effective Renewable Energy from Off-Island Sources	8.2	2009	• Successful delivery of Brookfield Energy hydro electic power (300,000 GWh) • Successful delivery of PPL landfill gas power (25,000 GWh)
Backyard Wind Initiative	8.4	2009-1018	• Provide rebates to homeowners, businesses, municipalities, and nonprofits that install "backyard" wind sources through the use of land-based wind turbines.

Initiaive	Recommendation Reference	Projected In-Service Year	Key Goals
Net Metering Program	8.6	2009	• Implement new tariff provisions that allow commercial customers who install solar generating equipment on their facilities, to sell excess generated power back to LIPA.

Exhibit 2-11 Power Supply Plan (cont.)

Initiaive	Recommendation Reference	Projected In-Service Year	Key Goals
Committed Initiatives			
Expansion of Solar Rebates	8.7	2009 2015	• Increase annual funding for incentives under its Solar program to $13.1 million. • Expand solar initiatives through the creation of a new Solar Entrepreneur program for businesses and municipal solar installations with capacities of up to 100 kW.
Caithness Project	8.10	2009	• Commercial Operation
Planned Initiatives			
Endorse the Adoption of a LIPA RPS Program that supports the Statewide Goal	8.1	2009-2015	• 30% renewables by 2015
Investigate Utilizing Transmission Inter-Ties to Import Cost-Effective Renewable Energy from Off-Island Sources	8.2	2009 2009-2015	• Successful deliviery of Brookfield Energy hydro electic power (300,000 GWh) and PPL landfill gas power (25,000 GWh) • Issue additional RFPs for off-Island rewable energy delivered to Long Island over interties
PV 50 MW RFP	8.5	2011	• 50 MW of Solar PV by 2011
Utilize Renewables to Enhance Fuel Diversity	8.8	2009-2018	• Issue RFPs to solicit renewable markets • Achieve lower environmental effects while also diversifying fuel mix

Exhibit 2-11 Power Supply Plan (cont.)

Initiaive	Recommendation Reference	Projected In-Service Year	Key Goals
Planned Initiatives			
Investigate Repowering Existing Older Plants to Address Enviromental Issues and Improve Efficiency	8.9	2009	• Determine technical viability, as well as economic and environmental implications
Address Potential Greenfield Plants and/or Repowering/Retireing Existing Plants	8.10	2009	• Issue competitive RFP to continue to investigate the opportunities for potential cost-effective greenfield plants and/or repowering/retiring existing facilities
NUSCO Cable Upgrade	8.12	2009	• Complete investigation of alternatives to increase transfer capacity beyond the current 200 MVA level. One option would bring the cable to its full 300 MVA rating. Another option would eliminate the emergency capability and use the backup cable to provide a total of 450 MVA.
Initiatives Under Study			
Regional Wind	8.3	2010	• Complete joint study to address the possibility of off-shore wind as an option to develop large scale regional wind resources
Future Solar Photovoltaic RFPs	8.5	2012-2018	• Dependant on the success of the current Solar RFP, issue additional RFPs

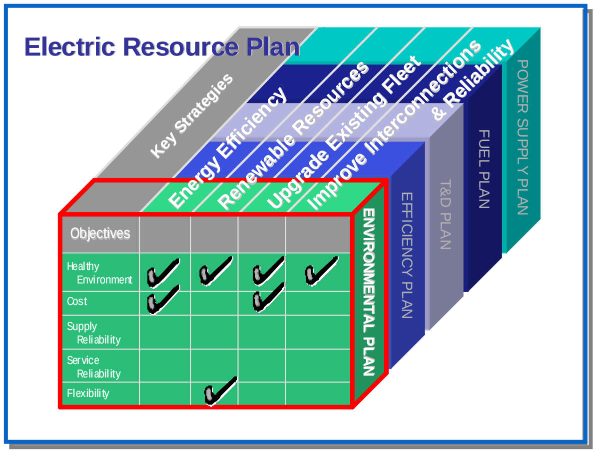
Exhibit 2-11 Power Supply Plan (cont.)

Initiaive	Recommendation Reference	Projected In-Service Year	Key Goals
Initiatives Under Study			
Repowering of Existing Plants	8.9	2009	• Assess the environmental, economic, and engineering feasibility of repowering existing Long Island plants – refer to Power Supply Plan in Section 2.5 and 3.5 of this Appendix for additional information
Determine the Best Site for Peaking Unit Retirements	8.11	2010	• Investigate the possibility of retiring and/or replacing some of its older peaking facilities.

3 Description of Plan Elements

This section provides detailed descriptions of the specific elements of LIPA's component plan elements as presented in the tables in Section 2 of this appendix.

3.1 Environmental Plan



LIPA is committed to promoting a healthier and cleaner environment. To this end, many steps have already been taken to minimize environmental impacts throughout the Long Island electric system. All components of the electric system, including generation, transmission, and distribution resources, can potentially impact the environment in numerous ways. It is essential that these systems be managed in an intelligent and proactive manner that meets both customer expectations and regulatory requirements, while maintaining quality service at a reasonable cost. The Environmental Plan is closely related to regulatory initiatives and requirements, which are described in Appendix B, Energy Primer.

Key Goals:

- ✓ *Plan to meet requirements of CO_2 emission reduction programs*
- ✓ *Plan to meet Ozone Transport Commission High Energy Demand Days requirements*
- ✓ *Plan for new Clean Air Interstate Rule regulations*

Targets:

- ✓ *Meet Nassau County CO_2 targets energy year*
- ✓ *Meet Suffolk County CO_2 targets every year*
- ✓ *Meet OTC targets every year regulations are in place*
- ✓ *Plan to meet NO_X and SO_2 CAIR targets*

Means:

- ✓ *Monitor compliance with all regulations*
- ✓ *Meet county targets by upgrading fleet through retirements, repowering and efficiency upgrades at plants*
- ✓ *Meet OTC HEAD targets once they are established through retrofits of plants and/or changes in operation*
- ✓ *Plan to CAIR targets identified in Exhibit 3-1*

3.1.1 Committed Initiatives

Committed to elements are either under firm contract, have approved funding, or are currently available

Monitor Emerging Air Regulatory Initiatives for Potential Implications (Recommendation 4.1)

There are numerous legislative and regulatory initiatives on the local, state and federal level designed to reduce emissions from the electric generating sector. The implementation of any one of these proposals will affect the future operation of generating units. As these occur, they will likely impact LIPA's electric resource options, and so must be factored into its planning. Relevant environmental initiatives and regulatory programs are described further in Appendix B, Energy Primer.

CO_2 Emission Reduction Programs

Both the Suffolk and Nassau County regulations set a target baseline CO_2 emission rate of 1,800 pounds per MW for all generators greater than 25 MW in the county. This target emission rate will then decrease by 1% for each 100 MW of new generation that comes on-line, up to a 20% reduction from the baseline. It is anticipated that compliance for the affected Long Island units will be feasible, especially as new, clean, efficient units are built that displace older generation. In addition, the Suffolk County Carbon Cap Implementation Advisory Committee was established to develop strategies for the reduction of greenhouse gas emissions from electric generation in Suffolk County by 25%. LIPA and its T&D system manager, National Grid, are on this committee to assist in its mission.

The Regional Greenhouse Gas Initiative (RGGI) is an agreement to stabilize carbon dioxide emissions from the Northeast region's power plants at current levels from 2009 through the end of 2014, followed by a 10% reduction in emissions by 2019 through a regional cap-and-trade program. The Part 242 NYCRR follows the model rule as developed by participating states in establishing the CO_2 Budget Trading Program. LIPA is working with its power suppliers that are under contract to minimize the costs and emission of carbon dioxide associated with its purchased power. LIPA is also evaluating several initiatives to increase the efficiency of specific units, increase overall system efficiency, and/or switch to lower carbon fuels. Further, LIPA is expanding its renewable energy programs.

Ozone Transport Commission High Energy Demand Days

The Ozone Transport Commission (OTC) is a multi-state organization created under the Clean Air Act (CAA) to develop and implement regional solutions to the ground-level ozone problem in the Northeast and Mid-Atlantic regions. The OTC issued a Memo of Understanding (MOU) on March 3, 2007 identifying NO_x reductions by High Electrical Demand Day (HEDD) units in the Northeast that should be achieved at the earliest by the beginning of the 2009 Ozone season, but no later than 2012. Although no state regulations are in place, compliance planning with this program has started with the installation of additional NO_x reduction technology already being pursued under CAIR, and NO_x reduction using water injection at the Holtsville gas turbine units.

Clean Air Interstate Rule

On the federal level, the U.S. Environmental Protection Agency (EPA) enacted the Clean Air Interstate Rule in an effort to achieve attainment with the 8 hour ozone and the new fine particulate (PM2.5) ambient air quality standards. The regulations, which affect states in the eastern half of the country, will require substantial reductions in NO_x and SO_2 emissions. Phase 1 NO_x begins in 2009 and will require 35% reduction in emissions from current levels; Phase 2 begins in 2015, and requires an additional 10% reduction. Compliance with this program for the PSA units will require the installation of additional NO_x reduction technologies, of which numerous options are currently being evaluated, at one or more of the units. It is anticipated that the use of 0.5% S fuel at Northport and Port Jefferson will ensure compliance with this program.

All of the above initiatives will affect the pricing of energy and capacity resources both on and off Long Island and will be factored into LIPA's resource planning decisions. They will also continue the trend towards lower air emissions and cleaner air, as well as start efforts on climate stabilization. They will also have the added benefit of lowering dependence of foreign oil and gas.

Exhibit 3-1 Annual SO_2 and NO_X Compliance Targets

Year	SO_2 Compliance Targets (in Thousands of Tons)	NO_X Compliance Targets (in Thousands of Tons)
1	27	6.5
2	26.5	6.5
3	26.5	6.5
4	26.5	6.5
5	26.5	6.5
6	26.5	5.9
7	18.5	5.9
8	18.5	5.9
9	18.5	5.9
10	18.5	5.9
11	18.5	5.9
12	18.5	5.9
13	18.5	5.9
14	18.5	5.9
15	18.5	5.9
16	18.5	5.9
17	18.5	5.9
18	18.5	5.9
19	18.5	5.9
20	18.5	5.9

Minimizing Impacts Associated with the Generation of Electricity (Recommendation 4.2)

Electric generation supplied to LIPA is produced both on- and off- Island. A description of the generation resources, fuel mix, and emission reduction efforts to minimize the impacts from the generation of electricity are discussed below.

Key Goals:

- ✓ *Ensure all new units have state-of-the-art emission control equipment*
- ✓ *Optimize fuel mix to balance environmental requirements with customer costs*

Targets:

- ✓ *Each unit built under contract to LIPA or by LIPA should have state of the art transmission technology*
- ✓ *Put into operation a emissions monitoring system to allow dispatch decisions to be informed by emissions impacts by January 2010*

Means:

- ✓ *Continuing incorporating emissions costs into bidding decisions*
- ✓ *Modify bid prices and/or fuel switch when emissions approach budgeted targets*

State-Of-The-Art Emission Control Equipment

New York State has an aggressive approach to regulating emissions from fossil-fueled electric generators. Increasingly restrictive regulations, such as those described above ensure that generation sources are equipped with advances in emission controls. In addition, new generation sources meet highly stringent requirements for state of the art emission controls.

The majority of the units on the LIPA system, the PSA, units report some of the lowest NO_x, SO_2, and CO_2 emission rates as compared to other baseload plants in New York State and the nation. Their low emissions are directly attributed to pollution reduction efforts, increased efficiency, and the use of clean fuel.

Optimizing Fuel Mix

Optimizing LIPA's fuel mix balances selection of generation sources and the fuels used to ensure that the emissions generated to produce a megawatt of electricity are balanced with generation costs and system reliability.

- *Generating Sources* - Base load steam electric generators and combustion turbine generators owned by National Grid provide the majority of on-Island generation capacity. These units utilize fuel oil or natural gas or both to generate electricity. The remaining on-Island generation capacity is supplied through generators owned by other private companies, State authorities, and municipal government utilities. These sources use a variety of fuels, including fuel oil, natural gas, and trash or wood.
- *Fuel Mix* - Whereas most of the electric power generation in the U.S. is produced by coal, the New York State fuel mix relies more heavily on cleaner emitting fuels such as natural gas, nuclear, low sulfur fuel oil, and renewable hydroelectric. On-island generation is limited to low sulfur fuel oil and natural gas, with a small contribution from resource recovery. The future mix is dependant upon fuel costs and environmental regulations; currently natural gas is the economic fuel for the PSA units. Having the option to use either natural gas or fuel oil to generate electricity provides desirable fuel diversity, which helps minimize generation costs and enhances reliability. In addition, LIPA's fuel mix is further diversified by its use of renewables, nuclear entitlement, hydroelectric, and off-island market purchases. LIPA is actively studying expanded use of biofuel as well.

Study Air Pollution Control Technologies (Recommendation 4.4)

To meet the reductions required by programs such as CAIR and RGGI, LIPA and National Grid are evaluating the use of lower sulfur fuel oil, biofuel, the installation of efficiency improvement projects at Northport to improve fuel economy and cut CO_2 emissions, and one or more NO_x emission reduction technologies. It is expected that a 20-30% reduction in NO_x emissions from the PSA units will be required to meet the increasingly stringent environmental regulations.

Key Goals:

- ✓ *Evaluate the use of lower sulfur fuel oil*
- ✓ *Install efficiency improvement projects at Northport and Port Jefferson to improve fuel economy and cut CO_2 and NO_X emissions*

Targets:

- ✓ *Install Dense Pack at Northport 3 by December 2009*
- ✓ *Install Dense Pack at Northport 4 by December 2010*
- ✓ *Install Dense Pack at Northport 1 by December 2011*
- ✓ *Install Dense Pack at Northport 2 by December 2012*
- ✓ *Install NO_X at Port Jefferson 4 by June 2010*
- ✓ *Install NO_X at Port Jefferson 34 by June 2011*
- ✓ *Install NO_X controls on Holtsville Units 6-10 by December 2009*

Means:

- ✓ *Use technology upgrades to reduce emissions and improve efficiency*
- ✓ *Fuel switch between fuel types or to lower sulfur content fuels when needed to meet emissions targets*

Minimizing Impacts from Transmission and Distribution System Operations (Recommendation 4.5)

There are numerous initiatives to minimize impacts from transmission and distribution systems. LIPA is taking action or directing others to ensure a cost-effective approach to environmental compliance, and identifying future activities that LIPA will consider in its efforts to promote a healthier environment.

Substations

The environmental issues for operating substations are related to dielectric fluid spills and their associated response and prevention efforts, pesticide usage, SF_6 (sulfur hexafluoride) greenhouse gas use, equipment servicing, and siting related issues. LIPA's approach to addressing these issues includes the following:

- Implementing a comprehensive Spill Response Program;
- Minimizing and eliminating use of Polychlorinated Biphenyls (PCBs);
- Minimizing the use of herbicides;
- Minimizing emissions of sulfur hexafluoride (SF_6) gas from high-voltage equipment by sealing switch gear and breakers, and implementing an aggressive repair program;
- Servicing equipment proactively to avoid fluid releases where possible;
- Considering environmental compatibility, visual impacts, and other siting issues when selecting locations for substations;
- Constructing spill containment at substations where warranted by environmental risk; and
- Implementing a Wetlands Construction Guideline to minimize impacts to wetlands or surface waters.

Transmission System

The overhead and underground electric transmission system serves over 1,200 square miles of LIPA service territory within Nassau and Suffolk counties and the Far Rockaway Peninsula. The environmental issues associated with the transmission system involve dielectric fluid spills from pipe-type cable in the underground system, visual impacts, electric and magnetic fields (EMF), right-of-way (ROW) maintenance, and siting. LIPA's approach to addressing these issues includes the following:

- Minimizing spill impacts from pipe-type cable systems;
- Monitoring research on Electric and Magnetic Fields (EMF) and, where feasible, consider low EMF design configurations in new facilities;
- Minimizing use of herbicides; and
- Considering environmental compatibility and other siting issues when selecting locations for transmission facilities.

Distribution System

There are nearly 9,000 circuit miles of overhead and 4,500 circuit miles of underground distribution lines, and 535,000 poles within the LIPA service territory. The primary issues associated with the distribution system are related to dielectric fluid spills from transformers, capacitors, and pole preservatives. Historically, the total number of spills for the distribution system from all causes ranges from 165 to 240 per year. The causes include transformer overloads, vehicle accidents, inclement weather (storms and heat), and equipment failure (leaking etc.). All transformers owned by LIPA were specified, at the time of purchase from the transformer manufacturer, to contain a dielectric fluid consisting of mineral oil, not PCBs.

Much time and effort has gone into the design of the distribution system to prevent electrical outages and concurrent transformer failures and associated spills. Overload protection and tree trim operations have enhanced system reliability and reduced the number of spill incidents.

LIPA currently acquires distribution poles treated with either Copper Naphthenate or Chromated Copper Arsenate (CCA). In the past, distribution poles purchased by LIPA and its predecessor LILCO were also treated with Pentachlorophenol. LIPA and KeySpan have participated in an Electric Power Research Institute (EPRI) sponsored study on the life-cycle cost analysis of various treated wood and composite options for distribution poles. The analysis was performed using EPRI's Life-Cycle Cost Management System methodology and software. Based on the assumptions used in the analysis for the expected life of various options, poles treated with CCA-ET (CCA Emulsion Treatment) are currently the cheapest over the full life cycle.

A spill response team is in place to respond to any releases from the distribution system. Refresher training and environmental outreach programs will continue to be provided to sustain LIPA's compliance posture.

Waste Management

Solid waste, hazardous or non-hazardous, is generated throughout the T&D system. Typically, most of the wastes from LIPA's electrical system consist of dielectric fluid, with or without PCB contamination, spill debris, and used poles. The total annual volume of PCB contaminated waste has been decreasing since 1997.

LIPA and its contractor National Grid have put into place a multi-faceted program for managing and controlling hazardous and non-hazardous waste. Some of the key elements are:

- Corporate Environmental Policy and implementing procedures,
- Environmental Oversight Committee consisting of corporate vice-presidents,
- Spill Response Plans,
- Hazardous waste disposal contracts,
- NYS Department of Environmental Conservation permitted storage facility (TSDF),
- Hazardous Waste Generator Outreach Conservation Program,
- Waste Minimization Program,
- Corporate training,
- Company-wide education programs on proper waste management, and
- Audit and Surveillance Program.

A centralized treatment, storage, and disposal facility (TSDF) is used to minimize both environmental impacts and costs associated with the transport and temporary storage of hazardous and non-hazardous wastes. The TSDF also ensures the proper disposal of such wastes. The use of a centralized TSDF with a staff of highly trained personnel provides strict controls over the management of the hazardous wastes. In addition, the facility also serves as a central processing facility for recovery and recycling of transformers containing both environmentally sensitive PCBs and non-PCB dielectric fluids. Waste minimization plans are also implemented at facilities that generate hazardous waste.

LIPA has a very active waste minimization program. There is a formal pollution prevention policy with documented supporting procedures. A "gatekeeper" system that evaluates the procurement of all chemicals is in place to control their purchase and use in order to minimize employee exposure and ultimately reduce the generation of hazardous waste. This procedure ensures that non-hazardous materials are always the first purchase option.

There is an active program to educate employees on proper waste management. All new operations employees are required to attend a session on environmental programs where waste minimization is stressed. Brochures and bulletins on environmentally friendly operational practices are regularly prepared and distributed to operations personnel.

Non-hazardous wastes such as tires, batteries, and scrap metals, are recycled. In addition, life-cycle analyses are performed to evaluate the amount and types of waste generated and methods to reduce their generation.

Habitat Enhancement (Recommendation 4.6)

LIPA's Transmission Line Right-of-Way (ROW) Plan provides for various environmental stewardship initiatives. LIPA employs ROW management personnel and contractors who are trained in the practice of environmentally sound land management, and provides staff and resources to assist with environmental stewardship programs. Such assistance is often requested by municipal agencies and various environmental groups. Recent and ongoing efforts include:

- In partnership with the Audubon Society, set up bird nesting boxes for American Kestrels in Setauket Woods and for Eastern Bluebirds in Dix Hills which are monitored by members of the Audubon Society;
- Working with the Town of Brookhaven and Suffolk County Parks Department in a cooperative land management plan for Setauket Woods;
- Assist the Friends of the Hempstead Plains and Nassau County Parks Department to remove invasive woody brush from one of the last remaining stands of Hempstead Plains grassland vegetation at Uniondale; and
- Worked with the Pine Barrens Commissions Law Enforcement to minimize use of ROW's by all-terrain vehicles by installing gates and barriers at entrances bordering park areas in Westhampton and Flanders.

LIPA will continue to explore opportunities to help to protect and enhance Long Island's natural resources as they arise.

Sustainability Improvements through Energy Efficiency (Recommendation 4.11)

This recommendation is more fully detailed in Section 3.2 of this appendix, which discusses the Efficiency Plan elements.

Sustainability Improvements through Investment in Renewable Resources (Recommendation 4.12)

This recommendation is more fully detailed in Section 3.5 of this appendix, which discusses the Power Supply Plan elements.

Encourage Economic Development - Green Collar Jobs (Recommendation 4.13)

Key Goals:
- ✓ *Creating jobs that support the advancement of a clean-energy economy on Long Island*

Targets:
- ✓ *Contract for the Installation of 50 MW of on-island solar PV projects by September 2009*
- ✓ *Install 50 MW of on-island solar PV projects by June 2011*

Means:
- ✓ *Solar RFP*
- ✓ *Solar Pioneer and Solar Entrepreneur Program*
- ✓ *Backyard Wind Program*

The Long Island Power Authority aggressively supports and encourages economic expansion on Long Island by attracting new business, by partnering on business expansion projects and by developing plans to retain existing businesses. We firmly believe that planned, manageable commercial and industrial growth enhances economic job and educational opportunities on Long Island. LIPA commits to achieving this growth while maintaining the quality of life on Long Island and preserving Long Island's abundant resources.

A report from the Political Economy Research Institute entitled "Job Opportunities for the Green Economy" was released in June, 2008 by a coalition of labor an environmental groups. The report offers evidence that millions of Americans are currently employed in green jobs and that millions more could benefit from a transition to a clean-energy economy.

What makes an occupation "green" is that the people working in them contribute toward environmental solutions to the problem of global warming. For example, the construction of wind farms creates jobs for sheet metal workers, machinists and truck drivers, among many others. Efforts to increase the energy efficiency of buildings through retrofitting rely on roofers, insulators, building inspectors and workers with many other skills. Train operators who now deliver furniture may one day deliver wind turbine component parts, meaning that their work will be contributing to the shift to a green economy that solves global warming and builds healthier communities.

Green jobs don't just mean the creation of new jobs. They can also mean greater job security for people who already work in a variety of fields. For example, if LIPA continues to promote weather-proofing homes and retrofitting buildings to meet new energy-efficiency standards, you can expect to see a rise in the number of carpentry jobs. The number of green jobs will only increase with a broadening commitment to building a clean-energy economy.

3.1.2 Planned Initiatives

Planned elements are those still under active discussion, negotiation, or development. While the intention is to proceed with these projects, LIPA may adjust the timing, size or design of the element as conditions change.

Report Greenhouse Gas Inventory (Recommendation 4.8)

LIPA believes the value of reporting greenhouse gases ensures that past reductions are fully recognized and future reductions are meaningful. To this end, LIPA is evaluating the voluntary reporting programs that are expected to be the template for future mandatory reporting requirements. The reporting of greenhouse gases includes all six gases identified in the Kyoto protocol, including carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). Of these, CO_2 and SF_6 are of primary concern to LIPA. The reporting protocols will be evaluated with respect to relevance to LIPA's operations and goals for achieving greenhouse gas reductions.

Key Goals:
- ✓ *Achieve greenhouse gas reductions*
- ✓ *Recognize past reductions*

Targets:
- ✓ *Register to participate in the Climate Change Registry by December 31, 2009 for level 3 reporting*

Means:
- ✓ *Register for Climate Change Registry for level 3 participation.*

Expand Availability of Emission Data (Recommendation 4.9)

In order to facilitate communication, LIPA will provide publicly available air emissions information on its Web site, www.lipower.org. LIPA will also provide a link to National Grid generation resource data regarding air quality and other relevant information on the environmental aspects of the National Grid generating plants on Long Island.

Key Goals:
- ✓ *LIPA Web site link to public air emissions data for National Grid generating plants on Long Island*

Targets:
- ✓ *Establish means of reporting by December 2009*
- ✓ *Establish web link by June 2010*

Means:
- ✓ *Use of national data sites for information*
- ✓ *Alternatively use emissions data from LIPA's market system*

3.1.3 Initiatives Under Study

Under study elements are those that are under discussion or in the early stages of development, with no contractual commitment from LIPA. Those programs found in the following sections are the elements, or initiatives of the Environmental Plan that are categorized as under study.

Biofuel Assessment (Recommendation 4.3)

As detailed in the Fuel Management Plan, LIPA is undertaking an assessment of biofuel as a potential technology for new and existing units on its system. LIPA has instituted the use of 20% biofuel in its fleet vehicles.

> ***Key Goals:***
> - ✓ *Assess the viability of using biofuels in existing and new plants*
>
> ***Targets:***
> - ✓ *Conclude study of biofuel viability by June 2010*
> - ✓ *Develop biofuel plan by biofuel plan by 2010*
>
> ***Means:***
> - ✓ *Conduct a study whether use of biofuels at existing or new plants on Long Island is an environmentally sustainable option*
> - ✓ *If the answer is affirmative, use the study to guide development of a biofuel plan*

Recreational Trails (Recommendation 4.7)

LIPA is currently exploring the installation of recreation trails along its transmission line ROWs. Multi-use recreational trails would allow public access for walking, running, biking, and skating along the ROW from one destination to another. LIPA is considering the aspects of this use, including safety, access, parking, operational impacts, design, economic benefits, and funding. LIPA has studied similar trails in the United States, identified a ROW segment for further study of this type of public use, and is working with the appropriate town and governmental officials on this project. Several other recreational trials are being studied as well.

Water Use Reduction Assessment (Recommendation 4.10)

LIPA is partnering with NYSERDA and National Grid to test a new technology patented by a local firm. The technology, called the Substratum Intake System (SIS), could dramatically reduce biological impacts from surface water use as well as increase power plant efficiency. Using water from a saline aquifer for cooling, as opposed to surface waters, has environmental and operational advantages, including reductions in impacts to fish eggs and larvae, increased thermal efficiency, and reduced maintenance. The evaluation is assessing the potential of a pilot demonstration and whether the technology can be scaled up to commercial availability as a method to reduce impacts and improve efficiency.

> ***Key Goals:***
> - ✓ *Assess the viability of using an innovative, patented system Substrate Intake System (SIS) to improve efficiency and reduce water use impacts*
>
> ***Targets:***
> - ✓ *Start construction of SIS test system by Jan 2009*
> - ✓ *Begin operation of SIS system test by Jan 2009*
> - ✓ *Conclude SIS system testing by December 2009*
> - ✓ *Complete report of SIS system by April 2010*
> - ✓ *Determine applicability of SIS system to existing and repowered plants by June 2010*
>
> ***Means:***
> - ✓ *Test the use of SIS system through a demonstration project located at Shoreham*

Power Supply CO_2 Footprint Reductions (Recommendation 4.14)

LIPA is studying cost-effective ways of reducing power supply CO_2 footprint emissions to a level 10% below 2005 emission levels by 2020 and a level 20% below 2005 emission levels by 2030. LIPA's CO2 Footprint Emissions Targets are shown on the next page in Exhibit 3-2.

Key Goals:

- ✓ *Establish CO_2 carbon footprint reduction Key Goals*
- ✓ *Study Cost-Effective Ways of Reducing Power Supply CO_2 Footprint Emissions to a Level 10% below 2005 Emission Levels by 2020 and a Level 20% below 2005 emission levels by 2030*

Targets:

- ✓ *CO_2 footprint emissions level 10% below 2005 emissions level by 2020*
- ✓ *CO_2 footprint emissions level 20% below 2005 emissions level by 2030*

Means:

- ✓ *Implement Electric Resource Plan in a manner that reduces emissions.*
- ✓ *Refine Electric Resource Plan to achieve emissions target*

There are many proposals at state, national and international levels to reduce emissions of greenhouse gases and/or CO_2. The only currently active program that affects LIPA is the Regional Greenhouse Gas Initiative (RGGI) that targets emission reductions at a statewide level (not for specific entities) and auctions allowances through a market mechanism. As described more fully in recommendation 4.1, the RGGI program is an agreement to stabilize carbon dioxide emissions from the Northeast region's power plants at current levels from 2009 through the end of 2014, followed by a 10% reduction in emissions by 2019 through a regional cap and trade program. Current RGGI prices have been in the vicinity of $3.50 per ton and are projected by LIPA, for planning purposes, to be in the $5 per ton range.

Various proposed federal legislative initiatives have suggested that the nation should target substantial long-term reduction of CO2 emissions from the 2005 level to about 70% to 80% by 2050. These initiatives have also suggested shorter-term reduction targets of 10% to 20% of 2005 levels by the year 2020, and 20% to 40% of 2005 levels by the year 2030. The costs per ton of reductions for achieving this level of decline are projected in the $50 per ton range.

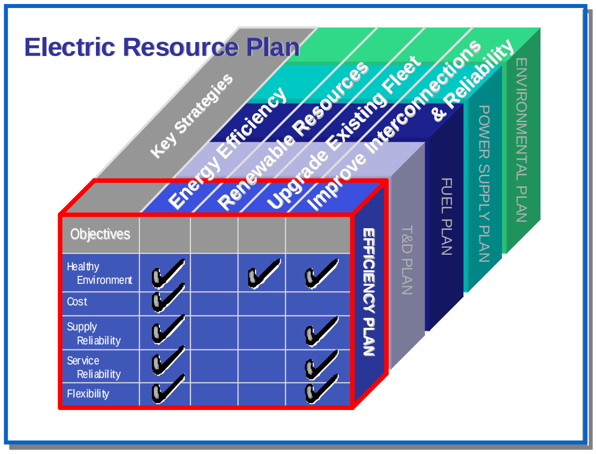
Recommendation 4.8 recommends that LIPA join The Climate Registry in order to follow a widely-accepted protocol of measuring and subsequently managing its carbon emissions. Currently The Climate Registry does not have a standardized way of measuring a greenhouse gas emission footprint for an electric utility power supply; it is under development. In lieu of this specific standard, LIPA has developed a CO_2 emission footprint metric to track the emissions used for LIPA's power supply. This metric tracks CO_2 emissions from power plants under contract to LIPA, takes credit for energy purchased and delivered to Long Island under LIPA's RPS program, and counts the incremental emissions produced as a result of LIPA's use of economy power from the PJM Interconnection, ISO-NE, and NYISO markets.

LIPA's recommendation to study cost effective ways of reducing power supply CO_2 footprint emissions to its target levels of 10% below 2005 emission levels by the year 2020 and 20% below 2005 emission levels by the year 2030 is the first step is developing a greenhouse gas reduction target. This target may be adjusted as LIPA considers expanding its targets to include greenhouse gases other than CO_2, to capture greenhouse gases from other portions of its business operations, or to take advantage of technological advances in carbon management or efficiency improvements. Further, the target may need adjustment upward or downward if The Climate Registry adopts a standard for tracking greenhouse gases from power production that differs from LIPA's metric, or if another metric becomes the industry standard. Finally, LIPA's target could be changed in response to any future federal or state regulations.

Exhibit 3-2 CO_2 Footprint Emissions Targets

Year	Percentage Change from 2005 CO2 Footprint	CO2 Footprint Target
1		-
2	6.48%	11500
3	4.83%	11322
4	3.19%	11144
5	1.54%	10966
6	-0.11%	10788
7	-1.76	10610
8	-3.41	10432
9	-5.06	10254
10	-6.70	10076
11	-8.35	9898
12	-10.00	9720
13	-11.00	9612
14	-12.00	9504
15	-13.00	9396
16	-14.00	9288
17	-15.00	9180
18	-16.00	9072
19	-17.00	8964
20	-18.00	8856

3.2 Efficiency Plan



Efficiency Long Island (ELI) in combination with LIPA*edge* and other demand response programs are the cornerstones of LIPA's demand-side planning program. ELI is targeted at achieving energy and capacity savings, delivering cost savings to customers, and providing environmental benefits to society.

Specifically included are market transformation programs, whose goal is to increase the energy efficiency of those appliances that are available on the market today. ELI also includes a mixture of prescriptive and custom energy efficiency programs. These prescriptive programs aim to satisfy specific issues for a broad range of customers, while custom programs can also be used to tailor energy efficiency plans and technologies to individual customer behaviors and needs.

LIPA's strong commitment to energy efficiency is demonstrated by the announcement of Efficiency Long Island (ELI), an enhanced program that builds upon LIPA's previous conservation efforts which concluded at the end of 2008. LIPA's ELI investment will encourage its customers to conserve by investing in the equipment, appliances, and installation and construction methods they utilize in their businesses and homes so that the most efficient technologies and practices available are adopted. ELI will offer prescriptive solutions such as appliance efficiency rebates, as well as customized approaches, such as helping customers to assess the appropriate technologies that result in lower energy consumption, to working with trades and contractors to ensure that they are aware of and trained in state of the art energy efficiency methods and practices. LIPA is committed to investing in this initiative over the next ten years. LIPA is further evaluating its ability to meet its efficiency goal by enhancing its internal generation and transmission system efficiencies, reducing energy losses, introducing smart meters through which customers may further modify their usage, and investigating the use of efficient electro-technologies.

Key Goals:

- ✓ *Reduce dependence on fossil fuels*
- ✓ *Reduce emissions*
- ✓ *Strengthen the Long Island Economy*
- ✓ *Defer the need for new generation resources*

Targets:

- ✓ *By 2015 Peak reduction of 70.22 MW*
- ✓ *By 2015 Energy Savings of 1,279,766 MWh*
- ✓ *By 2018 Peak reduction of 78.3 MW*
- ✓ *By 2018 Energy Savings of 1,661,857 MWh*

Means:

- ✓ *Efficient Products initiative*
- ✓ *Energy Star Homes Initiative*
- ✓ *Existing Homes Initiative*
- ✓ *C&I New Construction Initiative*
- ✓ *C&I Existing Buildings Initiative*

3.2.1 Committed Initiatives

Committed to elements are either under firm contract, have approved funding, or are currently available. The following sections contain the committed to components of the Efficiency Plan.

Invest in Efficiency Long Island Plan (Recommendation 5.1)

ELI consists of five initiatives. ELI targets more commercial savings than residential savings because the commercial sector has more opportunities for reduction in energy use. The projected reductions in energy usage and peak demand for each of the five initiatives are shown in Exhibit 3-3 below. In addition to these energy and demand reductions, ELI aims to reduce CO_2 emissions by 17.5 million tons. Exhibit 3-4, below, shows the ELI Program's Annual Targets relative to energy savings (MWh) and capacity savings (MW), as well as the annual ELI Budget.

Exhibit 3-3 Projected Impacts of ELI in 2018

ELI Initiative	Energy Savings in 2018 (MWh)	Demand Savings in 2018 (MW)
Efficient Products	338,257	30
ENERGY STAR Homes	44,960	23
Existing Homes	90,823	131
C&I New Construction	285,860	91
C&I Existing Buildings	644,047	244
Total	**1,403,947**	**519**

Exhibit 3-4 ELI Program Annual Targets

Year	Cumulative Annual Energy Savings (MWh)	Cumulative Capacity Savings (MW)	Annual Budget (USD)
2009	130,116	22.5	$ 29,993,028
2010	285,274	34.3	$ 54,218,945
2011	467,970	44.9	$ 70,176,745
2012	678,831	53.9	$ 76,572,993
2013	882,511	59.9	$ 87,915,420
2014	1,096,285	65.3	$ 98,108,804
2015	1,279,766	70.2	$ 109,532,517
2016	1,411,815	71.4	$ 119,295,524
2017	1,539,155	74.2	$ 131,792,562
2018	1,661,857	78.3	$ 147,169,467
Total	**9,433,580**	**574.8**	**$ 924,776,007**

Efficient Products

The Efficient Products initiative targets retail purchases of efficient appliances and lighting. While all LIPA customers (i.e., residents and businesses) are eligible to participate, the target market is the residential customer sector. The initiative provides a variety of incentives and marketing to support the stocking, promotion and sale of high efficiency lighting and appliance products. Nearly all of the efficient products supported by the initiative are ENERGY STAR qualified. Financial incentives offered through the initiative are targeted to retailers, manufacturers and directly to consumers.

This initiative will target the following product categories:

- Lighting - compact fluorescent lamps (CFLs) and all efficient fixture types (portable and hard-wired, including ceiling fans) plus holiday light strings will be included, whether utilizing fluorescent or solid-state technology.
- Appliances - refrigerators freezers, dehumidifiers, room air conditioners, clothes washers, and dishwashers. Active promotion of specific appliances may vary over the initiative's planning and implementation horizon, depending on incremental costs and savings.

- Consumer electronics - computers, monitors, set-top boxes, etc.
- Pool pumps

Of these products, lighting will be the primary focus. Not all products on this list will be promoted with financial incentives. Instead, these products will be the subject of marketing and other outreach efforts. Additional products may be added to or removed from this list as product selection and market conditions warrant, including changes to state and federal standards and ENERGY STAR specifications.

Energy Star Labeled Homes (Residential New Construction)

The ENERGY STARB Labeled Homes (ESLH) Initiative seeks to increase the efficiency of new homes in LIPA's service territory through a series of mutually supportive approaches. The initiative provides financial incentives and technical services to builders to construct homes that meet or exceed ENERGY STAR requirements and that also meet minimum kWh savings thresholds. The initiative also strongly supports efforts by towns on Long Island to adopt ELI ESLH initiative requirements as minimum energy codes.

This initiative targets both the efficiency of the building itself and the efficiency and proper installation of the various equipment and systems installed within it. Efficiency measures typically installed by builders to meet ENERGY STAR requirements and efficiency targets include:

- Building shell upgrades such as increased insulation, efficient windows, and air sealing
- HVAC
- Duct sealing for forced air systems
- Fluorescent lighting fixtures and CFL installation
- High efficiency appliances (e.g., refrigerators, clothes washers, dishwashers)

Existing Homes

The Existing Homes Initiative seeks to increase the efficiency of energy use in existing residential homes, with a focus on opportunities that result in both energy and peak load reductions. Four initiative participation tracks are planned:

- The Residential Direct Install track will provide duct sealing and instrumented tune-ups for homes with central air conditioning (CAC).
- The Home Performance track will provide comprehensive whole house retrofit assessment and installation services, focused on electricity-saving measures such as duct sealing and CAC system tune-ups. This track will also be a critical area of cooperation and leverage any natural gas efficiency programs that are developed on Long Island.
- The Residential Energy Affordability Program (REAP)/Assisted Home Performance will provide to income-qualified customers a defined set of electricity-saving measures such as lighting upgrades; duct sealing, air sealing, and insulation improvements in homes with CAC or heat pump (HP) systems; and water saving measures in homes with electric hot water heaters.
- The Central Cooling track will provide incentives for properly installed higher-than-code efficiency CAC and HP equipment.

All tracks will be supported by an aggressive marketing and contractor training campaigns.

C&I New Construction

The C&I New Construction initiative will target all new commercial buildings and significant building expansions. Major renovations, defined as complete replacement of at least two major building systems, are also included; smaller renovation opportunities will be covered under the C&I Existing Buildings Initiative. The initiative will offer comprehensive services including: financial incentives (covering measure, design, and analysis costs); technical and design assistance; and coordination services to assist consumers, design professionals, vendors and contractors to overcome various transaction barriers. Although incentives will be tied to electric savings, the initiative will take advantage of both electricity and natural gas savings to demonstrate cash flow benefits to customers.

The initiative will promote the installation of comprehensive efficiency measures using a systems approach that capitalizes on interactions between technologies serving multiple end-uses. Multiple building systems would be optimized, recognizing sizing and other interactions between systems, including in the following end-uses and systems: interior and exterior lighting, HVAC, motors, domestic hot water, building envelope, and refrigeration. Efficiency will be pursued through equipment selection, control equipment and strategies, fuel choice, the design process, and commissioning.

C&I Existing Buildings

The C&I Existing Buildings market consists of all existing C&I buildings on Long Island, regardless of type or end-use. Within this market there are significant differences between large customers and small/medium size customers: differences in management, building operation expertise, and the capacity to undertake capital projects. Recognizing this, the lnitiative is divided into two customer segments (large and smalllmedium). Within each, the lnitiative will address both lost opportunity (i.e., at the time of new purchase or natural replacement) and retrofit (i.e., discretionary equipment replacement) events. This lnitiative will take advantage of both electricity and natural gas savings generated by a variety of measures.

- Any efficiency measure that can generate positive net benefits will be considered for Large C&I customers.
- The direct install component for small/medium-size customers will focus primarily on lighting but may include cooling, refrigeration and other equipment.
- The prescriptive incentives will include lighting, motors, and cooling equipment.

Implementation of the ELI Program

Implementation of the ELI Program involves four major activities: transition from the Clean Energy Initiative; modifications to the Tariff for Electric Service to facilitate recovery of the Program costs; integration of ELI with other LIPA management processes; and ongoing management of ELI.

Transition from the Clean Energy Initiative

Transitioning from CEI to ELI will require at least four steps:

- Expansion of the LIPA Staff to put the internal management structure in place.
- Selection of Contractors to implement the program through a public Request For Proposal (RFP) process.

- Board approval of the overall program and initial Annual Budgets
- Education and Outreach to the trade and customer base as the ELI Program is rolled out.

Staff proposes to acquire and develop its in-house resources during 2008 in order to manage the transition and move aggressively into implementation in 2009. The staffing profile and requested positions will be presented to the Trustees in late 2007 as part of the 200B budget process.

The RFP process used to identify and select the ELI contractors is extensive, and involves:

- development of the necessary RFPs
- management of the RFP process (publication, solicitation of bids, review of responses, selection of the recommended contractors)
- Board approval of the contractors
- State Comptroller approval of the contracts.

RFPs will be required ultimately for each of the contractor roles envisioned for ELI. The list of potential contractor roles will be prioritized and sequenced so that the most critical contractor roles are bid out first. Those critical roles are Solution Providers, Market Channel Coordinators, and Customer Assistance. LIPA staff will manage the remaining functions by fulfilling those roles with existing resources or delaying the initiation of those roles until the appropriate attention can be focused on these subsequent RFPs.

Board approval of the initial Annual Budgets and Program Plans for 2009 and 2010 will be sought at the December 2008 Board meeting. Materials that present and support the Annual Budgets and Program Plans for 2009 and 2010 will be distributed to the Trustees and discussed at a public workshop prior to the December 2008 Board meeting.

Education and Outreach regarding the development of the ELI Program will continue through 2008, and increase in 2009 as the ELI program is implemented. Anticipated Education and Outreach milestones include:

- Public announcement if the intentions of the ELI program in Fall 2007.
- Public announcement of the RFP process in Fall 2007
- Announcement of Critical Contractors in early 2008.
- Trustee/Comptroller consideration of selected Contracts in mid 2008.
- Announcement of ELI program initiation in Fall 2008.
- Contractor outreach to trade allies and customers beginning in late 2008.

Monitor Performance of Efficiency Programs to Ensure Value is Achieved (Recommendation 5.2)

Reflective of the magnitude and importance of ELI to LIPA, a number of reporting requirements and financial and performance controls are included in the Program. These requirements and controls are necessary and appropriate to ensure that:

- The initiatives are producing the results that are expected and required.
- The initiatives are being refocused and redirected over time as market situations evolve and react to external influences.

- The costs being recovered through the proposed Cost Recovery Rider have been properly determined, authorized, and spent.

Key controls proposed for ELI include monthly reporting on achievements and costs to LIPA management, continuous measurement and verification of performance, rigorous evaluation of initiative efforts, periodic Energy Efficiency Committee meetings, annual Trustee review and/or approval of the program goals and associated budget levels, and Trustee approval of RFP selections and the level of the cost recovery rider each year. Additionally, it is expected that both operational and financial audits will be periodically performed.

Annual approval of the proposed ELI budget and associated level of the cost recovery rider are seen as the key control mechanism for the Program. Each year, the ELI staff will be required to provide a rolling two-year budget for Trustee consideration. The budget proposal would be expected to include financial and operational performance indicators to date, any proposed changes in the magnitude or direction of the separate initiatives, and other information that will enable the Trustees to set annual goals, budgets and the level of cost recovery for the coming year. Authorization for Goals and budgets (but not cost recovery) would be sought for the second year in the future. It is proposed that the Trustees' authorization will be requested in December, coincident with the regular budget process, to be effective at the beginning of January.

Additional oversight will be provided through the Conservation and Competition Committee, which will receive briefings from ELI management, review ELI program results and financial and operational audits, provide advice to ELI management, and provide input to the Board of Trustees.

Furthermore, a measurement and verification (M&V) process is embedded in the program design so that program performance can be monitored in a meaningful and independent manner. M&V audit reports will be provided to LIPA management and the Energy Efficiency Committee so that progress and performance can be tracked and managed in the context of LIPA's overall requirements and policies.

Ongoing Investigation of Cost-Effective and Targeted Energy Efficiency and Load Management Programs that Meet the Overall Resource Planning Strategies (Recommendation 5.3)

Subsequent to implementation of ELI in 2009, the Program will operate under an annual management process based on a rolling multi-year planning and feedback cycle. The multiyear cycle includes:

- Creation of a plan and preliminary budget for the next two years.
- Finalization of the program plan and budget for the coming year.
- Measurement and verification of results for the previous year.
- Evaluations of initiative efforts according to an approved evaluation plan.

This rolling cycle of planning and performance monitoring creates continuous opportunities for each initiative to demonstrate its success, make mid-course corrections where needed, and modify future plans to meet the emerging and changing needs of LIPA and its customers.

In addition, contractors will be subject to periodic review under contracts that contain provisions for modifying or terminating the arrangement not only for performance, but also as LIPA's needs or market conditions change.

Lastly, Staff recognizes that the ELI Program proposed in this Implementation Plan may need to be changed or expanded to accommodate developments in the 15 x 15 Goal. ELI is recognized as a key starting point for meeting the 15 x 15 Goal, but LIP A intends to maintain its flexibility and propose modifications or expansions to this Plan depending on the outcome of the EPS proceeding or related developments.

Investigate and Invest in LIPA T&D System Energy Efficiencies (Recommendation 5.4)

LIPA's Transmission and Distribution Plan recommends that system energy efficiencies should be investigated, identified, and evaluated for cost effectiveness. One example of a T&D system efficiency that could be considered is the use of low loss transmission transformers to reduce system energy losses. More information about this area is discussed in Section 6, Transmission and Distribution Plan.

Investigate and Invest in LIPA Generation System Energy Efficiencies (Recommendation 5.5)

LIPA recommends that energy efficiency opportunities for the generation system should be investigated and pursued where cost effective. Examples of generation system efficiencies include improvements to boiler efficiency, enhancements to heat rate and any investment that generates more energy with less input. LIPA plans to investigate the opportunities in this area and will assess their cost-effectiveness when compared with other investments.

3.2.2 Planned Initiatives

Planned elements are those still under active discussion, negotiation, or development. While the intention is to proceed with these projects, LIPA may adjust the timing, size or design of the element as conditions change.

Implement Smart Metering System (Recommendation 5.7)

Advanced Meter Infrastructure (AMI) has dramatically changed the way many utility companies perform their meter reading tasks, cutting costs and boosting efficiency within the metering department. These advanced meters provide enhanced information, service and choices to customers while providing the utility with new capabilities for operating and maintaining the grid. Intelligent metering offers a wide array of functionality above and beyond that offered by traditional AMI metering. While there is no consistent definition for intelligent metering, key capabilities include: near-real time metering, 2-way communication and demand-side management options. AMI provides the opportunity to have two way communications in place between the utility and the customer, allowing the customer to have access to real time prices and making informed consumption choices that they are unable to make today. Access to real time price information is expected to support energy efficiency and enhance the anticipated savings to support 15 x 15 for LIPA. Installing advanced meters is a major step in a utility's evolution towards a Smart Grid.

LIPA is in the process of implementing two AMI pilot installations; the project started in 2008 and continues in 2009. The goal of the pilot is to evaluate available technologies and obtain customer and operational input for longer term evaluation of company-wide implementation. Two technologies have been selected for installation at residential and commercial customer sites. Each technology pilot will consist of about 100 meters. One technology will be deployed in the Hauppauge industrial park area and vicinity and the second in the Bethpage area.

3.2.3 Initiatives Under Study

Under study elements are those that are under discussion or in the very early stages of development, with no contractual commitment from LIPA. The following sections describe the programs currently under study in LIPA's Efficiency Plan

Consider Smart Grid System (Recommendation 5.6)

The U.S. power grid is increasingly operating near its technical limits and often faces shortfalls in capacity, reliability, security and power quality. Advancing technology, often referred to as "Smart" facilities is beginning to replace aging infrastructure and expand capacity where practical. This "Smart" investment represents an opportunity to apply new technologies and systems to update designs and technologies of the 1960s and earlier. New advances in power delivery, communications and information technology have laid the groundwork for a modern grid that has proven effective in lab tests and field trials. These cutting-edge solutions offer dramatic improvements in power quality, customer service and satisfaction, customer communications, and cost savings.

Advanced Meter Infrastructure (AMI) has dramatically changed the way many utility companies perform their meter reading tasks, cutting costs and boosting efficiency within the metering department. These advanced meters will provide enhanced information, service and choices to customers while providing the utility with new capabilities for operating and maintaining the grid. Intelligent metering offers a wide array of functionality above and beyond what traditional AMI metering offers. While there is no consistent definition for intelligent metering, key capabilities include: near-real time metering, 2-way communication and demand-side management options. Installing advanced meters is a major step in a utility's evolution towards a smart grid. AMI provides the opportunity to have two way communications in place between the utility and the customer, allowing the customer to have access to real time prices and making informed consumption choices that they are unable to make today. Access to real time price information is expected to support energy efficiency and enhance the anticipated savings provided to support 15 x 15 for LIPA.

During 2009 LIPA will be reviewing the technology's ability to support open standards, flexibility, scalability, and its ability to migrate to and support Smart Grid infrastructure. One of critical goals is to obtain input from commercial and residential customers in identifying needs, requirements, and expectations for successful and effective company-wide implementation.

The adoption of AMI is expected to contribute to LIPA's ability to address the goals of New York State's 15 x 15 effort. This contribution is described in Section 5. LIPA recommends continuing to investigate the opportunities that may be available from the introduction of AMI system wide by continuing with its current pilot program and studying the implications when complete.

Study Cost-Effective Ways of Meeting the 15 x 15 Goal (Recommendation 5.8)

New York's Governor announced a strategy of achieving a 15% reduction in expected energy consumption by 2015, entitled 15 x 15, in order to reduce the need for investment in new sources of power and to reduce emissions.

LIPA has developed a preliminary plan that may support its ability to achieve that aggressive 15 x 15 goal on Long Island through a combination of several recommended electric resource plan initiatives. These include:

1. Adopting higher New York State building codes and appliance standards;
2. Completing investment in the Clean Energy Initiative;
3. Adopting the base Efficiency Long Island initiatives
4. Enhancing ELI through adoption of more aggressive approaches and program acceleration, as needed to meet the goal;
5. Investigating and implementing LIPA's internal generation and T&D efficiency programs;
6. Encouraging investment in and adoption of electrotechnologies;
7. Encouraging adoption of distributed generation applications on LIPA's service territory; and
8. Implementing the Smart Meter program.

Key Goals:

- ✓ *Implementation of the Program by pursuing a 15% energy reduction by the year 2015*

Targets:

- ✓ *Develop detailed plan for 15x15 by December 2009*
- ✓ *By 2015 Peak reduction of 978 MW*
- ✓ *By 2015 Energy Savings of 3315 GWh*
- ✓ *By 2018 Peak reduction of 1359 MW*
- ✓ *By 2018 Energy Savings of 4534 GWh*

Means:

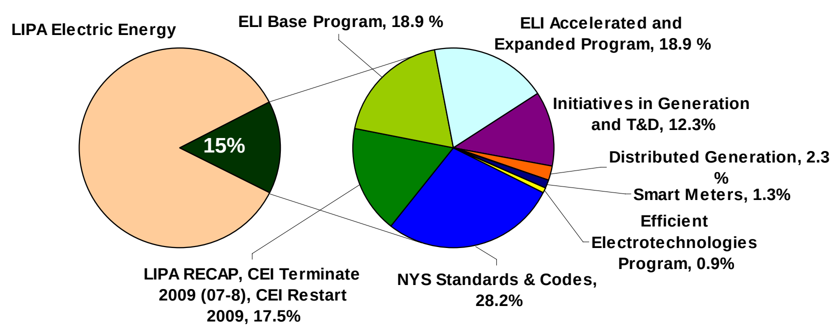
- ✓ *ELI Program*
- ✓ *Accelerate and Expand ELI Program*
- ✓ *Transmission and Distribution Efficiency*
- ✓ *Generation Efficiency*
- ✓ *Smart Meters*
- ✓ *Distributed Generation*
- ✓ *Electro technologies program*

The energy efficiency targets associated with 15 x 15 are shown in Exhibi 3-5, and the anticipated contribution of each element to the total 15 x 15 goal is depicted in Exhibit 3-6.

Exhibit 3-5 15 x 15 Energy Efficiency Targets

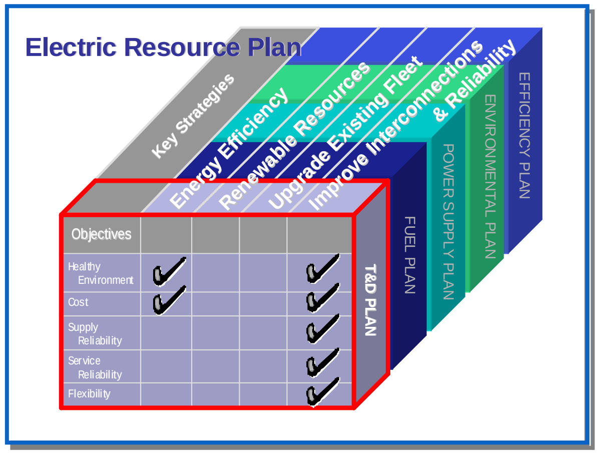
Year	Cumulative Annual Energy Savings (GWh)	Cumulative Capacity Savings (MW)	Annual Budget
2009	462	154	$ 115,904
2010	701	210	$ 154,084
2011	1066	293	$ 178,955
2012	1659	574	$ 198,863
2013	2270	715	$ 231,136
2014	2867	854	$ 260,902
2015	3315	978	$ 286,210
2016	3731	1104	$ 309,220
2017	4140	1232	$ 335,921
2018	4534	1359	$ 376,796
Total	**24,746**	**7,473**	**$ 2,447,992**

Exhibit 3-6 Addressing LIPA's 15 x 15 Contribution



Many of the initiatives identified that will contribute to LIPA's potential to meet the 15 x 15 goal are in various stages of development. New York State is already pursuing an update to the building codes to increase the potential energy savings. LIPA has completed its investment in CEI as of year end 2008. The LIPA Board of Trustees has adopted the base ELI initiative as described more fully in Recommendation 1 of this section. LIPA recommends investigating further efficiency opportunities for adoption as part of this plan and its adoption is under study. The current T&D plan recommends the investigation of system efficiencies and the investigation of generation system efficiencies is under study. Recommendation 2 in this section is under study. Adoption of distributed generation is under development and smart metering is currently being investigated through a pilot study that is underway in two counties on Long Island.

3.3 Transmission and Distribution Plan



LIPA has taken aggressive steps to upgrade and optimize its transmission and distribution systems. These improvements have enhanced system reliability and provided greater access to competitive sources of energy both on and off Long Island. As described further below, some projects were undertaken to improve import capability to Long Island from neighboring utility systems, while other improvements increased the internal interface transfer capabilities and accommodated competition from new merchant generators on Long Island.

Enhancements to Improve Import Capability

Transmission projects recently undertaken to increase the power import and export capability of the LIPA electric system include the creation of a 138 kV ring bus at Newbridge Road and the installation of "dynamic rating" equipment on a series of 138 kV transmission circuits to closely monitor circuit parameters, such as power flow and conductor temperature. Such monitoring allows a higher and more accurate rating of the conductor. Other projects have been completed to ensure deliverability of the power from the new HVDC Cross-Sound interconnection and added generation.

Enhancements to Improve the Reliability of the Transmission System

Some transmission and sub-transmission projects are designed to enhance service reliability to particular areas of the system. These projects range from the addition of capacitor banks and step-down transformers, to the construction of new lines to supply new substations, to the installation of double bus tiebreakers. A double bus tiebreaker design prevents severe overloads caused by the failure of an existing bus tie circuit breaker.

Improvements to Accommodate Merchant Facilities

Some transmission projects may be required to allow for the interconnection of new merchant generation and transmission projects. These projects will promote competition on Long Island.

Improvements to the Distribution System

Upgrade programs have significantly improved the reliability of the distribution system. Reliability improvement and programmed equipment replacement projects will continue to enhance system reliability and reinforce the distribution system infrastructure to help make it more resistant to storm-caused damage. Those ongoing elements of the Distribution Plan which have a focus on maintaining or improving distribution system reliability are described below.

3.3.1 Technical Performance

TP1. Technical Performance: Reliability, Committed

Reliability is defined as the frequency and duration of interruptions as experienced by Customers. LIPA's goal is to maintain first quartile system performance as compared nationwide to Investor Owned Utilities (IOUs) while also redirecting some capital and maintenance programs to improve pockets of poorer performance.

TP1.1 Reliability: Distribution Tree Trim Program, Committed

This program removes trees, limbs and branches near overhead electric lines to adhere to clearance standards that will reduce the probability of a tree caused customer interruption. The program can be broadly categorized by two types of work, namely scheduled and demand (typically associated with service restoration efforts or customer driven work). While both the scheduled and demand portions of the work can improve reliability at the customer level, the more significant impact to mitigating future customer interruptions occurs as a result of scheduled trimming. LIPA trims its distribution circuits on a 3, 5, or 7-year trim cycle, depending on tree density, circuit performance, and tree growth rate.

Each year a detailed analysis of tree caused interruptions is performed for all distribution circuits and specific circuit trim cycles are adjusted as appropriate.

Key Goals: ***TP1.1***

- ✓ *Improve system reliability at the customer level by undertaking a scheduled and on-demand vegetation control program near overhead electric lines*

Targets:

- ✓ *Maintain each distribution circuit on assigned cycle*
- ✓ *Complete approximately 1600 miles of circuit tree trim per year*

Means:

- ✓ *Circuit analysis and associated scheduled trimming of distribution circuits*

TP1.2 Reliability: Circuit Improvement Program, Committed

This program involves a detailed field survey of selected poor performing circuits. The survey identifies the needed corrective actions for all substandard conditions that are likely to cause customer interruptions. In addition to correcting substandard field conditions, this program also identifies additional measures that can be taken to cost effectively improve electric reliability on a given circuit, like the addition of lightning arresters, replacing armless insulators with cross arm construction, replacing automatic style wire splices with compression splices, etc. Circuits are chosen based on a prioritization of the poorest performing circuits as identified through an in depth analysis of performance attributed to key interruption statistics. The program is optimized by focusing on the mainline of the circuits thereby affecting the most customers in the most cost effective manner possible.

Key Goals: ***TP1.2***

- ✓ *Improve performance of least reliable circuits; (i.e. those that are likely to cause customer interruptions) and identify where reliability improvement measures are needed*

Targets:

- ✓ *Apply each year the Circuit Improvement Program to the least reliable 2% of LIPA distribution circuits*

Means:

- ✓ *Implementation of program*

TP1.3 Reliability: Infrared Scans of Distribution Lines, Committed

Infrared scans of distribution lines involves the use of an infrared camera to examine overhead distribution line clamps, taps, splices, and equipment to proactively identify overheating, so that remedial action may be taken before a failure causes an outage. Repairs to identified hot spots are prioritized based on the severity of the overheating detected. LIPA infrared scans all of its highway distribution lines on a two-year cycle.

> ***Key Goals:*** ***TP1.3***
> - ✓ *Improve reliability by examining overhead distribution line equipment in order to replace or repair a component before its' failure causes an outage*
>
> ***Targets:***
> - ✓ *Scan annually 50% of the distribution circuits*
>
> ***Means:***
> - ✓ *Infrared scans are completed on all distribution lines every two years*

TP1.4 Reliability: Distribution Automation and Automatic Sectionalizing Unit Installation Program, Committed

The Distribution Automation (DA) Program has proven to be a very cost-effective and powerful reliability program. It involves the installation of supervisory controls on various distribution equipment (i.e. switches, capacitor banks, reclosers, etc). This automation enables remote monitoring and operation and acts to improve control of the electric system. Specifically, automation helps to provide information to facilitate operation of the electric system, enabling quicker restoration efforts and helping to minimize the number of customers affected by a given event on the distribution system.

> ***Key Goals:*** ***TP1.4***
> - ✓ *Improve reliability by decreasing outage restoration times and limiting the number of customers interrupted when a mainline distribution system fault occurs*
>
> ***Targets:***
> - ✓ *Relocate and install ASU switches to account for load growth and circuit re-configurations and improve reliability of select circuit. Identify and install DA on other equipment as appropriate.*
>
> ***Means:***
> - ✓ *Implementation of program*

As part of the Automatic Sectionalizing Unit (ASU) Installation Program, supervisory controlled switches are installed on distribution circuits in a midpoint-tie point configuration. In addition to providing supervisory control of distribution switches (which decreases outage restoration times), it limits the number of customers interrupted when a mainline fault occurs downstream of the ASU by auto-sectionalizing (automatically opening) and avoiding a complete distribution breaker lockout. When a mainline fault occurs upstream of the ASU, the downstream section of circuit can be rapidly restored by supervisory control using the tie point ASU. As a result of this program, LIPA has one of the most automated distribution systems in the United States. Additionally, this automation has helped place LIPA's T&D system among the most reliable in the country.

TP1.5 Reliability: Underground Cable Testing and Replacement Program, Committed

Key Goals: ***TP1.5***

- ✓ *Improve reliability through prioritized replacement of distribution circuit cables based on their condition, and reducing likelihood of failure which may cause customer interruptions*

Targets:

- ✓ *Test/prioritize primary cables resulting in approximately 40,000 feet replaced annually*

Means:

- ✓ *Implementation of program*

Three phase underground mainline exit cables and dips are used on distribution circuits to allow distribution feeders to emanate from a substation (i.e. exit cables) or to allow distribution circuits to traverse obstacles or areas where overhead pole lines cannot be used (i.e. dips). These cables operate at either 4kV or 13 kV. In either case, a failure of a portion of the cable results in the interruption of electric service. As part of recent improvements to the program, LIPA now tests the condition of certain cables in order to identify and proactively address potential cable failures. The cable test results are analyzed in conjunction with historical data to better manage LIPA's cable assets in order to reduce impending outages while improving the cost effectiveness of the program. The addition of testing to prior methods that were strictly based on data analysis has helped to improve the efficiency of the program by approximately 40%. In short, the combination of data and testing has improved the overall ability to identify those cables that are likely to fail while allowing others to stay in service that are not in danger of imminent failure.

TP1.6 Reliability: Secondary Network Cable Replacements, Committed

Key Goals: ***TP1.6***

- ✓ *Maintain the highest degree of service reliability to customers served from aging underground secondary network facilities*

Targets:

- ✓ *Continue the refurbishment program of underground secondary distribution networks initiated in 1998 and updated in 2003 in accordance with annual capital budgeting process and prioritization.*

Means:

- ✓ *Implementation of program*

Network facilities provide the highest degree of service reliability, and are typically located at major centers of commerce or areas where a higher degree of service reliability is required, like at large shopping malls, commercial districts, etc. LIPA recognizes the sensitivity of the loads that these networks serve. In 2003, a multi-year program was initiated to install monitoring systems to provide remote monitoring of the status of these networks. Specifically, remote network monitoring systems for secondary networks were installed at Dayton Towers Apartment complex, Smith Haven Mall and Walt Whitman Mall. Future installations are planned at other major shopping malls supplied from network systems. LIPA's commitment to maintaining its secondary networks also includes the replacement of significant sections of primary cable and the installation of additional pad mounted switchgear to facilitate rapid circuit switching and restoration. In 2005, lead cables and manholes were replaced at the South Shore Mall. In 2007, primary cable was replaced in the Smith Haven Mall. In addition, proactive plans are in place to address aging infrastructure in other networks, such as Roosevelt Field and Green Acres Mall, and involve the upgrade of cabling and other equipment as appropriate.

TP1.7 Reliability: Overloaded Distribution Transformer and Fuses Upgrades, Committed

Customer loads can increase over time to a point that the increased customer demand can overload the distribution transformer and cause an outage, especially during high heat periods. Recent summer periods have taxed the distribution system to unprecedented load levels due to the prolonged abnormally high, sustained heat experienced. New peak demand records for the Long Island Control Area were set during two of the past three summers. Transformer loads are reviewed on an annual basis and units evaluated and prioritized based upon the previous summers' maximum customer KWH usage and each transformer's connected kVA. Transformers are then replaced or have their load split prior to the next summer peak load so as to avoid an impending outage. Additional efforts are made to identify and upgrade overloaded distribution fuses up stream of the transformer.

Key Goals: ***TP1.7***

- ✓ *Improve reliability by reducing customer interruptions through continued implementation of the transformer upgrade program, which identifies overloaded distribution transformers that may contribute to increased customer interruptions during periods of peak summer usage*

Targets:

- ✓ *Upgrade 140 highly loaded or overloaded transformers on the distribution system and upgrade fuses upstream of transformers annually*
- ✓ *Implement periodic monitoring process for fuse overload*

Means:

- ✓ *Implementation of program*

TP1.8 Reliability: Transmission and Distribution Pole Replacements and Reinforcements, Committed

LIPA owns approximately 350,000 wood distribution poles, and approximately 17,000 wood transmission poles with an average age in excess of 30 years. An aggressive pole inspection program was introduced in 1995. The objective of the pole inspection program is to maintain the structural integrity of the pole infrastructure by evaluating in-service poles to ensure they meet required strength criteria. Poles that have deteriorated to the point where structural integrity is questionable are replaced or reinforced. As a cost-effective alternative to total replacement, LIPA uses steel truss technology to reinforce select poles. Once installed, the steel truss restores the pole to its original NESC strength requirements. The steel trussing process can be performed at significant cost savings compared to replacing the pole.

In 2007, LIPA, in conjunction with the Electric Power Research Institute (EPRI) initiated a study to determine an asset management strategy for its wood pole inspection, reinforcement and replacement program. Such efforts will help to improve the

Key Goals: ***TP1.8***

- ✓ *Maintain reliability of overhead distribution lines by maintaining the structural integrity of the overhead pole infrastructure*

Targets:

- ✓ *Continue with multi-year inspection program of over 350,000 distribution poles introduced in 1995*

Means:

- ✓ *Complete annual pole inspection programs*
- ✓ *Inspect and evaluate in-service poles to ensure they meet required strength criteria,*
- ✓ *Complete annual pole replacement and reinforcement program*

overall cost effectiveness and efficiency of the program through adoption of a strategy which levelizes financial risk over a period of time.

TP1.9 Reliability: Blackout Mitigation Program – Regional Standards and EIPP Project, Committed

As a result of the recommendations resulting from the investigation of the August 14, 2003 Blackout, the Northeast Power Coordinating Council, Inc. (NPCC) has been delegated the authority to create Regional Standards to enhance the reliability of the international, interconnected bulk power system in Northeastern North America. These Regional Standards will be more specific and/or more stringent than the Electric Reliability Organization (ERO) Reliability Standards. The Standards will be developed and revised according to a NERC ERO and Federal Energy Regulatory Commission (FERC) approved NPCC Regional Reliability Standards Development Procedure. LIPA will be subject to these standards.

Key Goals: ***TP1.9***

- ✓ *Improve reliability through implementation of stringent regional standards and faster detection of operating conditions leading to outages*

Targets:

- ✓ *Participate in EIPP Working Group*
- ✓ *Implement solution as it is developed*
- ✓ *Implement ERO Standards as they are approved by NERC*

Means:

- ✓ *Install Phasor Measurement Units (PMU) at selected substations in the system.*

Furthermore, as a result of the Blackout follow-up investigation, LIPA has adopted several initiatives to prevent a future reoccurrence of such incident. *The Eastern Interconnection Phasor Project (EIPP)* supports the NERC blackout recommendations and will provide greater visibility of system conditions to system operators to allow monitoring a wider area and for keeping an eye on other neighboring systems as well. The system will monitor the Eastern Interconnection with GPS-synchronized telemetering devices and the communication set up for various Online and Offline applications to increase Power System Reliability and Security of the Eastern Interconnection.

TP1.10 Reliability: Blackout Mitigation Program – Upgrade of Oil Cable Systems, Committed

As a result of the follow-up investigation of the August 14, 2003 Blackout, LIPA has adopted several initiatives to prevent a future reoccurrence of such incident. One of importance is the upgrade and maintenance improvements of oil cables.

Key Goals: ***TP1.10***

- ✓ *Improve reliability by ensuring that cable pump back-up generator is in working order during a power outage*

Targets:

- ✓ *Implementation of improved design and maintenance at all 17 substations equipped with dielectric fluid pump houses*

Means:

- ✓ *Effective Back-up generator maintenance*

A total of seventeen LIPA substations are equipped with dielectric fluid pump houses that are utilized on 54 pipe-type cable systems to maintain elevated pressure in the cable system, and/or to flow the dielectric fluid through the cable systems at the levels required for effective load transfers.

In order to provide supplemental electrical supply back up capability, the pump houses are presently equipped with back-up diesel generators and automatic throw over (ATO) switches for continued operation during power failure conditions. LIPA has reviewed its design criteria and revised its maintenance procedures to ensure that these back-up systems will be in working order during a power outage.

TP1.11 Reliability: Distribution Vision 2010, Under Study

LIPA is a participating member, and currently chairs the. Distribution Vision 2010 (DV2010) project. DV 2010 is a consortium of progressive utilities, formed in 2001 to develop new technologies which will help member utilities provide options to customers who require superior reliability levels. DV 2010 has developed a number of advanced designs and presently has several demonstration projects in operation to test and demonstrate the development of these new technologies.

> ***Key Goals:*** ***TP1.11***
>
> ✓ *Improve reliability by developing and implementing new Distribution Automation technology*
>
> ***Targets:***
>
> ✓ *Develop and evaluate new feeder and protection designs to minimize customer outages*
>
> ✓ *Develop and evaluate new or enhanced distribution equipment needed to automate switching and recloser operations*
>
> ***Means:***
>
> ✓ *Partner with DV2010 consortium of utilities and vendors*
>
> ✓ *Demonstration of designs and equipment to incorporate DV2010 design concepts in existing and new distribution designs when new technology is available and proven*

One such project demonstrates significant improvements to a conventional distribution system. In a conventional system the utility supplies loads radially, having a number of normally open switches between feeders. If a disturbance to the power flow occurs on a line action from operators or field personnel is required to restore power to customers from an alternative circuit. This results in customer outages of varying duration while the fault is located and isolated.

Using one of the new DV2010 designs, the critical customer loads are supplied from two feeders from adjoining substations which are normally tied together continuously through a reverse vacuum fault interrupter (RVFI). When either of the feeders experiences a fault, fault interrupters inside the RVFI quickly isolate the critical customers from the fault and the load remains continuously supplied from the alternate feeder. Instead of experiencing an outage, the critical customers only experience a brief voltage dip while the fault is cleared.

In a second, more complicated design, a four-tier level system of new switching is demonstrated and is designed to make the area virtually outage proof. The system uses three different feeder lines to the protected area thus incorporating the concept of a "matrix" so that if one feeder is interrupted, the system automatically switches to another.

DV2010 has worked with Cooper Power Systems to enhance their standard Form 6, recloser control. WE Energies is also using PeerComm communication system developed by Cooper Power Systems. Using Cooper electronic vacuum reclosers with their enhanced Form 6 control unit, fault isolation will occur in less than five (5) cycles of fault current. The NovaTech substation master, enhanced through the direction of DV2010, is used to reconfigure the system after the fault is isolated and also to provide system status data to the distribution dispatcher.

Benefits of participation in the DV2010 program include access to advanced applications, capital and life cycle cost savings; influence in equipment development with key suppliers; and first access to results from R&D projects, demonstrations, and implementations.

TP2. Technical Performance: Aging Assets - Infrastructure and Workforce

The goal of LIPA's programs addressing aging infrastructure, physical assets and workforce, is to maintain long term performance through continuous optimization of maintenance and planned replacement of aging physical assets and through effective management of knowledge and industry best practices.

TP2.1 Reliability: Aging Physical Assets and Risk Modeling, Planned

Electric power T&D industry across US is facing potentially significant future reliability performance degradation and requirements for extraordinary capital for upgrades of aged infrastructure due to decades of inappropriate historical investments.

In spite of dramatic increase and investment since LIPA took the responsibility for Long Island T&D assets, even more intensive future investments is expected to be required. Due to large population of assets of various designs historically operating under various and changing operating conditions, LIPA is in the process of consolidating asset data and developing probabilistic models to forecast future long term performance of critical assets and system, and to optimize long range assets replacement and upgrades programs. This is done in cooperation across industry in collecting required statistical data and developing models of higher accuracy.

Key Goals: ***TP2.1***

- ✓ *Maintain high reliability over long-term through continuous optimization of maintenance and replacement programs of aging physical assets.*

Targets:

- ✓ *Develop long term performance models and hazard (failure) curves for critical distribution asset groups (including cables, poles, transformers)*

Means:

- ✓ *Use of asset performance modeling for system performance forecasting and for capital investment prioritization and project selection*

Most of the aging assets modeling is new to industry and LIPA is in the leading edge of developing and implementing models for aging assets and system performance forecasting. Aging asset and system performance forecasting is used in capital budgeting for project selection and prioritization.

TP2.2 Aging Assets: Knowledge Management and Loss of Expertise, Committed

LIPA is faced with industry-wide problem of potentially significant loss of expertise through retirement of professionals whose average age is continuously increasing together with average age of electric system infrastructure.

LIPA is addressing this problem internally in two ways. Consolidation and documentation of existing processes is combined with use of latest technologies for data and process integration and automation enabling consistency and more effective use of available resources. Consolidation and documentation of existing knowledge and processes includes regular updates of process documents in planning, design, maintenance, and operation. This includes work processes, criteria, and documenting results for company-wide use and future analysis.

Externally, LIPA is addressing this problem in several ways. This includes LIPA's active participation in industry-wide projects developing and documenting industry best practices for maintenance, asset management, planning and operation. For example, collaborative projects through EPRI are developing and regularly updating reference books and guides for equipment life cycle management, underground transmission system management, overhead transmission management, reliability centered maintenance, integrated asset management, and other. LIPA is a T&D industry leader in promoting and implementing infrastructure for data and process standardization and automation and is one of the most active participants in new technology projects. Examples include use of superconductive cables with DOE, CIM and data and process Integration Bus with EPRI, DV2010-Distribution Automation and Phase Measurement industry consortium projects, Short Term Load Forecasting with local Stone Brook University and other projects.

Key Goals: ***TP2.2***

- ✓ *Maintain high level of system performance through effective management of best practices*

Targets:

- ✓ *Document best practices and perform regular updates within LIPA*
- ✓ *Document industry bets practices and ensure periodic future updates*
- ✓ *Promote interest for education and professional development in the area of key technologies*

Means :

- ✓ *Regular and scheduled updates of LIPA's process documents for planning, design, maintenance, and operation*
- ✓ *Data integration and process automation – includes installation of infrastructure for SOA and use of CIM and IntelliGrid s*
- ✓ *Active participation in industry collaborative projects developing new technologies, standards, reference books and best practice guides*
- ✓ *Active support for education and R&D*

TP3. Technical Performance: System Efficiency and Losses

This program is focused on optimization of technical losses and optimization of energy transfers.

LIPA's overall strategy in this area is to continue the reduction of system losses by system upgrades and refurbishment using low loss distribution transformers, implementation of real time monitoring, dynamic circuit reconfigurations, and near-real- time optimization of system operation.

The reduction of system losses is one of the major goals of the design and operation of the LIPA T&D system. LIPA combines several approaches to accomplish this, such as operating the elements of the delivery path closer to unity power factor, load balancing on the primary distribution system, adding capacitive reactive VAR's, purchase of low loss power transformers, and use of larger conductors when these activities can be economically justified.

The implementation of LIPA's new technologies such as the introduction of the GIS system, CymDist system modeling program, and the availability of more on-line information provide an opportunity to reassess and optimize system loss reduction strategies.

TP3.1 Efficiency and Losses: Distribution Transformer Efficiency Program, Committed

The Department of Energy (DOE) has established that transformer efficiency standards will result in energy conservation, are technologically feasible, and are economically justified. These requirements will commence in 2010. The levels are more efficient than the 1996 voluntary levels established by National Electrical Manufacturers Association (NEMA).

LIPA has proactively purchased extremely efficient transformers since they became owners of the Long Island T&D system. During the last blanket order, all distribution transformers exceeded NEMA TP-1 efficiency levels, and 97 percent of the units met the recently issued DOE levels.

LIPA purchases approximately 5,500 transformers annually. In 2008, these 5,500 transformers will save 304 Megawatt-Hours compared to DOE requirements and 851 Megawatt-Hours compared to NEMA levels. Looking ahead during the next decade, these transformers will save 4,035 Megawatt-Hours compared to DOE requirements and 11,264 Megawatt-Hours compared to NEMA levels.

Key Goals: ***TP3.1***

- ✓ *Continue reduction of system losses by proactive replacement and purchase of transformers that meet and exceed DOE transformer efficiency requirements*

Targets:

- ✓ *Implement new DOE efficiency requirements by 2010 with remaining 3% of units*
- ✓ *Evaluate cost effectiveness of improving T&D efficiency to reduce losses*

Means:

- ✓ *Update and use new distribution transformer specifications for replacements and new installations*

TP3.2 Efficiency and Losses: System Efficiency Improvement– "15 x 15 Program", Committed

In January, 2007, the New York State Governor called for the creation of a program that will result in 15% state-wide energy savings by the year 2015.

Energy savings has been a priority for LIPA due to the high cost of energy in its service territory and in the past few years LIPA has taken steps to save energy with programs such as purchasing more energy efficient transformers as discussed above.

LIPA has been conducting a study to analyze the potential benefits of various transmission and distribution system loss reduction alternatives that will result in cost savings to its customers Besides replacing existing distribution transformers with more efficient units, LIPA is also balancing its distribution feeder phase loadings, adding capacitive reactive VAR's, and reducing distribution feeder lengths.

Key Goals: ***TP3.2***

- ✓ *Reduction of system losses in accordance with the NY State Energy Savings Initiative*

Targets:

- ✓ *Reduction in losses by the year 2015 in accordance with LIPA's energy savings study, LIPA's goals, and funding where cost justified*

Means:

- ✓ *Conduct Energy Savings Study and identify most efficient programs*
- ✓ *Programs implementation in accordance with funding availability*

The Energy Savings study is ongoing and could result and require more aggressive program to meet the goals of the Governor's Program, such as wide-scale efficient transformer replacement, as cost/benefit analyses are completed and funds are available in the capital improvements budget.

TP4. Technical Performance: System Adaptability, Committed

LIPA conducts Long Range (30-40 year, and/or doubling of peak load) Planning studies to identify backbone system infrastructure that could support a wide range of long term scenarios that will improve electric system reliability while providing system capacity to serve load growth and accommodate the installation of new capacity additions.

A long term design strategy is assessed for its flexibility of accepting power injections of various levels and at various locations in the system. Alternative high level conceptual system design options to meet future system requirements are also considered to determine technical and financial feasibility of alternate transmission system design approaches. The system enhancements proposed as a result of these studies must be flexible enough to allow deliverability of capacity from future interconnections or merchant plants across the system.

All study recommendations must adhere to LIPA's System Design Criteria evaluating technical and financial design alternatives over the study period.

Key Goals: ***TP4***

- ✓ *Ensure long-range system performance by optimizing backbone infrastructure to support wide range of long term scenarios for power injections, load growth, and load distributions*

Targets:

- ✓ *Conduct Long Range system upgrade studies to assess impact of doubling of present load over 30-40 year to guide the future evolution of the LIPA transmission system*
- ✓ *Periodically update Long Range Study (every second year or as needed)*

Means:

- ✓ *Load forecasting studies*
- ✓ *Long Range Studies to identify need for new substations , lines, and transformer capacity*

TP5. Technical Performance: Short Range Planning, Committed

Short-range planning assumes a time frame ranging from one to 10 years. The goal is to ensure system performance and to reliably support load growth at an overall lower cost by providing capacity to serve load through short-term projects which are consistent with a longer range strategy.

TP5.1 Short Range Planning: Short Range Studies, Committed

Key Goals: TP5.1

- ✓ *Ensure system performance by providing capacity to reliably serve load through short term (1-10 years) projects in adherence to long range strategy in order to minimize overall cost in long term*

Targets:

- ✓ *Reliably support load growth in all areas and load pockets through projects consistent with long range strategy and infrastructure*
- ✓ *Annually analyze summer and winter peak system condition and expected performance*

Means:

- ✓ *Load forecasting studies*
- ✓ *Short Range and Seasonal Operating Studies to identify need for new substations , lines, and transformer capacity Connect new merchant plants or interconnections*
- ✓ *Capital budgeting and project prioritization process*

LIPA also conducts Short Range (1-10 year) studies to identify system enhancements required to support the latest load forecast based on the most recent information on customer demand and the latest capacity addition requirements. These studies include recurring seasonal operating studies and real time system performance monitoring that result in system reinforcement recommendations that more accurately reflect a project need.

Transmission system reinforcement recommendations proposed as a result of these Short Range studies must be consistent with the long range vision in order to minimize overall cost in the long term. In general, Short Range studies consider in more detail constructability, environmental compatibility, losses and other design considerations.

The annual Summer and Winter Operating Studies perform a system analysis to identify delivery constraints on the LIPA transmission/sub-transmission system. The studies consist of voltage and thermal analyses at normal summer and winter peak and at extreme weather load level conditions to determine the expected performance of the bulk transmission/sub-transmission system under those load conditions. Generation dispatch requirements and local must-run generation levels are discussed in detail within each of the individual load pocket/area analyses included in the study report. The load pockets/areas identified in the study are also analyzed at peak and light load levels.

These seasonal operating studies together with others conducted in conjunction with NYISO staff analyze normal and emergency import/export limits on the LIPA system and provide guidelines for system operation during peak load conditions. Inter-tie transfer limits with the Cross Sound Cable and the new Neptune HVDC inter-tie both in and out of service are also studied. The Import/Export limits determined in these studies are based on NERC, NPCC and NYISO Criteria.

TP5.2 Short Range Planning: Load Forecasting, Committed

Key Goals: **_TP5.2_**

- ✓ *Provide accurate and timely load forecast to ensure additional capacity will be available to effectively serve electric demand of existing and new distribution customers*

Targets:

- ✓ *Annual load projection for 2-3 years and 10 years time frames, for new and existing customers load growth with satisfactory accuracy*

Means:

- ✓ *Accurate load forecasting studies for system, load areas, and load pocket based on probabilistic methodologies*

The load forecast at the system level is based on econometric models and is developed on both a weather-normalized and weather-probabilistic basis. Load forecasts are also developed for specific load areas using system load data acquired by the Energy Management System (EMS) and other systems in LIPA's T&D Operations.

The peak load forecast is used for short and long-term capacity planning evaluations, the evaluation of specific projects and alternatives for the resource mix, transmission planning and distribution planning. The Summer Peak Load forecast is developed using the Hourly Electric Load Model (HELM™) developed by the Electric Power Research Institute (EPRI).

Due to uncertainty of future peak load weather, a range of forecasts are developed based on a normalized distribution of historic weather conditions. The actual peak load producing weather experienced during the past thirty years is used to develop energy and peak-load probability tables. These tables show the probability for any of the peak load producing weather conditions experienced over the past thirty years to reoccur and the peak load expected under that weather. Using this information, peaks can be predicted for a cool summer season, normal summer season, hot summer season and extreme heat summer season. The LIPA peak load forecasts are usually reported for normal (50%) weather conditions. Where additional reliability requirements are essential, forecasts for hotter than normal temperatures may be used for planning, design and rating.

To increase the accuracy of area/pocket load forecasting techniques, load pocket forecasting software has been developed as part of the R&D projects funded by LIPA. In particular, it is based on weather normalized load of each distribution substation and circuit on the LIPA system, and provides for each area a weather-probabilistic load forecast.

The area load pocket load forecast is based on the previous summer or winter experienced peak load of each distribution substation transformer's high side load. The area load forecast procedure distributes the projected system peak load increase into each area, coincident with the system peak and predicting each area's own peak. Individual substation load is forecasted for the next ten (10) years based on historical trends for the individual substation/circuit service area plus known major load additions planned for future years

TP5.3 Short Range Planning: Capacity to Serve the Load, Committed

The LIPA Distribution System Conversion and Reinforcement (C&R) Program consists of projects that provide increased distribution circuit capacity, or improve transfer capability for meeting forecasted normal and contingency load conditions on distribution substations or circuits. The majority of the enhancements to the distribution system are concentrated on the three phase circuit main conductors beyond the substation exit cable. In these cases, the improvements are primarily replacing existing conductors or installing new mainline facilities such as overhead conductors, underground cables and switches.

The types of projects that make up the annual *C&R Program* are classified as:

Associated Projects Overhead - These are overhead reinforcement projects that are required as a result of unanticipated load growth, such as large new loads, that were not considered in prior area forecasts.

Overhead Conversion - These projects are primarily involved with the conversion of 4 kV load to 13 kV in order to meet design criteria.

Associated Projects Underground - These projects are required due to unanticipated load growth, such as large new loads that were not considered in prior area forecasts.

Key Goals: ***TP5.3***

- ✓ *Timely support load growth in all load areas and load pockets with reliability of service consistent with performance targets*

Targets:

- ✓ *Optimization of Load Pockets*
- ✓ *Optimization of reliability and cost of programs for reinforcement, conversion, upgrades, and new overhead and underground facilities,*
- ✓ *Issue annual recommendations for capital programs to improve capacity to serve load*

Means:

- ✓ *Load forecasting studies*
- ✓ *Distribution substation, feeder and transformer capacity studies*
- ✓ *Use system modeling tools to perform analysis and utilize results to support the justification of major Capital Projects*
- ✓ *Annual summer and winter operating studies*

Overhead Reinforcement - These projects are associated with reinforcement of the existing overhead distribution system through the replacement of existing conductors or the installation of new conductors.

Underground Reinforcement - These projects are associated with the reinforcement of the existing underground distribution system through the replacement of underground cables and associated facilities.

TP5.4 Short Range Planning: Enhancements to Improve Import Capability, Committed

Transmission projects recently undertaken to increase the power import and export capability of the LIPA electric system include the creation of a 138 kV breaker and a half bus configuration at Newbridge Road and the installation of "dynamic rating" equipment on a series of 69 kV sub transmission circuits to closely monitor circuit parameters, such as power flow and conductor temperature. Such monitoring allows a higher and more accurate rating of the conductor. Two new 345 kV circuits that are being initially operated at 138 kV have been added between E. Garden City and Newbridge and between Newbridge and Ruland Road to allow deliverability of power from the new Neptune 660 MW HVDC interconnection to New Jersey (PJM).

Key Goals: ***TP5.4***

- ✓ *Increase the power import and export capability of the LIPA electric system*

Targets:

- ✓ *Replace existing 38 year old Northport – Norwalk Harbor cable with a new more durable, reliable and environmentally friendly solid dielectric cable*
- ✓ *Energize first two cables (300 MVA) in 2008*
- ✓ *Add new circuits as required*
- ✓ *Install dynamic rating equipment where needed to better utilize existing circuits*

Means:

- ✓ *Timely filing of Article VII applications and meet all construction permit requirements*
- ✓ *Complete LIPA system reinforcements to absorb the additional interconnection capacity*

NUSCO Interconnection Cable, Committed

Since installation in 1969, the existing Northport – Norwalk Harbor 138 kV, 300 MVA submarine cable has experienced a total of 51 outages, primarily due to external causes like anchor drags and buoy anchors, with restoration times varying from a few days to several weeks. As a result of past fluid releases triggered by external causes, Consent Orders have been issued by both Connecticut and New York State.

In light of these numerous incidents, the cable is being replaced with three new more durable and reliable solid dielectric cables each rated 150 MVA.

The new cables reflect state-of-the-art design that by replacing the dielectric fluid with a solid dielectric eliminates the possibility of fluid releases into Long Island Sound.

TP5.5 Short Range Planning: Service Voltage, Committed

The proliferation of electronic devices in recent years has resulted in the connection of a large number of computers, photovoltaics, and other solid state equipment to the LIPA system making reliable voltage service a priority concern to LIPA. In an effort to provide the most reliable service to its customers LIPA follows a very stringent voltage design criteria.

It is LIPA's criteria to maintain voltages within applicable pre-disturbance and post-disturbance limits for both normal and emergency transfers, consistent with the NYSRC Reliability Rules and all applicable guidelines and procedures. (See "Voltage Assessment Criteria" in the LIPA T&D Criteria, Appendix D-7)

Service Voltage levels are provided within a steady-state tolerance range as per ANSI C84.1. This specification requires that voltage be provided within +/- 5% of the nominal voltage level.

Voltage analyses are performed for both peak and light load conditions as part of system reliability impact studies. Transient voltage recovery analysis area also performed for both peak and light load conditions as part of the "Other Studies" under the NYISO Large Facilities Interconnection Process according to current LIPA methodology. Complex load models are utilized as appropriate for specific system conditions.

Key Goals: ***TP5.5***

- ✓ *Maintain transmission and distribution voltages within design criteria limits and standards*

Targets:

- ✓ *Maintain pre contingency system voltages between 105% and 95%s*
- ✓ *Maintain post contingency transmission system voltages between 105% and 95%s*
- ✓ *Maintain post contingency sub-transmission system voltages between 110% and 90%s*

Means:

- ✓ *Complete System Reliability Studies*
- ✓ *Review of the reactive load representation in operating and planning studies*
- ✓ *Comparison of forecasted reactive load to experienced real time system loads*

TP5.6 Short Range Planning: Short Circuit Analyses, Committed

LIPA serves a densely populated area requiring delivery of large amounts of power to its substations. The high load density results in numerous circuits in relatively short distance from generators with many installed underground that create low impedance paths from generator to substation. Besides the five major steam plants, LIPA's load is served by numerous CTs installed throughout the system very close to the load.

This results in very high short circuit currents at substations that in some instances require the installation of expensive non-standard circuit breakers.

Key Goals: ***TP5.6***

- ✓ *Maintain system performance by ensuring system and equipment operation within design limits*

Targets:

- ✓ *Prevent circuit breaker overstresses*
- ✓ *Replace any circuit breaker overstressed above 100% of its rated capability*

Means:

- ✓ *Conduct fault duty analysis of circuit breakers installed in the LIPA system* valuations of transmission circuit breaker fault duties are conducted using the ASPEN™ Breaker Rating Module. Similar to the NYISO study process, screening is performed by comparing substation bus maximum short circuit values to the lowest rated breaker associated with that substation bus. Then individual breaker analysis is performed for substations where maximum total short circuit at the bus exceeds the capability of the lowest rated breaker in that substation. This analysis is performed for peak load conditions as part of system reliability impact studies for targeted areas of LIPA system.

TP5.7 Short Range Planning: Power Quality, Committed

The term Power Quality has recently achieved a high level of visibility due to the emergence of the digital economy. Today, there is widespread use of digitally controlled devices in all areas of LIPA's customer equipment. Many of these new devices are highly sensitive and may not operate properly in the event of voltage variations or disruptions such as voltage spikes, sags or dips.

Voltage dips or spikes and brief service interruptions of varying duration and severity occur due to operating conditions on the electric system.

Normal electric distribution system operation includes reacting and responding to unexpected events such as overhead wires falling, capacitors being placed on line, auto accidents, trees and/or wildlife intrusions into wires any of which can cause voltage spikes, dips, temporary low voltage, and even outages. Each of these instances is an event that causes a normal, automatic fault clearing episode on the electric system.

Key Goals: ***TP5.7***

- ✓ *Provide quality power to LIPA customers.*

Targets:

- ✓ *Comply with industry standards for Power Quality and IEEE519 harmonic distortion guidelines*
- ✓ *Minimize voltage harmonic distortion*
- ✓ *Minimize voltage spikes, sags or dips at the customer site*

Means:

- ✓ *Complete Distribution System Reliability Studies*
- ✓ *Address complaints working with the customer as required*

Although it is the customer's responsibility to provide adequate protection against any abnormal voltage incident involving its electric system, LIPA will respond appropriately when notified by a customer, of such events. Typically the customer would install of a quality surge protection device or an Uninterruptible Power Supply (UPS).

Finally, IEEE 519 guidelines limit the maximum individual frequency voltage harmonic to 3% of the fundamental frequency and the Total Harmonic Distortion (THD) of the voltage to 5% on the LIPA side of the Point of Common Coupling (PCC).

TP5.8 Short Range Planning: Changing Nature of Customer Load, Planned

> ***Key Goals:*** ***TP5.8***
> - ✓ *Understand and adopt to changing nature of customer load*
>
> ***Targets:***
> - ✓ *Prepare T&D infrastructure for wide-spread use of PHEV*
> - ✓ *Monitor and model system transient voltage recovery and install dynamic voltage compensation where required*
>
> ***Means:***
> - ✓ *Participate in industry and community programs testing and promoting new technologies for transportation, appliances, air-conditioning, etc. that may change system behavior and/or require new processes to support customers*

In recent years the nature of the LIPA customer load has changed with the installation numerous electronic devices such as computers, energy savings bulbs and more fluorescent lights, solid state DVD players and plasma TVs in the home and the workplace that are more sensitive to service line "noise" and to voltage "flickers".

Customers have been installing more photovoltaic devices and more air conditioning and home appliances with new technology solutions. This is changing characteristics of system load and its power factor and may aggravate transient voltage recovery problems.

LIPA is promoting the use of and supplying the load for plug-in hybrid vehicles that may become a major future load source. Extensive use of Plug-in Hybrid Electric Vehicle (PHEV) will need to be supported with new infrastructure for data and financial transactions, including customer billing for charging PHEV at various locations and/or time of charging.

LIPA continues to participate in industry and community programs related to use of new technologies that may change character of system load and may require new processes and systems to support customer needs. This includes participation in EPRI's studies of changing character of system load, participation as a member of the Greater Long Island Clean Cities coalition, investigating the feasibility of demonstrating hybrid electric drive systems in heavy duty equipment, partnering with the Town of Hempstead on a NYSERDA funded program to install and evaluate a hydrogen fueling Station, converting its new light duty vehicles to alternate fuels, etc.

TP5.9 Short Range Planning: Changing Nature of Generation Mix, Under Study

The location, magnitude, and operating characteristics of new and existing generation significantly impact the requirements of the LIPA transmission system. This includes constrains and impact related to characteristics of alternative generation sources, switching fuels, must-run generation, transient voltages, and other operating conditions, for example.

To support effective interconnection of transmission and distribution system by alternative generation sources LIPA is committed to promote and support open standards.

The economic displacement of power from older less efficient generation with that from new more economical and environmentally friendly resources may cause upgrades to the transmission system. New resources, such as new interties and generation, may require upgrades to the transmission system to ensure power can be delivered from the source to all LIPA customers.

LIPA regularly performs financial and technical analysis to ensure the transmission system is planned to allow delivery of power from a diverse portfolio of economically efficient resources located all across Long Island. This includes seasonal operating studies, short and long range studies, and System Reliability Impact Studies (SRIS) for new power resources.

Key Goals: ***TP5.9***

- ✓ *Reliably support load growth in all areas and load pockets consistent with performance target by timely adopting to changing nature of generation mix*

Targets:

- ✓ *Deliver power from new plants or interconnections across the system consistent with long-range transmission system planning*
- ✓ *Connect new merchant plants or interconnections*
- ✓ *Maintain open standards which promote interconnection of transmission and distribution system by alternative generation sources*

Means:

- ✓ *Load forecasting and repowering studies*
- ✓ *System Reliability Impact Studies (SRIS) to identify transmission system expansion requirements*
- ✓ *Short Range and Operating Studies to identify need for new substations , lines, and transformer capacity*

Least cost transmission expansion alternatives are currently being developed to accommodate a number of different resource injection scenarios including new interties, new generation and repowering of existing plants.

LIPA is currently evaluating the cost and impact associated with transmission expansion requirements to accommodate an additional interconnection from Long Island to New Jersey. LIPA continues to study the cost and requirements associated with upgrading the new NUSCO interconnection cable to increase interconnection transfer capacity beyond 200 MVA with several alternatives under study for the 2010 time frame and beyond. One option would bring the cable to its full 300 MVA rating. Another option would use a backup cable to provide a total of 450 MVA.

LIPA is currently evaluating the potential for repowering the existing National Grid Generation units. The present study analyzes the cost and impact of each plant individually to identify likely candidates for repowering and includes required adjustments to T&D system. The ultimate decision for repowering will be based on many different considerations including the cost of transmission expansion requirements

TP6. Technical Performance: Improved Situation Awareness

The goal of situation awareness improvement is better reliability and system operation through near-real-time monitoring of system performance and outage management, and through improved visualization of critical information for system operators.

TP6.1 Improved Situation Awareness: Real Time Performance and Outage Monitoring, Planned

In addition to providing wide range of up to date information of interest to customers through LIPA's Internet based communication and information system, LIPA is implementing and systems for automated and near-real-time performance monitoring designed to support more efficient operation. As technology evolves these systems are upgraded to work with more databases, more process applications (GIS-Geographical Information Systems, CMMS-Computerized Maintenance Management Systems, EMS–Energy Management Systems, OMS-Outage Management Systems, CIS-Customer Information Systems,…), and to support more complex and automated performance analysis, reporting, and notification.

Key Goals: ***TP6.1***

- ✓ *Improve system performance and outage restoration by providing real-time information of system performance and outage management*

Targets:

- ✓ *Near-Real-Time monitoring and reporting of outages, customers and circuits affected, and status of restoration processes*
- ✓ *Replace existing Outage Management System by 2013*
- ✓ *Complete programmatic upgrades of distribution automation control system by 2010*

Means:

- ✓ *Data integration from various process and information systems including asset, outage, customer, work management systems (OMS, CMMS, CIS/CMS, GIS…)*
- ✓ *Dashboard and data query tools with automated updates and analysis*

LIPA development is focused on improving situational awareness in key performance areas. One of the first is reporting of current and historical customer outages, and near-real-time reporting of status and performance of restoration process.

Planned future development and implementation includes integration and use of data for assets and system performance monitoring and analysis. The development is coordinated with projects improving asset and performance risk management, and development and implementation of concepts of "integrated" and "dynamic" risk assessment and performance management.

Development in this project assumes close coordination with development and installation of future IntelliGrid infrastructure for company-wide data and applications integration, and process automation.

TP6.2 Improved Situational Awareness: Improved Visualization for System Operation, Under Study

> ***Key Goals:*** ***TP6.2***
> - ✓ *Improve near-real-time assessment of system reliability for system operators*
>
> ***Targets:***
> - ✓ *Near-real-time alert system for system operations to prevent customer outages and equipment damage*
>
> ***Means:***
> - ✓ *Provide real-time and easy to interpret information and graphics allowing the operator taking immediate action*

As the industry evolves there is a need for Operations and Planning groups to communicate in a more efficient manner and provide data to each other that is consistent and accurate.

One of the graphical displays in the LIPA Control Center Common Information Model (CIM) real time transmission system model is the Contour application which displays transmission system deterioration in a color scheme. This output is refreshed every five minutes to alert the system operator of impending overloads which need operator intervention.

In 2007 LIPA implemented a real time voltage stability tool. This software tool is available to the System Operators and it is designed to avoid blackouts. The graphical interface is displayed as a speedometer with green (stable operation), yellow (instability margin) and red (system unstable) sectors. A black needle represents the current LIPA voltage stability condition.

Planning and Operating Engineers are supported by the tools to analyze radial primary distribution feeder voltage profile. This software program is used to asses the condition of the feeder in real time mode. The program provides graphical display describing the geographical location of the circuit and using different colors highlights low/high voltages or overloaded conditions in the affected portions of the distribution circuit. This will prompt the System Operator to take corrective action including distribution field transfers and changing the outgoing voltages. In extreme cases to protect the distribution assets load shedding might be initiated.

TP7. Technical Performance: System Improvement

The goal of system improvement program is performance improvement through system upgrades and modernization using new technologies, decision support systems, and hardening of infrastructure for normal and emergency operating conditions.

TP7.1 System Improvement: Multi Purpose Use of Smart Protection Systems, Committed

Over last several years LIPA invested in program that replaces older electro-mechanical relays on distribution feeder breakers with microprocessor-controlled relays. These relays, for example, provide a short delay of five cycles before they operate to allow branch line or lateral line fuses to blow before a breaker trip, which avoids momentary interruptions to the customers upstream of the fuse.

This program has played a significant role in reducing the number of momentary interruptions to customers to an acceptable level and, at the same time, provided an opportunity for further improvements by leveraging data, communications, and processing power of new microprocessor-based technology.

LIPA's concept of multi purpose use of new smart protection technology includes, for example, integration of relays data at the substation and company levels for equipment condition and system performance monitoring, and use of processing power of new relays to improve fire detection at the distribution feeders and manholes. LIPA is also investigation, in cooperation with protection relays vendors, potential for improvement of detection of distribution wires on the ground. Conventional protection systems are not very effective in detecting fires and some of failures with wires on the ground in the cases of "high impedance"/"low current" faults.

Key Goals: ***TP7.1***

- ✓ *Improve system reliability and public and employee safety by leveraging latest technology of smart protection relays*

Targets:

- ✓ *Reduce momentary interruptions to customers*
- ✓ *Integration and use of data from new smart relays for asset condition monitoring and system performance improvement*
- ✓ *Evaluate options and effectiveness of new concepts for fire detection on distribution feeders and manholes*
- ✓ *Evaluate options for improvement of detection of distribution wire on a ground*

Means:

- ✓ *Design and Implementation of systems for data integration and use of new "smart" protective relays for system condition monitoring and performance management in existing and new substations and distribution system*
- ✓ *Cooperation with vendors in developing and testing new concepts for fire and wire on the ground detection*
- ✓ *Pilot installations and field testing of selected solutions*

TP7.2 System Improvement: Rapid Recovery and Readiness, Committed

LIPA's System Operations Department maintains the tools and processes necessary to promptly restore service on the transmission system should an interruption occur.

The System Operators maintain constant awareness of the transmission system conditions via telemetry to each substation and via communication with the NYISO and operators at neighboring utilities. They also conduct daily reviews of all planned work requiring system outages to ensure the transmission system will remain operational and in accordance with reliability rules, criteria and standards while the work is being performed.

The operators train annually, utilizing a simulator, on the processes to recover from various system events. They also participate in the NYISO System Restoration Drills.

The System Operators also review and simulate the steps required to restore the LIPA system from a blackout condition.

Key Goals: ***TP7.2***

- ✓ *Improve system performance by more effective recovery from system events*

Targets:

- ✓ *Minimal customer interruptions due to transmission and substation events*
- ✓ *Maintain high level of readiness to respond to system events through planned training and technology upgrades*
- ✓ *Maintain compliance with reliability rules, standards and criteria during normal operations and planned work.*
- ✓ *Provide for additional redundancy in the company's internal radio and communication networks*

Means:

- ✓ *Annual and situational training*
- ✓ *Maintaining NERC certification of System Operators*
- ✓ *Regular reviews of planned work*
- ✓ *Regular reviews of short and long term performance*

TP7.3 System Improvement: Storm Hardening, Committed

LIPA wants to minimize the impact of having a severe storm such as a Category 3 hurricane land on its service territory. LIPA recognizes that a major storm could cause substation floods and significant pole line damage impacting service to a large number of customers.

The Company is in the process of formalizing a multi-year system wide Storm Hardening Program whose objective is to minimize system outages during storms and ensure prompt restoration of service to its customers.

LIPA is studying all aspects of the design and operation of the T&D system including identification of supplies to critical facilities such as its control centers, identifying areas prone to flooding and substations and transmission lines located in those areas.

The major elements of the program will center on three items: durability, resilience and restoration. More specifically, these elements include modifying the system design criteria to include higher strength transmission poles and elevating equipment installed at low lying substations as part of its capital improvement program and ensuring prompt power restoration to critical facilities.

Key Goals: ***TP7.3***

- ✓ *Reinforce electric system to minimize impact of having a "Category 3" Storm land on LIPA's service territory*

Targets:

- ✓ *Devise and assess a storm hardening program*
- ✓ *Criticality analysis and prioritization of reinforcements options*
- ✓ *Capital budget investment of $20 million over a 20 year period*
- ✓ *Complete storm hardening of all critical transportation crossings by 2014*
- ✓ *Complete storm hardening of all ASU locations by 2018*
- ✓ *Develop timeline for critical substations in hurricane surge zones*

Means:

- ✓ *Effective criticality analysis and reinforcement solutions*
- ✓ *Capital budgeting program and projects prioritization, and effective project management*

Priorities will be established. The program elements will ensure that LIPA control centers are operational. It will also stress LIPA's ability to deliver power from IC units, on-island generators and interconnections, ability to deliver power to energized substations neighboring those prone to flooding, and ability to move power across the system.

TP7.4 System Improvement: Outage Management Optimization, Committed

Customer outages which occur on LIPA's distribution system are prioritized utilizing an Outage Management System (OMS) which has been effective in maintaining our status of being at the top of performance list in New York State Overhead Electric System Reliability.

Annual restoration training and effective monitoring and utilization of manpower during storms have also enabled LIPA to lead the State in storm restoration times.

LIPA is highly dependant on the OMS to analyze, prioritize, and dispatch crews to effectively manage customer outages during storm and non-storm events.

The risk of a computer system failure can have an affect on the Key Goals highlighted. A complete update of Emergency Restoration Operation Procedures was completed in 2007 which reinforced the manual method of tracking and restoring outages in the event of a computer system failure.

> ***Key Goals:*** ***TP7.4***
> - ✓ *Maintain and improve Reliability Performance Levels including CAIDI, SAIDI and SAIFI*
>
> ***Targets:***
> - ✓ *SAIFI: 12.0-16.93 months*
> - ✓ *SAIDI: 42.1-68.9 minutes*
> - ✓ *CAID: 56.9-75.55 minutes*
> - ✓ *Storm CAIDI: 54.1-221.15 minutes*
>
> ***Means:***
> - ✓ *Constant Monitoring of outage and storm activities with focus on outage priorities, restoration times and manpower utilization*
> - ✓ *Complete Capital and O&M System Improvements Work Plan*

A LIPA team is reviewing the integration of all operational platforms, including the Energy Management System, Distribution Management System and Outage Management System in an effort to further enhance LIPA's outage management abilities and response.

TP7.5 System Improvement: Overhead vs. Underground Strategy and Design Criteria, Committed

Approximately 85% of the annual customer interruptions on the LIPA distribution system occur on overhead lines. Outage data indicates that underground construction is more reliable compared to overhead construction.

The primary advantage of underground construction is less exposure to outages related to external factors such as inclement weather, trees, animals and motor vehicle accidents which has the potential to significantly reduce customer interruptions. Historic electric interruption data indicates that the frequency of outages to customers supplied by underground circuits is approximately three times lower than for overhead systems. However it also takes considerably longer to repair those underground circuits once an outage occurs.

LIPA rates support construction of an all overhead transmission and distribution system. However, when a new distribution circuit is required to supply a complex of five or more dwelling units they will be supplied underground.

It is LIPA policy to underground all new 345 kV transmission circuits. In addition, LIPA will decide whether or not to place a new line underground based on the economic, engineering and environmental factors present. LIPA will consider partial or full undergrounding of new 138 kV or 69 kV circuits depending on the above mentioned factors. However, for 138 kV circuits, the PSC will make a final decision after the proposed route is analyzed in accordance with the requirements of Article VII of the Public Service Law.

Key Goals: ***TP7.5***

- ✓ *Performance improvement through optimum under grounding of distribution system*

Targets:

- ✓ *Implement and monitor performance of circuits that have been undergrounded because of reliability concerns*
- ✓ *Update and formalize LIPA undergrounding policy*

Means:

- ✓ *Distribution circuits: use of "worst circuit" performance approach to identify circuits with worst reliability indices (SAIFI, CAIDI, SAIDI and MAIFI) significantly exceeding distribution circuit averages*
- ✓ *Sub transmission circuits: optimization of cost, engineering and environmental factors with performance targets*
- ✓ *138 kV circuits: Article VII filing with NY PSC for selected circuit optimization*

TP7.6 System Improvement: Load Pocket Optimization, Committed

A load pocket is defined as a geographic area supplied by a networked transmission delivery system where a transmission limitation exists during any part of an annual load cycle period.

It is LIPA's design objective to prevent the transmission limitations leading to the formation of a load pocket. LIPA will evaluate various design alternatives to prevent those transmission limitations comparing their cost to the annual cost of "must run" generation in the load pocket, if generation exists.

The transmission limitations leading to the formation of a load pocket can also be mitigated by reducing the load contained in the load pocket, building new or upgrading existing transmission facilities or adding new efficient generation in the load pocket.

Planning will analyze hours of exposure for a particular contingency and determine risks and consequences related to technical, financial, customer satisfaction, and regulatory performance requirements.

Key Goals: ***TP7.6***

- ✓ *Enhance customer service reliability in constrained portions of the network*

Targets:

- ✓ *Reduce number of load pockets when economically justified*
- ✓ *Prevent transmission limitations leading to the formation of a load pocket.*
- ✓ *Implement transmission solutions to reduce must run generation where economically justified*

Means:

- ✓ *Annual test of circuits supplying the area to determine if normal and contingency design criteria is met*
- ✓ *Consider adding new generation in the pocket if none exists*
- ✓ *Capital budget projects prioritization*

TP7.7 System Improvement: Advanced Metering Infrastructure (AMI), Planned

Over the past several months a review of the available advanced metering infrastructure (AMI) technologies has been conducted. An AMI Team comprised of individuals from various departments has been meeting with vendors and other utilities. The Team has prepared a business case supporting the deployment of AMI for Long Island. Work of the AMI Team is ongoing with respect to further investigating the optimum technology solution and deployment strategies. A more in-depth review of the various technologies is currently underway. This comprehensive review includes AMI vendor/technology support of industry standards, openness in protocol, scalability and flexibility as well as available bandwidth to include future more enhanced metering and T&D Smart Grid with distribution automation (DA) and monitoring functionality. The AMI Team road map also includes a thorough review with ultimate deployment of a meter data management (MDM) system to support a full scale AMI / Smart Grid deployment as well as a home area network (HAN) solution to provide the ultimate in LIPA / Customer partnership strategies. In further support of the above efforts,

Key Goals: ***TP7.7***

- ✓ *Evaluate customer responsiveness and acceptance of time based rate structures.*

Targets:

- ✓ *Select AMI technology footprint*
- ✓ *Develop AMI deployment schedule*
- ✓ *Implement AMI deployment schedule*

Means:

- ✓ *Select technology that is compatible with AMI and Smart Grid deployment*
- ✓ *Develop AMI communication infrastructure*
- ✓ *Deploy AMI as required when cost justified or by public policy*

LIPA is proceeding with an AMI pilot deployment. The AMI pilot is to be installed at the former Bethpage Utility District (BUD) service area. Vendor selection for the pilot should be completed by first quarter 2008 and installation of an estimated 100 end points by second quarter of 2008.

TP7.8 System Improvement: IntelliGrid and SmartGrid Infrastructure, Under Study

LIPA is continuing to lead this utility and vendor consortium which is developing processes, methods and standards that are required to fulfill the vision of the electric systems future grid; the 'Smart Grid.'

> ***Key Goals:*** ***TP7.8***
> - ✓ *Help develop 'SmartGrid' Technologies*
> - ✓ *Promote the development and adoption of open and non-proprietary standards*
> - ✓ *Lower the cost of implementing the 'Smart Grid' concepts*
>
> ***Targets:***
> - ✓ *Incorporate IntelliGrid consideration in all IT and Operations projects going forward(as appropriate)*
>
> ***Means:***
> - ✓ *Partner with vendors and utilities through EPRI*
> - ✓ *Install Utility Integration Bus and link legacy systems*

New technologies have the potential to give utilities the means to create an intelligent grid that automatically anticipates and responds to power system disturbances while continually optimizing its own performance. For utilities, this means a nimbler, more flexible system that marries electric power with cutting-edge communication and computing capabilities—an intelligent grid that can predict and heal power problems before they get out of hand. For electricity consumers, the smart grid provides enhanced reliability and security, lower energy bills, and new services that can add value to electricity while controlling its cost. The IntelliGrid Program is leading the drive to turn this vision into reality. It follows an open-standards-based approach that promotes interoperability between vendor products, which will lower capital and life cycle costs. The intelligent grid will allow utilities to enhance customer satisfaction, increase power system reliability, improve worker safety, optimize maintenance and asset management programs, and lower capital and life cycle costs.

Participation in the IntelliGrid program provides benefits across the funder's entire organization—the most important of which is helping to implement system development plans and projects that best serve company needs and objectives. The IntelliGrid team works closely with the program partners in building these plans and projects, integrating technologies and strategies that will grow with the system as it evolves in the future. Rather than being a centralized, top-down makeover, the IntelliGrid process is a distributed, bottom-up transformation created when individual energy providers add advanced capabilities, piece by piece, onto the grid. This modular, phased approach can be adopted by companies immediately or further down the road to advance their own strategic objectives.

The IntelliGrid program provides the methods, tools, and technologies that allow utilities to deploy technologies today that meet near-term business needs while laying the groundwork for an intelligent grid. With its own foundation established, the IntelliGrid Architecture and implementation tools in place,

and demonstrations showing success, the program is developing integration guidelines, providing specification assistance, disseminating information, and building and supporting a user community.

Benefits of participation in the IntelliGrid program include access to advanced applications, capital and life cycle cost savings; a seat at the table with key suppliers and public sector representatives; direct input to and impact on the direction of a multimillion-dollar R&D program; first access to results from R&D projects, demonstrations, and implementations; and direct support in implementing IntelliGrid results.

TP7.9 System Improvement: Universal Distribution Transformer, Under Study

LIPA is taking a leading role in the demonstration, development and commercialization of a universal distribution transformer.

The Intelligent Universal Transformer (IUT) is an advanced power electronic system replacement for conventional distribution transformers. The IUT will provide numerous operating benefits to the system and added functionality relative to conventional transformers. It will provide alternative customer service options, such as DC or 400-Hz AC power (for communications applications). It will have power quality enhancement functions, like sag correction will be capable of being configured to provide three-phase power from a single-phase line, will have remote communication capability and can be used as a smart monitoring node as part of a larger networked ADA monitoring capability in the Distribution System of the Future.

Key Goals: ***TP7.9***

- ✓ *Evaluate Intelligent Universal Transformer Technology for LIPA performance goals*

Targets:

- ✓ *Develop and demonstrate low power electronic IUT*
- ✓ *Participate in field demonstration of a pre-commercial unit.*

Means:

- ✓ *Partner with various utilities*
- ✓ *Develop and test field prototype*
- ✓ *Use technical applications study to document results with participating vendors*

The IUT can help regulate voltage and power factor thus contributing to lower electrical losses in the distribution system. It will be modular and capable of being configured in multiple ratings, thus reducing the number of spare inventories relative to conventional transformers.

The IUT will contain no hazardous dielectric fluids. The hazards of spills and the cost of spill cleanups will be avoided. This benefit can save tens of thousands of dollars annually in spill cleanup costs and significantly improve relations with the public and regulators on environmental impact issues.

The IUT is a key component of the Distribution System of the Future. It will provide a major innovation to distribution system operations and to the options for customer service. The IUT is being developed for commercial release at the lowest power ratings, and will be increased to higher ratings as a successful track record emerges. It is also anticipated that the advanced power electronic circuit used in the IUT will be commercially viable in other spin-off power electronic product areas.

TP7.10 System Improvement: High Voltage Superconductor Cable Project, Committed

Steady growth in power consumption and the growing opposition to new high voltage projects demands new, technological solutions to meet consumer power demands. LIPA has taken a leading role in the demonstration, development and incorporation of superconducting transmission cables on a utility system.

This project is designed to demonstrate a long length section of very low impedance (VLI) high temperature superconducting (HTS) cable that is capable of increasing power grid transmission capacity without increasing system voltage levels, while at the same time eliminating the need for dielectric oils; and enabling controllable power flow in an AC power network.

High temperature superconductor (HTS) cables offer the opportunity to transmit more electrical power at the same or a reduced voltage in a compact cable construction. The superconducting state of the cable conductors is maintained by circulating sub-cooled liquid nitrogen, which flows through one phase of the cable and returns through the other two phases. The cable is designed to operate at 138 kV and 2,400 amperes (574 MVA).

Key Goals: ***TP7.10***

- ✓ *Evaluate and demonstrate high capacity transmission cables in superconductor technology*
- ✓ *Evaluate technology and potential for reduction in number of cables required in right of way*

Targets:

- ✓ *Complete testing tasks of the Phase 1 deployment that was put in service in 2008*
- ✓ *Complete Phase 2a project as awarded by DOE*

Means:

- ✓ *Partner with DOE, AMSC, Nexans and Air Liquide*
- ✓ *Help develop the cable system (refrigeration, cable, termination, installation requirements)*
- ✓ *Evaluate the cost and effects of installing and operating the system*

Benefits of participation in the superconducting program include access to advanced transmission applications, alternatives to ROW siting; direct input to and impact on the direction of a multimillion-dollar R&D program; and first access to results from R&D project, demonstration, and implementation.TP8. Technical Performance: Risk and Risk Mitigation

This program is focused on improving system performance through broader use of probabilistic risk assessment methodologies (instead of traditionally used deterministic methodologies) for asset and system performance management.

TP8.1 Risk and Risk Mitigation: Capital Budgeting with Performance Modeling, Committed

LIPA's T&D Capital Budgeting process and methodology includes short and long range studies of load growth for existing and new customers and system performance analysis for various scenarios of normal and emergency system operations. The capital budgeting process combines company level and project level future performance modeling.

The company level performance modeling includes, for example, modeling of impact of level of investment in maintenance, asset replacements, upgrades, condition monitoring, process improvements etc. on reliability of system, company's financial performance, customer satisfaction, and regulatory compliance. The modeling for capital budgeting includes performance modeling of aging assets and critical assets groups, including underground cables, transmission and distribution poles, and other. This is combined with modeling of effectiveness of key processes, at the process and company levels and at the individual asset and asset group levels.

> ***Key Goals:*** ***TP8.1***
> - ✓ *Optimum use of LIPA capital spending and available resources for reliability and overall performance improvement*
>
> ***Targets:***
> - ✓ *Improvement of capital budgeting with cost/benefit, analysis combined with new methodologies for criticality, and probabilistic future performance risk analysis for reliability, financial, customer satisfaction, and regulatory performance goals*
> - ✓ *Complete the implementation of pole and cable models*
>
> ***Means:***
> - ✓ *Use of capital budgeting and project prioritization methodology with probabilistic performance and risk modeling*

Performance and risk modeling is used for capital budgeting at the levels of broader performance and investment categories, and at the levels of individual projects. Projects impacting more than one goal and/or issue (i.e. improve reliability, reduce system losses, etc) and addressing higher-risk performance area are given the highest priority.

TP8.2 Risk and Risk Mitigation: Risk Focused Asset Management, Planned

Traditionally T&D electric power industry is focused on optimizing maintenance since maintenance cost are the largest internally-controllable cost. LIPA and other leading utilities have realized that further cost and performance optimization should be done through an "integrated" asset management (AM) that simultaneously considers maintenance, operation, design, and capital investment options. LIPA is one of four utilities initiating through EPRI, in early 2000, first collaborative project to develop T&D specific AM concepts and tools for implementation. That project has evolved into broader supported EPRI AM program to develop methodologies, tools, and industry-wide best practices. In this project, in parallel and in coordination with EPRI's program, LIPA is developing its own company-specific AM.

The LIPA's AM is focused on risk management in achieving company's technical, financial, customer satisfaction, and regulatory compliance goals.

This project is developing measurable and quantifiable risk indicators of performance measures for key stakeholders, identifying and developing methodologies for risk assessment at the levels of assets and processes, identifying data and infrastructure needs for data and process integration and automation. The project also includes performance and risk visualization, and development of methodologies for "dynamic" analysis of criticality and FMEA (failure modes and effects).

One of the goals of the project is to improve short and long term performance through replacement of outdated deterministic approaches and by introducing probabilistic methodologies for planning, maintenance, operation, design, and performance management.

Key Goals: ***TP8.2***

- ✓ *Improve customer satisfaction, technical and financial performance, and regulatory compliance through implementation of new concepts enabling continuous performance and risk asset assessment*

Targets:

- ✓ *Quantifiable and measurable performance risk indicators*
- ✓ *Continuous assessment of short and long term risk for performance goals at company, organizational, processes, and asset levels*
- ✓ *Probabilistic risk assessment addressing uncertainties in operating conditions, asset performance, and work processes – as replacement for outdated deterministic approach in planning and management*

Means:

- ✓ *Infrastructure for data and process integration supporting "dynamic" risk assessment (consistent with IntelliGrid concepts, CIM, and SOA)*
- ✓ *Development of methodologies for asset performance risk modeling*
- ✓ *Development of methodologies for company performance risk modeling*

TP9. Technical Performance: Process Effectiveness

This program is focused on improving system performance by using RCM (Reliability Centered Maintenance) methodologies and by integrating asset and system data and simulation models to enable near –real-time optimization for improvement of key asset management processes.

TP9.1 Process Effectiveness: Maintenance and Reliability Center Maintenance, Committed

Electrical failures of substation transformers and breakers over the last several years are at an all time low.

Reliability Center Maintenance (RCM) concepts were initiated for substation assets to improve reliability by reducing equipment failures. This provides a roadmap for preventive maintenance of assets to help minimize the risk of failures.

LIPA continues to perform analyses of equipment problems. Poor performing equipment with specific problems are being identified and best maintenance practices modified. As data history is developed, the type and frequency of maintenance can be analyzed to determine if changes to the preventive maintenance plan are warranted.

The maintenance includes methods to identify problems prior to failure such as gas in oil analysis for transformers and thermovision equipment for hot spots. Also maintenance is triggered on events such as faults operations on breakers. Where required, special maintenance programs were established to address specific equipment problems.

Key Goals: ***TP9.1***

- ✓ *Improve system performance and reliability by reducing equipment failures through effective maintenance*

Targets:

- ✓ *Optimize maintenance expenditures and reliability of assets by using proven RCM methodology*
- ✓ *Complete the deployment of RCM for substation equipment*
- ✓ *Implement RCM for overhead and underground transmission lines*

Means:

- ✓ *Develop and analyze equipment failure data history*
- ✓ *Optimize maintenance tasks based on asset condition and criticality in accordance with RCM methodology*

Capital improvement projects have also been completed from replacing whole substations (i.e Rockaway Beach and Fire Island) to replacing specific poor performing equipment such as breakers and transformer type U bushings.

TP9.2 Process Effectiveness: Planning and System Operation Improvement, Committed

LIPA working jointly with the Electric Power Research Institute (EPRI) established real time T&D model based on the international industry wide Common Information Model (CIM). The Control Center Project was activated in 2006; this model of the LIPA transmission system runs in real time and was designed to bridge the gap between the Planning and Operations organizations. The transmission model also includes distribution substations and feeder voltage in real time. For 2008 the object is to connect the Electric Geographic Information System (EGIS) distribution feeder model to the transmission network thus making available in real time voltage and feeder loads on the distribution side.

> ***Key Goals:*** ***TP9.2***
> - ✓ *To improve System Operation by using sophisticated Planning tools in near-real-time mode to make better and faster system operation decisions*
>
> ***Targets:***
> - ✓ *To integrate a set of enterprise wide computer applications to manage T&D assets*
> - ✓ *Automate Planning tools to operate in near-real-time mode*
> - ✓ *Improve system monitoring to increase the availability and security of data*
>
> ***Means:***
> - ✓ *Use the Common Information Model (CIM) for integration of real-time data and system modeling tools.*

By using tool for voltage profile modeling (CymDist) , Planning will be able to study feeder voltage profile at any point in time (present and past), and provide load projection for distribution feeders during heat waves and alert the operations division to formulate corrective actions. The creation of the Utility Integration Bus (UIB) will allow several applications to be connected enterprise wide. Example: 1) Currently the LIPA real time Automatic Sectionalizing Unit (ASU) data is available using the CIM model for planning purposes. 2) Real Time Transformer rating is available. 3) Resolve unbalanced feeder overloads by using line trackers to monitor 3-phase load at any point on the distribution line.

Several future applications are under study, such as the Substation Reliability Assessment (SUBREL), Real Time Optimization (OPF), and Probabilistic Reliability Assessment (PRA).

TP10. Technical Performance: Major Causes

The goal of this program is to ensure effective and focused performance improvement by identifying and understanding major causes of both normal and unusual asset and system failures and then using that understanding to develop future programs and corrective actions and to forecast future system performance.

TP10.1 Major Causes: Root Cause Failure Analysis, Committed

LIPA is committed to continuous improvement and learning from abnormal events that are experienced on the transmission & Distribution system. To that end, a process has been put in place to thoroughly review all abnormal events and/or equipment failures experienced. Under this process, an in depth and unbiased investigation is conducted, studying all aspects of the event with the ultimate goal of determining the root cause. Detailed reports are produced for each event studied and contain key findings and recommendations so that future events can be avoided. Results are shared with all applicable personnel, with recommendations given high visibility and tracking to completion.

Key Goals: ***TP10.1***

- ✓ *Ensure effective performance improvement by identifying major root causes of failures*

Targets:

- ✓ *Identify, monitor, and take corrective actions for root causes of abnormal events (i.e., equipment failures) on the electric T&D systems*

Means :

- ✓ *In depth and unbiased forensic analysis*
- ✓ *Detailed root cause analysis report*
- ✓ *Track recommendations for improvement to ensure implementation*

TP10.2 Major Causes: Misapplied and Outdated Assets, Committed

LIPA is performing forensic system and asset performance studies and, as apart of regular planning, is analyzing future requirements at the system level and at the levels of individual load areas and load pockets. This is combined with route cause analysis of failures and outages to identify assets and operating conditions that may require replacements and/or upgrades of existing assets due to current or future operating requirements exciding assets operating capabilities.

This may occur, for example, as a result of natural system and load growth, due to expected degradation of aging assets, and also due to planned system improvements in order to meet and/or improve reliability and performance goals through use of latest and new technology. Examples includes replacement of circuit breakers due to requirements for higher fault current interruption capabilities or replacement of old electromechanical protection

Key Goals: ***TP10.2***

- ✓ *To ensure system reliability and performance by timely replacement and upgrades of asset reaching their operating limits and/or end of life based on current and projected operating requirements*

Targets:

- ✓ *To identify assets and asset groups reaching their operating limits and end of life for short and long term projected operating requirements.*

Means:

- ✓ *Asset performance and EOL (End of Life) modeling and forecasting*
- ✓ *System and operating requirements forecasting for short and long term planning*
- ✓ *Failure modes and causes analysis for critical assets and asset groups*

relays with new "smart" microprocessor based relays to improve reliability and, for example, reduce momentary outages while providing, at the same time, more data and communication capabilities to support better system and assets condition monitoring.

TP10.3 Major Causes: Design and Criteria, Planned

The LIPA T&D system planning criteria and guidelines are described in a document called the T&D Design Criteria that is to be followed in the development of the LIPA T&D system. At a minimum, LIPA adheres to the standards and criteria of NERC, NPCC, NYSRC and the NYISO. However, in today's uncertain environment this may not always be possible when the improvements required to bring the system into compliance can not be accomplished in a timely manner. This could be due to many factors such as delays caused by design changes to accommodate public comments on a project, due to long equipment lead times for an unexpected merchant project, or due to delays obtaining permission to work on premises owned by others (i.e. LIRR).

> ***Key Goals:*** ***TP10.3***
> - ✓ *Maintain system reliability by strictly complying with LIPA T&D Design Criteria*
>
> ***Targets:***
> - ✓ *Meet system design standards even when it is challenge to meet a project date of need*
>
> ***Means:***
> - ✓ *Implement probabilistic methodology for evaluation of design alternatives*
> - ✓ *Increase lead times to obtain permits*
> - ✓ *Use Special Protection System (SPS) where needed*
> - ✓ *Re-rate sub-transmission lines based on actual weather and field conditions*

Under these circumstances, application of a deterministic standard may have to be abandoned for a specific event or piece of equipment and a probabilistic analysis utilized if possible. For example, it may be shown that the probability of a specific outage on the distribution system occurring during a critical operating period is acceptable so the system, at least for a short period of time, does not have to be designed to prevent or withstand that outage. The acceptable probability threshold might depend upon safety issues, how many customers are affected, how long they will be affected, the amount of equipment damage and how much it would cost to withstand, prevent or mitigate the outage. Alternatively, it might be shown that the probability of interrupting customer load, damaging equipment, etc. is less for a proposed design than it is for any other feasible alternative.

LIPA might also use a special protection system (SPS) judiciously and when employed, it will be installed consistent with good system design and operating policy. The decision to employ an SPS will take into account the complexity of the scheme and the consequences of correct or incorrect operation as well as its benefits.

For overhead sub transmission lines where Planning studies indicate potential overloads less than 10%, LIPA is exploring the possibility of re-rating these circuits on a circuit-by-circuit basis. Subsequently, LIPA has installed monitoring equipment on several overhead sub transmission lines experiencing contingency overloads with the expectation that some overhead lines will be re-rated and that the system will identify line ratings based upon actual weather and field conditions.

TP10.4 Major Causes: Failure Rates and Statistics, Planned

> ***Key Goals:***
> - ✓ *Improve reliability and technical performance by improving data collection and availability of failure statistics of key assets*
>
> ***Targets:***
> - ✓ *Improvement of systems and processes for tracking of T&D system failures, forensic analysis, and failure data analysis*
>
> ***Means:***
> - ✓ *Establish common database to house information on equipment related failures*
> - ✓ *Drive consistency in data capture for all failures experienced on LIPA T&D system*

Today there is no single electronic database at LIPA that is utilized to access data related to the varying types of equipment failures. Several sources of information exist, with many of these still paper based.

When a failure occurs in a substation, Substation Maintenance repairs and/or replaces the unit as required. For the Distribution system, Service Section repairs and/or replaces the equipment sometimes with the assistance of Electric Design and Construction. There are several sources of information and varying methods utilized to track the failure information.

In order to better keep track of all equipment related failures, it is LIPA's intent to populate a single electronic database with all failure related information. This information will then be utilized to provide failure rates for the various types of equipment and compare these failure rates to various industry standard failure rates to insure there are no potential problems with LIPA equipment and to better predict future failures.

TP10.5 Major Causes: End of Life Asset Modeling and Forecasting, Under Study

Currently there is an ongoing EPRI project exploring aging underground primary distribution cables. LIPA is one of the leading utility participants in this effort. The result of this project will be a computer model that will assist in identifying future capital spending levels. The model provides many options for utilities to choose from to "customize" the model to their specific system attributes and allows for industry standard "defaults" if no specific data is available for the utility.

The computer model will provide an Optimal Economic Policy for the utility, and based upon the utility's practice of cable testing, cable replacement and/or run to failure options, suggests a cable strategy for testing and replacement of the distribution cables.

In addition to the EPRI project, LIPA has concurrently developed their own cable model that will expand the findings of the EPRI model. Similar efforts have been launched with other distribution equipment, specifically wood distribution poles.

Key Goals: ***TP10.5***

- ✓ *Improve reliability and technical performance by improving end-of-life assessment for key assets.*

Targets:

- ✓ *Establish computerized models to permit end of life assessment of key distribution equipment*

Means:

- ✓ *Compile data for LIPA assets to populate computer models*
- ✓ *Compile data from other utilities to supplement data and expand breadth of data available for analysis*
- ✓ *Develop models for end of life analysis*

TP10.6 Major Causes: Process Effectiveness, Under Study

Industry standard practices for identification and analysis of major causes are, typically, focused on failures of physical assets and operating conditions, such as loading and weather, and less on effectiveness of key asset management processes.

LIPA's "integrated" approach to asset management and clear separation of roles of asset owner (LIPA) and asset manager (NGrid) requires specific performance measures for asset management and processes. For example, current contract with NGrid specifies 18 performance measures, including targets and ranges for performance incentives.

LIPA is developing measures for predictive assessment of effectiveness of key processes, including planning, performance analysis, maintenance, operation, design and engineering, IT services, as a "major causes" contributor for future performance.

Key Goals: ***TP10.6***

- ✓ *Improve performance by improving key asset management processes.*

Targets:

- ✓ *Establish methodology and specific measures of impact of key processes on financial, technical, customer satisfaction, and regulatory compliance performance*

Means:

- ✓ *Data consolidation and integration for process effectiveness measurement*
- ✓ *Implementation of processes for analysis of major causes with reporting of process effectiveness*

Measures and methodologies include data and methodologies for probabilistic performance and stability analysis of key processes (including "process control charts" and other statistical and probabilistic tools, for example). Development includes risk measures and criteria, and processes for monitoring and reporting. Examples include accuracy and consistency of accuracy of short and long term load forecasting, asset condition and performance forecasting, accuracy of cost, schedules, and deliverables of work processes and capital and maintenance projects, modeling and projecting technical, financial, customer satisfaction, and regulatory compliance at the system, operating areas, load pockets, and circuits levels, under normal and emergency operating conditions.

TP11. Technical Performance: Physical Security of Assets, Committed

The goal of the program is to ensure physical security of critical assets for system operation in normal and emergency operating situations.

All LIPA substations are provided with signs on the fences to discourage entry by making the public aware of a potential danger for electrocution and personal injury within the premises. In addition, all substation control equipment and switchgear are installed behind locked doors.

A number of substations in the system have been identified as critical substations for delivery of power to the customers. These substations have been provided with enhanced security measures, including electronic surveillance, security guards, or regular security inspections to prevent injury, theft or vandalism that may cause customer service interruptions.

Key Goals: ***TP11***

- ✓ *Physical security and availability of critical assets in normal and emergency operating conditions*

Targets:

- ✓ *Zero unauthorized entries into critical substations*
- ✓ *Protect the public from contact with electrical equipment*
- ✓ *Prevent Vandalism and theft*

Means:

- ✓ *Provide appropriate fencing and signage*
- ✓ *Use of electronic surveillance*
- ✓ *Controlled access to critical substations requiring personnel identification when on-site*
- ✓ *Debris removal from substations*

TP12. Technical Performance: Public and Employee Safety

It is LIPA's objective to conduct its operations with the utmost regard for the safety and health of its employees, customers and the public.

The goal of this program is to ensure public and employee safety through appropriate level of employee training, public awareness and education programs, system improvements and development of new protection technologies (including wire-on-ground and fire detection in distribution system)

TP12.1 Public and Employee Safety: Safety Education Programs, Committed

To employees, the Company provides equipment, specifications and working conditions designed to promote efficient operations and minimize hazards and conditions that may cause injuries and health problems. Each department is responsible for taking the initiative for developing and implementing active programs that assure compliance with the Company's Safety procedures and applicable Federal and State Regulations. The design and purchase of new equipment, tools and materials, and the implementation of new work methods and procedures shall permit compliance with the Company's applicable rules and federal and state safety and health regulations.

> ***Key Goals:*** ***TP12.1***
>
> - ✓ *System operation with no, or minimum possible, risk for safety of public and employees*
>
> ***Targets:***
>
> - ✓ *Eliminate loss time accidents*
> - ✓ *Ensure employees are following safety rules*
> - ✓ *Customer awareness of safety and risk elements of T&D system*
>
> ***Means:***
>
> - ✓ *Continued employee training*
> - ✓ *Provide employee incentives to work following safety rules*
> - ✓ *Continued customer education from an early age*

For customers and the public in general, LIPA has implemented public safety awareness program that consists of a series of documents on electric safety to remind and educate customers and the public on a variety issues such as how to make a home safer, electric and magnetic fields (EMF) near power lines, polychlorinated biphenyls or PCBs, and how to prepare for storm emergencies that are also available on the LIPA website. In addition, LIPA offers Electric Safety classroom presentations.

TP12.2 Public and Employee Safety - Training and Standards Compliance, Committed

Key Goals: ***TP12.2***

- *Safe electric T&D system in compliance with applicable safety codes*

Targets:

- *No employee loss time accidents*
- *No customer contacts with LIPA T&D energized facilities*

Means to Achieve Targets:

- *Ensure system is designed according to safety codes*
- *Employee safety training*
- *Customer safety awareness program*

It is LIPA's mission is to deliver safe, reliable and economical electric service to its customers. It is the objective of the Company to conduct its operations with the utmost regard for the safety and health of its employees, customers and the public. For this reason, the Company provides equipment, specifications and working conditions designed to promote efficient operations and minimize hazards and conditions that may cause injuries and health problems.

The Company recognizes the importance of wearing safety apparel (safety eyeglasses, safety shoes, hardhats, etc.) for the employees' personal protection while working in areas where there may be exposure to injuries. Each department is responsible for taking the initiative for developing and implementing active programs that assure compliance with the Company's Safety procedures and applicable Federal and State Regulations. Sufficient time shall be allocated on a regularly scheduled basis for training all employees in accident prevention and recognition and control of hazardous substances and/or conditions that can affect their health.

LIPA Engineering staff is responsible to give adequate consideration to fire prevention and protection relative to the design of new and/or modifications to existing facilities. Toward this end, they shall ensure that the designs are in compliance with applicable federal, state and local regulations, applicable codes and insurance company standards.

3.3.2 Customer Satisfaction

Exhibit 2-6 provides a summary listing of the T&D Customer Satisfaction programs. A more detailed description of each program is included in this section.

CS1. Customer Satisfaction: Reliability Improvements, Committed

The goal of this program is to improve customer satisfaction by reducing number of circuits, groups of customers who are experiencing significantly lower-than-average reliability while maintaining first quartile of reliability at the system level

Key Goals: ***CS1***

- ✓ *Improve customer satisfaction by implementing programs aimed at reducing frequency and duration of outages experienced by customers*

Targets:

- ✓ *Implement electric reliability improvement programs to reduce interruptions of customers with significantly lower-than-average reliability*
- ✓ *Maintain first quartile of reliability at the system level*

Means:

- ✓ *Develop and implement portfolio of reliability programs aimed at general population*
- ✓ *Supplement with targeted programs to strategically address area and customer specific reliability issues*

Electric reliability is of great importance to LIPA and among the most important attributes in customer satisfaction. LIPA has adopted an aggressive strategy that is committed to improving the reliability of the electric T&D system on Long Island. This focus has helped LIPA to be recognized as the most reliable overhead electric utility in NYS in terms of frequency of outages, restoration time and average annual outage time experienced by customers. LIPA has a host of reliability programs that are targeted to the general population and such programs have been highly successful in driving the reliability on LI to its current level.

LIPA, however, recognizes the need for additional reliability programs that are of a more targeted and strategic nature for areas where the more generic programs have not been successful in delivering a high degree of reliability. As such, LIPA has adopted several programs that are targeted to the particular geographic area or customer segment. For instance, LIPA has a Targeted Reliability Improvement Program where measures are recommended to treat areas where local conditions dictate an alternate approach. Measures such as hazardous tree removal and the installation of a more tree resistant cable have helped to improve reliability in certain heavily treed areas. Additionally, LIPA is in the process of launching a Multiple Customer Outage (MCO) Program that will target reliability improvements to customers experiencing 4 or more outages in a given year.

Overall, it is anticipated that such strategic programs will supplement the existing portfolio and help to improve overall reliability.

CS2. Customer Satisfaction: Power Quality, Committed

> ***Key Goals:*** ***CS2***
>
> - ✓ *Improve customer satisfaction by maintaining power quality and providing effective customer support*
>
> ***Targets:***
>
> - ✓ *Provide service voltage within IEEE standards*
> - ✓ *Comply with IEEE519 harmonic distortion guidelines*
> - ✓ *Expeditiously identify and address any T&D system source of the PQ problem*
> - ✓ *Use of AMI and SmartGrid technologies for monitoring and improvement of PQ*
>
> ***Means:***
>
> - ✓ *Complete periodic and customized Distribution System Reliability Studies*
> - ✓ *Address complaints working with the customer as required Effective use of PQ monitoring equipment, and future AMI and SmartGrid technologies*

Power quality is defined by voltage levels and distortions due to characteristics of system, load, and interferences.

LIPA's goal is to ensure satisfactory power quality during normal and emergency operating conditions by implementing customized design, implementation of new monitoring systems and developing improved system operation criteria where necessary

The ability to provide power that is clean and free of anomalies is of utmost importance to customers, especially as customers migrate to more sophisticated state of the art appliances, processes and electronic in home systems. When customers experience and report abnormalities an initial inspection takes place. This initial effort is intended to expeditiously identify and address any T&D system source of the PQ problem. If in the initial inspection no root cause is identified or the PQ issues continue, installation of PQ monitoring / recording equipment will take place. The type of PQ monitoring / recording equipment that ultimately is installed will depend on the type of service and characteristics of the reported PQ complaint. For many situations the PQ monitoring equipment may need to remain at the customer facility/home for some time until an abnormality is captured for review and analysis. If needed a more in-depth review and analysis is performed by Performance Engineering to assist in identifying the root cause of a PQ issue. LIPA's responsibility ends at the point of service. If the problem is determined to be on the customer side of the meter, LIPA will recommend that the customer contact an industry expert that is better equipped and trained to remedy the problem.

CS3. Customer Satisfaction: Support in Resolving Customer Power Quality Issues, Committed

> ***Key Goals:*** ***CS3***
> - ✓ *Improve customer satisfaction by providing expeditious review and resolution to customer PQ issues.*
>
> ***Targets:***
> - ✓ *Address all PQ customer complaints expeditiously.*
> - ✓ *Maintain adequate supply and variety of PQ monitoring / recording equipment. Provide engineering support in analyzing PQ data and identify the root causes of such problems*
> - ✓ *Identify and purchase additional PQ monitors as needed.*
>
> ***Means:***
> - ✓ *Root cause analysis of customer PQ issues*
> - ✓ *PQ monitoring and recording equipment*
> - ✓ *Engineering support for analysis and*

This LIPA's program is established to assist to customers with root cause analysis and to improve customer satisfaction by providing expeditious review and resolution to customer PQ issues by providing PQ monitoring / recording equipment and engineering support for root cause analysis.

The ability to provide power that is clean and free of anomalies may be a good retention, attraction and marketing tool especially with major commercial and industrial customers. As customers migrate to more sophisticated state of the art appliances, processes and electronic in home systems good power quality becomes essential. When customers experience and report abnormalities an initial inspection takes place. This initial effort is intended to expeditiously identify and address any T&D system source of the PQ problem. If in the initial inspection no root cause is identified or the PQ issues continue, installation of PQ monitoring / recording equipment will take place. The type of PQ monitoring / recording equipment that ultimately is installed will depend on the type of service and characteristics of the reported PQ complaint. For many situations the PQ monitoring equipment may need to remain at the customer facility for some time until an abnormality is captured for review and analysis. If needed a more in-depth review and analysis is performed by Performance Engineering to assist in identifying the root cause of a PQ issue. To minimize delays, it is necessary for us to maintain an adequate supply and variety of PQ monitors on hand for deployment to expedite resolution of the issue and satisfy the customer concerns. Our inventory of PQ monitoring equipment is reviewed periodically with additional more state of the art units purchased as needed. As it relates to solving a customer PQ issue LIPA's responsibility ends at the point of service to the customer facility. In instances where it is determined that the PQ problem is on the customer side of the meter, LIPA will recommend that the customer contract with a PQ professional who is equipped to analyze and remedy the problem. In an effort to further support resolution of a PQ issue, LIPA is contemplating making available to customers a full range of PQ monitoring and services to include abnormalities on the customer side of the point of service.

CS4. Customer Satisfaction: Service Quality, Committed

This program is focused on improving quality of services provided by T&D Operations. The goal is implementation of processes for providing better proactive communication to customers and then assuring that customer concerns are addressed in a timely manner

Key Goals: ***CS4***

- ✓ *Improve customer satisfaction by improved and proactive communication to customers and timely addressing customer concerns*

Targets:

- ✓ *Open lines of communication with customers*
- ✓ *Contact all customers who contacted LIPA to report an outage on a primary main or branch line, transformer or single interruption.*
- ✓ *Capture customer comments and level satisfaction based on Ambassador's perception of call.*
- ✓ *Identify opportunities to enhance customer service*

Means:

- ✓ *T&D employees make follow-up calls to customers who have experienced a sustained outage*
- ✓ *Utilize 21st Century Reverse 911 call back system to contact customers*
- ✓ *Use "identified opportunities to enhance customer satisfaction" to improve work processes and capital budgeting*

As part of its efforts to improve customer satisfaction, LIPA has launched a number of initiatives that are aimed at understanding the needs of its customers and proactively reacting so as to improve the customer's overall experience with the utility. Examples include its Trade Ally Program, improved and expanded customer communications and an Automated Outage Call Back System to more readily keep customers informed during electrical outages. LIPA is also expanding a portfolio of customer care programs.

The LIPA Customer Care programs and initiatives are built around providing convenience, choice and tools for the customer. These web-based programs offer Residential and Commercial customers options in managing their energy, interacting with LIPA and obtaining important information.

Programs such as "My Account" which is an online account management system that allows customers to perform functions such as: enter a meter reading, view their account status and look at account balances. This program also gives customers access to tools such as Home or Business Analyzer which provides online analysis of their electric consumption as well as providing energy management advice.

The Customer Care program also offers customer choice through programs such as balanced billing and electronic billing or payment. In addition, customers who establish an online relationship with LIPA receive periodic energy-related information or management tips via email. The objective of LIPA customer care programs are to provide customers choice, options and increased customer satisfaction.

Additionally, on August 1, 2007 LIPA began a program to reach out to its customers to create a positive experience for the customer and to improve their perception of LIPA's level of service. Under this program, customers who experience electrical outages receive follow-up phone calls from LIPA employees to apologize for the outage, review the outage and confirm that there are no outstanding issues related to the outage. A secondary program goal is to have LIPA employees acquire a strengthened recognition of the type of business that we are in and that we are here to serve the customer put a face on the business. Everything LIPA does will touch the customer in some way. In addition, the open lines of communication enable LIPA's staff to reevaluate the current business processes and engage new ideas as it embraces the new culture.

LIPA is also actively engaged in conducting customer satisfaction surveys. Such surveys provide additional insight to customer wants and needs and provide a mechanism to track overall performance as measured by the customer.

CS5. Customer Satisfaction: O/H vs. U/G Criteria and Strategy, Committed

The goal of this program is to improve customer satisfaction by implementing targeted programs aimed at increasing electric reliability and ensuring transparency of strategy, criteria, and decision making processes for selectively undergrounding some portions of the T&D system.

Approximately 85% of the annual number of customer interruptions on the LIPA distribution system occur on overhead construction lines and outage data indicates that underground construction is more reliable compared to overhead construction.

The primary advantage of underground construction is less exposure to outages related to external factors such as inclement weather, trees, animals and motor vehicle accidents which has the potential to significantly reduce customer interruptions. Historic electric interruption data indicates that the frequency of outages to customers supplied by underground circuits is approximately three times lower than for overhead systems. However it also takes considerably longer to repair those underground circuits once an outage occurs.

LIPA rates support construction of an all overhead transmission and distribution system. However, when a new distribution circuit is required to supply a complex of five or more dwelling units they will be supplied underground.

Key Goals:

- ✓ *Improvement of performance and customer satisfaction through optimum strategy and criteria for selective under grounding*

Targets:

- ✓ *Implement an updated undergrounding policy by 2010.*
- ✓ *Review and update strategy and criteria for optimum undergrounding decisions*
- ✓ *Review and update cost estimate methodology and reimbursement policies*

Means:

- ✓ *Distribution performance data and analysis, including "worst circuit" performance approach used to identify those circuits with the worst reliability indices that is, where their SAIFI, CAIDI, SAIDI and MAIFI significantly exceed distribution circuit averages.*
- ✓ *Subtransmission circuits performance, and cost data, engineering and environmental factors*
- ✓ *138 kV circuits performance, cost, and: Article VII filing with NY PSC requirements*

It is LIPA policy to underground all new 345 kV transmission circuits. In addition, LIPA will decide whether or not to place a new line underground based on the economic, engineering and environmental factors present. LIPA will consider partial or full undergrounding of new 138 kV or 69 kV circuits depending on the above

CS6. Customer Satisfaction: Outage Management, Committed

This program is focused on customer satisfaction improvement through better outage customer communication.

The goal is to improve the quality of analyzing customer outages and provide improved estimates of restoration times, status updates, outage causes and remedies to customers in a way that satisfies their needs.

Customer outages which occur on LIPA's distribution system are prioritized utilizing an Outage Management System (OMS) which has been effective in maintaining our status of being number one in New York State Overhead Electric System Reliability.

Annual restoration training and effective monitoring and utilization of manpower during storms have also enabled LIPA to lead the State in storm restoration times.

Key Goals: ***CS6***

- ✓ *Improve customer satisfaction through better experience and communication during customer outages*

Targets:

- ✓ *Provide more accurate restoration information including assessment of outage and predicted restoration time*

Means:

- ✓ *Implement technology to provide automatic updated outage restoration information to customers*
- ✓ *Improved outage data and outage management*

LIPA is highly dependant on the OMS to analyze, prioritize, and dispatch crews to effectively manage customer outages during storm and non-storm events.

Over the past year, LIPA has enhanced its outage management system capabilities as a means to improve the customers overall experience when dealing with an outage. Specifically, LIPA has added a "Customer Call Back" module to its outage management system that allows a customer to elect to be called back when additional information is available relative to their outage. Specifically, when a customer first calls in an outage, it is difficult to predict the exact nature of the problem and thus difficult to predict restoration time with any certainty. With the introduction of the call back module, customers can elect to enter a phone number to which LIPA will provide additional information on the outage once more up to date and accurate information is available. Customers can also elect to be called back once power has been restored so as to confirm restoration and eliminate instances where smaller nested outages may still exist.

3.3.3 Compliance with Regulatory Requirements

Exhibit 2-7 provides a summary listing of the T&D Regulatory Compliance programs. A more detailed description of each program is included in this section.

RC1. Reliability Standards

For the first time as of June 18, 2007 the U.S. electricity industry has been operating under mandatory, enforceable reliability standards. Utilities and other bulk power industry participants that violate any of 83 standards will face enforcement actions including possible fines of up to $1 million a day. The North American Electric Reliability Corporation (NERC) is responsible for developing and enforcing these standards as one means of improving the reliability of North America's bulk power system.

LIPA's goal is to comply with reliability standards at the DOE, regional, state, and Company levels. Yhis includes compliance with NERC, New York (NYISO and NYSRC) and Northeast Power Coordinating Council (NPCC) Standards as a minimum requirement and compliance with LIPA internal design standards.

RC1.1. Reliability Standards: NERC/ERO Standard Compliance, Committed

The North American Electric Reliability Corporation Reliability Readiness Evaluation and Improvement Program is one of the commitments of NERC and the industry following the blackout of August 14, 2003, to strengthen the reliability of the North American bulk power system. The program conducts independent evaluations of balancing authorities, transmission operators, reliability coordinators, local control centers, and other key entities that support the reliable operation of the bulk power system to assess their preparedness to meet their assigned reliability responsibilities. The evaluations identify strengths and areas for improvement in an effort to promote excellence in operations among these organizations.

Key Goals: ***RC1.1***
- ✓ *Comply with NERC Planning Standards*

Targets:
- ✓ *Continue to meet and proactively improve or exceed existing NERC standards*

Means:
- ✓ *Monitor and document compliance with NERC*
- ✓ *Have required documentation available for review and perform periodic reviews*
- ✓ *Improve and coordinate with LIPA internal standards*

The reliability readiness evaluation teams, each led by a NERC staff member and a regional co-leader, include industry volunteers with considerable expertise selected to provide representation from other interconnections, other regions, and neighboring operating entities. The teams also typically include representatives from the Federal Energy Regulatory Commission (FERC) staff.

The evaluation team for the Long Island Power Authority (LIPA) met on-site with LIPA representatives on May 1 – 3, 2007 to evaluate the readiness of the LIPA to meet its responsibilities as a local control center (LCC) and transmission owner.

The NERC evaluation team found no significant operational problems and concluded that LIPA has adequate facilities, processes, plans, procedures, tools, and trained personnel to perform the LCC/transmission owner functions necessary to maintain the reliable operation of the bulk power system, with no notable exceptions. The evaluation team identified a number of positive observations.

RC1.2 Reliability Standards: NYSRC Standards Compliance, Committed

LIPA is under the jurisdiction of several regional reliability organizations including the New York State Reliability Council (NYSRC) and Northeast Power Coordinating Council (NPCC).

> ***Key Goals:*** ***RC1.2***
> - ✓ *Comply with New York (NYISO and NYSRC) and Northeast Power Coordinating Council (NPCC) Planning Standards*
>
> ***Targets:***
> - ✓ *Demonstrate compliance with Regional standards*
>
> ***Means:***
> - ✓ *Have required documentation available for review and perform periodic reviews*

The NYSRC monitors compliance with the NYSRC Reliability Rules through an annual NYSRC Compliance Monitoring Program. The Northeast Power Coordinating Council (NPCC) monitors compliance with the NPCC Reliability Rules through an annual NPCC Compliance Monitoring Program. These programs establish a schedule of reporting dates with descriptions of compliance documentation requirements and obligations for the rule measurements that have been selected for review. The NYSRC RCMS provides oversight with respect to NYISO compliance reviews for those NYSRC Reliability Rules for which Market Participants have compliance responsibility. The NPCC CMAS provides oversight with respect to NPCC compliance reviews for those NPCC Reliability Rules.

When non-compliance by either NYSRC or NPCC is identified, mitigation plans and corrective actions are developed to achieve compliance.

In 2006, the NYISO and LIPA were in full compliance with every measurement assessed during 2005 and 2006.

The NYSRC Reliability Rules also require the NYISO, in collaboration with the Transmission Owners (including LIPA) to conduct annual long term comprehensive reliability adequacy and security assessments of New York Control Area (NYCA) resource adequacy and transmission reliability. The NYSRC concluded that the NYISO 2005 and 2006 assessments were in full compliance with NYSRC Reliability Rules.

Despite recent record-breaking demand in the Northeast, power supplies were adequate and the power system operated reliably, clear evidence of the close cooperation between the New York Independent System Operator (NYISO) and New York's Transmission Owners , including LIPA. This demonstrates the benefits of New York's and LIPA's excellent operator training and compliance with reliability standards and rules.

RC2. Planning Compliance

Planning compliance include process and use of criteria defined by DOE and regional organizations to ensure reliability of transmission system. This includes compliance with DOE and regional standards for planning process and criteria in combination with additional requirements for planning process and criteria developed at the LIPA level.

RC2.1 Planning Compliance: ISO Planning Process Compliance, Committed

Attachment Y of the NYISO Open Access Transmission Tariff (OATT) describes the process that the NYISO, the Transmission Owners, and Market Participants shall follow for planning to meet the reliability needs of the New York State Bulk Power Transmission Facilities ("BPTFs"). The objectives of the process are to: (1) evaluate the reliability needs of the BPTFs; (2) identify, through the development of appropriate scenarios, factors and issues that might adversely impact the reliability of the BPTFs; (3) provide a process whereby solutions to identified needs are proposed, evaluated, and implemented in a timely manner to ensure the reliability of the system; (4) provide an opportunity for the development of market-based solutions while ensuring the reliability of the BPTFs; and (5) coordinate the NYISO's reliability assessments with Neighboring Control Areas.

Key Goals: ***RC2.1***

- ✓ *Comply with ISO Planning Process*

Targets:

- ✓ *Demonstrate compliance with ISO process and criteria*
- ✓ *Document compliance, process, and criteria*

Means:

- ✓ *Have required documentation available for review and perform periodic reviews*

Procedures for the implementation and administration of the Comprehensive Reliability Planning Process are included in the NYISO's manuals. They establish a schedule for the collection and submission of data and the preparation of models to be used in the required studies. The procedures are designed to allow the coordination of the NYISO's planning activities with those of NERC, NPCC, and other regional reliability organizations so as to develop consistency of the models, databases, and assumptions utilized in making reliability determinations.

Reliability Needs Assessment (RNA)

The NYISO develops the RNA in consultation with Market Participants. NYISO Subcommittee Transmission Planning Advisory Subcommittee (TPAS) has responsibility to ensure consistency with NYISO Procedures for review of the associated reliability analyses. NYISO's Electric System Planning Work Group (ESPWG) has responsibility for providing commercial input and assumptions to be used in the development of the reliability assessment scenarios and in the reporting and analysis of historic congestion costs.

The RNA evaluates what additional system resources would be needed over a 10-year study period in order for the NYCA to comply with the applicable reliability criteria. It assesses a Five Year Base Case to determine whether the BPTFs meet all Reliability Criteria for both resource and transmission adequacy in each year, and report the results of its evaluation in the RNA. Transmission analyses include thermal, oltage, short circuit, and stability studies. If any Reliability Criteria are not met in any year, the NYISO performs additional analyses to determine whether additional resources and/or transmission capacity expansion are needed to meet those requirements, and to determine the expected first year of need for those additional resources and/or transmission. The studies do not seek to identify specific additional facilities. Reliability needs are only defined in terms of total deficiencies relative to Reliability Criteria.

At the NYISO's request, Market Participants provide the data necessary for the development of the RNA. This input includes but is not be limited to (1) existing and planned additions to the NY State Transmission System (provided by Transmission Owners and municipal electric utilities); proposals for merchant transmission facilities (provided by merchant developers); generation additions and retirements (provided by generator owners and developers); demand response programs (provided by demand response providers); and any long-term firm transmission requests made to the Transmission Owners or by municipal electric utilities.

As Transmission Owner, LIPA is responsible for reviewing the data used to model its existing transmission system and for submitting its transmission expansion plans to the NYISO to be included in the RNA. The NYISO reviews all Transmission Owners' plans to determine whether they meet Reliability Needs, recommends an alternate means to resolve the needs from a regional perspective, where appropriate, or indicate that it is not in agreement with a Transmission Owner's proposed additions.

LIPA's Transmission Planning staff communicates and coordinates studies with NYISO and ISO-NE on a regular basis. Participation in NYISO and ISO-NE planning committees facilitates the exchange of information and study results. All recommended future projects resulting from studies are incorporated in the NYISO databases through the NYISO base case development process.

RC2.2 Planning Compliance: LIPA additional Planning Criteria, Committed

The set of rules and standards that determine the manner in which the LIPA electrical system is planned and operated are collectively referred to as the planning criteria. These criteria ensure that alternative solutions are compared on an equal basis and that the system is planned and built to maintain a consistent level of reliability.

Key Goals: ***RC2.2***

- ✓ *Provide capacity to serve customer load within compliance and with optimum solution for overall performance*
- ✓ *Deliver power from new plants or interconnections across the system in compliance with standards with optimum solution for overall performance*

Targets:

- ✓ *Reliably support load growth in all areas consistent with expected performance targets and with full compliance with standards*

Means:

- ✓ *Load forecasting studies*
- ✓ *Long Range, Short Range and Operating Studies to identify need for new substations , lines, and transformer capacity*
- ✓ *Updated planning criteria for compliance with standards*

LIPA's Planning Criteria is consistent with prevalent utility practice, and reflects the best-in-class practices exhibited throughout North America. As a load serving entity and transmission owner within the State of New York and a member of the New York Independent System Operator (NYISO), New England Independent System Operator (ISO-NE), and PJM, LIPA adheres as a minimum to the standards and criteria of the North American Electric Reliability Council (NERC), the Northeast Power Coordinating Council (NPCC), the New York State Reliability Council (NYSRC), the NYISO, ISO-NE, and PJM.

- NERC *Planning Standards*
- NPCC *Basic Criteria for Design and Operation of Interconnected Power*
- NYSRC *Reliability Rules for Planning and Operating the New York Bulk Power System*.

The above documents describe the performance standards and analyses requirements to be used in the planning, design, or operation of the *Bulk Power System* as have been established by NERC, NPCC and NYSRC, respectively. These reliability criteria and standards are followed by the NYISO in conducting studies and assessments associated with transmission expansion and interconnection.

RC3. Environment Protection

LIPA processes and standards to ensure high level of environment protection include compliance with all applicable environmental laws and regulations, continuous monitoring and proactive implementation of effective environment protection and processes. In addition, LIPA is developing, adopting, and comply with specific LIPA standards that protect Long Island's special character.

RC3.1 Environment Protection: Oil Containment Upgrades, Committed

Suffolk County Department of Health Services code requires all single walled underground storage tanks to be replaced with double walled design or an aboveground design with secondary containment. LIPA has four tanks containing insulating fluid used in underground pipe type transmission cables installed in Suffolk County that it has agreed to replace with new above grade tanks. In addition, containments have been installed on the new Northport to Pilgrim 138 kV cable dielectric fluid reservoirs.

The new above grade tanks will be installed on a concrete foundation with secondary containment consisting of concrete curbing with a minimum capacity of 110% of the above grade tank shell capacity. The existing insulating fluid steel piping will be welded to new steel piping to supply and return lines on each side of the tanks. The tanks will be coated with a corrosion resistant material. The exiting single walled underground storage tank will be removed and any contaminated soil shall be properly disposed.

Key Goals: ***RC3.1***

- *Comply with Suffolk County Health Services Code*

Targets:

- *Complete engineering drawings and submit permit applications to County for approval*
- *Replace existing tanks with new above grade oil tanks*
- *Replace Oakwood, Greenlawn and Ruland Rd underground tanks by 1/1/2010*

Means:

- *Obtain approval from Suffolk County Dep. Of Health for planned tanks replacement*
- *Complete engineering and construction target dates*

Oil containment dikes were installed on new and select existing transformers at the Northport and Port Jefferson power stations to address Federal and County requirements.

It is LIPA's policy to inform all environmental authorities at the State or Federal levels of any proposed dielectric fluid storage project and to include in its design the necessary containment facilities to prevent a potential fluid spill. Currently the Federal Spill Prevention, Control and Countermeasure (SPCC) and Suffolk County Article 12 regulations apply to dielectric fluid.

RC3.2 Environment Protection: Standards Compliance, Committed

LIPA is committed to the design, construction, operation and maintenance of its facilities in compliance with all applicable environmental laws and regulations**.** This commitment to environmental protection is the responsibility of each LIPA employee and contractor and is an integral part of its total customer service objective. This means considering community impacts, and working closely with local groups across its service territory to accentuate the good and mitigate the bad. In a nutshell, it means *"We must be good neighbors and respect the environment,"*

> ***Key Goals:*** **RC3.2**
>
> - *Comply with all applicable environmental laws and regulations*
> - *As a company, live up to high environmental standards and responsibilities*
>
> ***Targets:***
>
> - *Ensure that all levels of the company have appropriate accountability for environmental programs, needed information, and support systems (EMS, EMIS)*
> - *Meet or, when appropriate, exceed regulatory requirements*
> - *Implement formal spill management process for major storms*
>
> ***Means:***
>
> - *Resources allocation for program implementation and capital budgeting*
> - *Maintain and effectively use EMS and EMIS systems and an electronic database to track compliance status of company facilities with environmental laws*
> - *Up-to-date maintenance of all permits/licenses*

All employees are accountable for implementing the environmental programs that fall within their areas of responsibility and management is committed to overseeing the programs. LIPA, through its Management Services Agreement with National Grid, relies upon an extensive Environmental Management System (EMS) which incorporates environmental policies and procedures covering all aspects of system construction, operation and maintenance. The EMS is web based and readily available to employees. It is further supplemented by "Quick Tips" which provides immediate field level guidance for facilitating environmentally sound operation and emergency response.

The EMS is also supported by The *Environmental Management Information System (EMIS)*, allows LIPA to continue to enhance its commitment to environmental responsibility and compliance. EMIS supports a wide range of operations. Using the company's Intranet communication infrastructure, it gets timely and important environmental information to all levels of the company quickly and accurately. It provides access to real-time data on a multitude of environmental programs and enables rapid decision making. Employees have access to this information right at their fingertips on their personal computers or hand-held devices.

The company regularly interacts with community and government agencies in a continuous effort to encourage environmentally sound legislation.

RC4. Article VII Permitting, Committed

In order to comply with Article VII of the Public Service Law, LIPA must file an application for a Certificate of Environmental Compatibility and Public Need requesting authorization to install any new transmission facility 125 kV and above that extends a distance of one mile or more. The Application is filed with the NY Public Service Commission (PSC) with copies sent to the NY Department of Environmental Conservation (DEC) and other local and State governmental entities.

> ***Key Goals:*** ***RC4***
>
> - *Improve system reliability by installing new transmission lines*
> - *Obtain public (customer) input and create goodwill for new transmission facilities 125kV and above*
>
> ***Targets:***
>
> - *Comply with Article VII of the Public Service Law*
>
> ***Means:***
>
> - *Complete engineering and environmental studies required to support Application in a timely manner*
> - *Complete Application and submit it to PSC in a timely manner*
> - *Meet projects in-service dates*

The Application must contain information regarding location of the line, any alternate routes considered, and the reasons why the primary proposed route is best suited for the facility, a description of the transmission facility being proposed, a description of environmental studies made, and a statement explaining the need for the facility.

Before an application is filed, informal meetings are held to inform the public of the applicant's proposals, explain the Article VII process, answer general questions, and gain input from the public. In the application, the applicant is encouraged to submit a complete report of the applicant's public involvement activities and its plans to encourage public participation.

Then there are hearings presided by a PSC Administrative Law Judge (ALJ) during which evidence is presented. Finally, based on the information in the record and the arguments in the briefs, the ALJ prepares an analysis of the issues and issues a "Recommended Decision" to the full PSC proposing the disposition of the case.

RC5. Regulatory Compliance - Energy Policy Act Issues, Committed

LIPA is committed to comply with Energy Policy Act requirements addressing advanced metering, renewables, transmission corridors, and other requirements.

Key Goals: ***RC5***

- *Comply with Energy Policy Act requirements*
- *Obtain public (customer) input and create goodwill*

Targets:

- *Implement Federal Energy Policy Act requirements for advanced metering, renewables, and NIETC*

Means:

- *Engineering and environmental studies required to support application in a timely manner.*
- *Capital budgeting and project prioritization*

Advanced Metering, Committed

Several sections of the Energy Policy Act address advanced metering including time of use and net metering. For example, Section 103 requires advanced metering, (where practical) in federal buildings by October 2012, Section 922 requires R&D into metering at high power density industrial facilities, Section 925 requires that the Department of Energy (DOE) initiate a comprehensive R&D program, Section 1251 requires utilities to provide net metering to customers (if the States find it appropriate), and Section 1252 requires utilities to offer customers time based rate schedules January 2007 (if the States find it appropriate).

LIPA has had some forms of advanced metering and time based rates for many years. For example, LIPA, through New York State's Net Metering Law and LIPA's tariff for electric service, provides net metering to residential customers that installed Photovoltaic (PV) systems 10 KW or less as part of its Clean Energy Initiative. In addition, LIPA has recently issued an RFP for a pilot program that will provide advanced metering to 100 residential and commercial customers. It appears, however, that LIPA's programs are independent of Energy Policy Act initiatives or requirements.

Renewables, Committed

Several sections of the Energy Policy Act address renewables such as biomass, hydrogen, photovoltaic, solar, wind and geothermal power. Primarily, the Act requires the DOE to initiate an extensive array of R&D programs and other initiatives to facilitate the implementation of renewable energy sources (these programs are funded in excess of $700 million per year). It also facilitates the production and procurement of biomass derived fuels through marketing certification grants and matching funds. The Act does not appear to mandate utilities or any other energy provider to utilize renewables in its portfolio.

Nevertheless, LIPA has had a Clean Energy Initiative which preceded the federal Energy Policy Act and includes several renewables such as a Solar Pioneer Program and program that facilitates the installation of geothermal systems by commercial and residential customers. To date 1150 PVs have been installed on the LIPA system. Again, it appears that LIPA's programs are independent of Energy Policy Act initiatives or requirements.

National Interest Electric Transmission Corridor (NIETC)

Section 216(a) of the Federal Power Act (FPA) (created by the Energy Policy Act of 2005) directs DOE to identify transmission congestion and constraint problems and authorizes the Secretary to designate geographic areas where transmission congestion adversely affect consumers as NIETC. On April 26, 2007 the DOE issue draft National Corridor designations for comment. Additional orders and/or clarification will follow after consideration of comments and further consultation with the affected States and assuming the Secretary of Energy decides this designation remains appropriate. Likely impacts are summarized below:

The FPA which authorized DOE to designate areas with significant congestion as National Corridor designation was brought about by political pressures from Congress and is still in an intermediary stage. Significant State rights issues have yet to be addressed. Overall LIPA does not expect the NIETC Designations Act to have a significant impact on existing business plans in New York and New England. In NY Article VII law has worked well for more than 30 years and most projects are internal and modest in scope. It is considered unlikely that local TO's would try circumvent this State transmission line siting process in favor of a Federal process unless the State process produces an unsatisfactory outcome. And the proposed National Corridor excludes New England entirely. However, the DOE National Corridor designation might be of help by expediting and realizing complex multi-State transmission projects such as proposed 765 kV lines in the PJM region that will support future interconnections from PJM to New York if these projects face serious local opposition.

3.3.4 T&D System Financial Performance

Exhibit 2-8 provides a summary listing of the T&D Financial Performance programs. A more detailed description of each program is included in this section.

FP1. Cost Effectiveness - Multidisciplinary Projects, Committed

One of challenges of asset intensive and complex business operations such as electric power T&D, is to ensure effective coordination of key processes (operation, maintenance, capital investment, planning, design…) in addressing short term and longer term issues. Historically, T&D industry is known for operating within organizational and key process "silos".

Concept of "integrated" asset management, adopted and in implementation by LIPA, assumes evaluation of all options and alternatives, and is continuously seeking for optimum solution and/or combination of maintenance, design, operation, planning, capital investment, and other possible options in addressing multiple performance issues and goals. For example, capital budgeting process and project selection process will favor projects that simultaneously address combination of technical and/or financial performance with customer satisfaction and regulatory compliance.

Key Goals: ***FP1***

- *Improve financial performance through ensuring that synergies between otherwise separate projects are realized whenever possible*

Targets:

- *Established effective and formal process of identifying multidisciplinary solutions across key asset and performance management processes, issues, and performance goals*

Means:

- *Capital Budgeting Process and Project Selection based on multidisciplinary performance modeling and evaluation*

In addition to multidisciplinary project selection process for considering all alternatives and selecting best combination of options to address multiple issues, LIPA is working on further improving this processes to incorporate probabilistic risk assessment and risk-focused "integrated" asset management concepts.

FP2. Risk and Risk Mitigation - Project Selection and Prioritization, Committed

Annual T&D budgeting process and project selection includes formal project selection and prioritization process that considers criticality and overall future effects on LIPA's key performance areas: technical performance, financial performance, customer satisfaction, and regulatory compliance.

Projects are recommended to supply new or existing customer load growth, improve system reliability, provide system operators with greater flexibility to allow line clearances for construction and/or maintenance, load transfers during outages, etc.

A team of experts from LIPA's Planning, Engineering, Operations and Construction departments then ranks each project into categories and assigns a priority based on criticality and overall benefit to customer service. Projects impacting more than one goal (i.e. improve reliability, reduce system losses, etc) are give the highest priority.

> ***Key Goals:*** ***FP2***
> - ✓ *Improve performance by selecting the most efficient projects*
> - ✓ *Stay within limits of LIPA capital spending plan*
>
> ***Targets:***
> - ✓ *Prioritize projects according to cost/benefit and criticality for key LIPA's performance (technical, financial, customer satisfaction, regulatory compliance)*
>
> ***Means:***
> - ✓ *Capital budgeting process and project prioritization that includes criticality and impact on key performance categories*

The Team finally reviews and reaches consensus on a portfolio of projects that is later submitted to LIPA for approval.

FP3. Capital Forecasts, Committed

LIPA has created a long range capital forecast model which becomes the basis for long range capital planning.

Long range capital planning is managed to avoid placing upward pressure on rates whenever possible while also maintaining reliability, adequate capacity to service our customers, planned replacement of aging equipment, and implement LIPA's strategic programs

Capital expenditures traditionally come from reliability programs, increasing capacity of the system to serve new electric load, planned replacement of aging equipment, and updating of substandard equipment.

> ***Key Goals:*** ***FP3***
> - ✓ *Avoid placing upward pressure on rates whenever possible while maintaining system performance*
>
> ***Targets:***
> - ✓ *Optimize and update capital forecasting and long range planning process to reflect future requirements of improved system efficiency and SmartGrid concepts*
>
> ***Means:***
> - ✓ *Updated long range capital forecasting model*

In recent years additional emphasis has been placed on projects that reduce bottlenecks in the system which can cause uneconomical generation resources to be operated.

Given anticipated direction on public policy, it is expected that development of SmartGrid technologies and improvement of the T&D system efficiency will become a dominant theme during the term of this energy plan.

The portfolio of capital projects are managed so that synergies between otherwise separate projects are realized whenever possible. This is done at all levels of capital investment decision making and includes identifying synergies between company-wide programs, and also between individual projects addressing more localized issues. Example of synergies of company-level programs is leveraging communication infrastructure required for AMI and Smart Meters to support Distribution Automation and system efficiency, including reduction of technical losses, power quality, and power flow optimization.

FP4. Cost Effectiveness - Must Run Generation, Committed

Must Run Generation is defined as a minimum level of generation or imports needed to ensure reliability at the load pocket and/or load area levels

LIPA goal is to improve cost effectiveness by reducing the use of non-economic generation where practical and financially justified to meet the needs for "must run" generation and imports at the system level, and load pocket and load area levels.

Installation of the 660 MW Neptune HVDC interconnection to PJM in 2007 together with the 330 MW Cross Sound Cable (CSC) to New England and the two 345 kV cables (Y49 and Y50) to upstate New York are allowing LIPA to import large amounts of economical power from outside Long Island. At certain load levels, this economical power supply a significant percentage of the On-island load thus requiring a reduction of local generation to match that load.

In general, during periods of high imports On-island generation should first reduced at the less efficient gas turbine stations, then at steam power stations and finally at the newer combined cycle plants. LIPA "must take" any IPP generation.

Key Goals: ***FP4***

- ✓ *Improve cost effectiveness by reducing the use of non-economic generation*

Targets:

- ✓ *Maximize import of economical power while maintaining system reliability within limits of performance targets for reliability indices (SAIFI, SAIDI, CAIDI)*

Means:

- ✓ *Ongoing studies comparing system reinforcement costs to running uneconomical generation*
- ✓ *Balance power imports and On-Island power plant output based on system study results*
- ✓ *Operate reactive power compensators as required*

Thermal, voltage and system stability analyses were conducted to determine the impact on the LIPA system of importing large amounts of power from sources outside of Long Island utilizing the four major interconnections namely Y49, Y50, the Cross Sound Cable (CSC) and the Neptune HVDC cable. The studies identified substandard thermal and voltage conditions at peak and at lower load levels (80%, 60% and 40% of peak) assuming generation reductions at specific power stations. The study results identified uneconomical generation required to run and/or the system reinforcements required to prevent those substandard conditions. The stability study concluded that elimination of "must run" generation will have no adverse effects on the LIPA system stability.

Finally, the studies concluded that maintaining "must run" generation on the system has an economic penalty associated with it because by forcing certain steam units to run, less expensive purchases must be reduced in order to maintain reliability. LIPA cost/benefit analyses of transmission system reinforcements versus running uneconomical generation are ongoing.

FP5. Cost Effectiveness - Life Cycle Cost Management, Committed

> ***Key Goals:*** ***FP5***
> - ✓ *Improve financial performance by optimizing long term and life cycle cost of assets*
>
> ***Targets:***
> - ✓ *Annual updates of asset performance models and benchmarking studies (underground cables, distribution poles, overhead transmission lines)*
> - ✓ *Life cycle cost modeling used in decision making from design, purchase, maintenance, and capital budgeting.*
>
> ***Means:***
> - ✓ *Availability of financial, failures, operation, maintenance, performance data through LIPA's Operation Data Mart*
> - ✓ *Probabilistic life cycle models for assets and system performance.*
> - ✓ *Participation in Industry-wide failure data collection and performance benchmarking.*

Life cycle cost management of assets is based on process of optimizing total cost of assets from asset acquisition to asset retirement.

LIPA goal is to improve cost effectiveness and financial performance by considering and optimizing life cycle cost of assets in capital budgeting, maintenance, operation, and system improvements decision making.

Typical design life of high voltage electric power assets is in the range of 20 to 50 years. Some assets, such as microprocessor based protection and control systems, may have significantly lower life expectancies (10 to 15 years). LIPA's asset management processes includes asset life cycle cost optimization from design and purchase to asset maintenance and retirement. This includes optimization of cost of spare parts, maintenance, upgrades, and replacement over asset life time, and in relation with operating condition and performance requirements at the system level, asset population level, and at the level of individual critical assets.

LIPA's life cycle cost optimization program has resulted in replacing time-based maintenance with more effective "condition-based" and "reliability-centered" maintenance that takes into account asset's criticality, performance requirements, and operation condition. Effective life cycle cost optimization requires availability of historical data (failures, operating condition, and maintenance history) and use of probabilistic asset condition and performance modeling at the system and assts levels.

LIPA is addressing data issue through implementation of IntelliGrid concepts for data standardization and integration within LIPA's Operational Data Mart project. LIPA is also participating in collaborative industry projects collecting industry-wide asset failure and performance data and participating in industry-wide benchmarking studies (EPRI, Doble, SGS).

LIPA's asset performance probabilistic modeling is continuously improved and updated with most current data and is used as an input for capital budgeting, project selection and prioritization, and company-wide performance and risk management.

FP6. Cost Effectiveness: Long Range Plan and Infrastructure, Committed

LIPA's Long Term Planning is focused on optimizing T&D system infrastructure to support load growth and energy transfers 30-40 years in the future.

The Goal of Long Range Planning is to improve LIPA's cost effectiveness and financial performance by optimizing short term investment decisions with long term needs and system infrastructure requirements.

Effective life of high voltage electric power assets and infrastructure is typically well over 20-30 years (transformers, underground cables) and could be over 50-60 years or more for some assets (transmission poles, substations). Within this time frame it is reasonable to expect significant changes in T&D system operating requirements, load, and energy injections and transfers. In order to optimize long range cost and optimize utilization of assets over their effective life, LIPA is evaluating potential scenarios and developing optimum system infrastructure for various possible long range options of load growth and energy injections. This includes optimization of timing for future system upgrades, permitting, and land acquisitions, and identifies issues and potential concerns for future R&D.

Key Goals: ***FP6***

- ✓ *Improve financial performance by optimizing short term investment decisions with long term needs and system infrastructure development*

Targets:

- ✓ *Evaluate all short term (1-10 years) investment decisions in relation to long term (30-40 years) system needs and projected infrastructure*
- ✓ *Regularly update (every two years or sooner) Long Range System Strategy, and projected optimum system infrastructure for scenarios of possible future long range load growth and injections*

Means:

- ✓ *Availability of long range strategy and projected optimum infrastructure to meet possible scenarios of future load growth and energy injections.*
- ✓ *Capital budgeting and project selection process accounting for long range cost optimization*

LIPA's Long Range Plan (30 - 40 years) and Infrastructure is a reference point for short term (1-10 years) system upgrades. By continuously updating the long range study and evaluating options to meet short range requirements in agreement with long term optimum infrastructure, capital projects are funded for short and long term cost and system performance effectiveness.

The Long Range Study identifies system infrastructure requirements that are common for wide range of scenarios of potential load growth and energy injections. In addition, the study identifies requirements for combinations of various load growth and injections scenarios for specific geographical and system operating areas, and critical circuits and substations.

The study identifies key system infrastructure, components, design parameters, and "triggers" for major infrastructure upgrades and provides inputs for detailed analysis at the levels of specific load areas, load pockets areas, critical circuits, and substations.

FP7. End of Contract Risks, Committed

LIPA goal is to reduce the business risks associated with the end of the Management Service Agreement (MSA). The MSA expires in 2013 or upon certain events of default.

Development and implementation of business processes and standards that promote interoperability between systems using documented, repeatable business processes and standards-based Information Technology (IT) development is one of key targets in achieving flexibility of efficiently and cost effectively transitioning to new service providers.

Electric Power Industry in coordination with EPRI and IEC is actively working on developing standards for data and interfaces to enable interoperability and "near-plug-and-play" integration technology for key applications, systems, and processes.

LIPA is actively involved in development, testing and implementation of key technologies for performance and asset management, and control center applications. In 2007 LIPA developed and adopted roadmap for data management and implementation of infrastructure with latest SOA-Service Oriented Architecture, CIM – Common Information Model, and Generic Data Interfaces based on IEC standards.

Key Goals: ***FP7***

- ✓ *Reduce the business risks associated with the end of the Management Service Agreement (2013)*

Targets:

- ✓ *Develop business processes and systems that promote interoperability between systems using documented, repeatable business processes and standards-based Information Technology (IT)*
- ✓ *Implement Data Governance Policy and Data Integration Strategy developed in 2008 in coordination with National Grid*

Means:

- ✓ *Use of standard-based technologies for data and process standardization.*
- ✓ *Use of standard-based interfaces for systems and applications integration*
- ✓ *Consistency in documenting processes and best practice*

3.3.5 New York State Transmission Assessment and Transmission Study (STARS)

The New York State Transmission Owners are conducting a joint study of the state's bulk power system to help meet future electric needs, support the growth of renewable energy sources, and ensure the reliability of the power system. Called the New York State Transmission Assessment and Reliability Study ("STARS"), its aim is to develop a thorough assessment of the transmission system and suggest long-range plans for coordinated infrastructure investment in the state's power system.

Because the bulk power system is owned by separate entities, yet interconnected, the STARS will examine the types of investments, including smart grid

Key Goals: ***FP7***

- ✓ *Participate in the STARS initiative as a Transmission Owner*
- ✓ *Evaluate, as part of the STARS initiative, was of improving the transfer of upstate New York and Canadian power to Long Island including a potential project that could follow the Iroquois natural gas pipeline right of way to a landfall located at the Port Jefferson power station*

Targets:

- ✓ *Issue STARS Phase I and Phase II report by August 2009*
- ✓ *Evaluate potential Canadian/Upstate New York to Long Island alternative by December 2009*

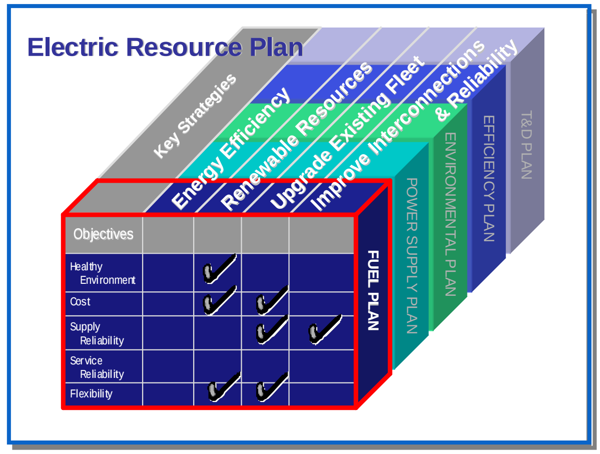
Means:

- ✓ *Participate in STARS study*
- ✓ *Develop internal analysis of transmission options*

applications, needed to meet the long-term needs of the entire state to complement studies currently being performed by the New York Independent System Operator (NYISO). A reliable and robust transmission grid is vital to New York and essential in order to allow the addition of significant new renewable energy sources. It is the intent of STARS to provide a roadmap that will help guide future transmission infrastructure investment and development.

On February 27, 2009, the New York State Transmission Assessment and Reliability Study ("STARS") Group consisting of the New York Transmission Owners, including LIPA, retained ABB Inc. for purposes of performing a study to determine long term reliability and economic upgrade alternatives for the transmission system in New York for a planning horizon covering the period 2018 through 2028. The Study will propose various strategies for upgrading, refurbishing and/or building new transmission in New York State, include an examination of the aging New York State transmission infrastructure, identify zones of potential “bottled” generation on the bulk power system, and identify limitations of the current transmission system to meet future renewable generation development. Of particular interest to Long Island will be the evaluation of an option that could construct a transmission line along the right of way of the Iroquois pipeline. Such an option could improve the ability to move less expensive power from upstate New York and Canada to the center of Long Island.

3.4 Fuel Management Plan



LIPA's Fuel Management Plan is described in this section – this plan is necessary to support the Electric Resource Plan as the cost of fuel to produce electricity is a key component in the evaluation metrics used to select a plan. The primary objective of the Fuel Management Plan is to ensure the adequacy of the physical fuel supply chain and fuel supply infrastructure to provide needed fuel to the generating plants for production of energy to meet LIPA customers' needs in a safe, reliable, economical and environmentally responsible manner. The Fuel Management Plan provides a means to determine the appropriateness of current fuel supply practices and a plan for improving current and future practices for fuel sourcing.

3.4.1 Committed Initiatives

Committed to elements are either under firm contract, have approved funding, or are currently available. The following sections contain the committed to components of the Fuel Management Plan.

Continue Structured Hedging Program (Recommendation 7.3)

Hedging programs are in place at most utilities as is the case with LIPA. Hedging provides a means to address the volatility of prices in the market through the use of financial strategies. LIPA's hedging program should be a systematic approach that relies on programmatic choices of hedging tools in order to ensure that day to day philosophies do not impact the hedging protocols. Hedging is a tool to better control the costs of key inputs in the production process over which we have little control.

LIPA should continue to improve its hedging program through review of its protocols, re-assessment of its risk profile and evaluation of the appropriate personnel to participate in its development and management. The ongoing program should have built in flexibility but strong structure and programmatic controls to ensure that there is no speculation or gaming in the market.

Key Goals:

- ✓ *Structured, yet flexible implementation program that achieves effective fuel hedging Key Goals*

Targets:

- ✓ *Implement an active structured hedging program with flexible defined targets on an ongoing basis*

Means:

- ✓ *Use advisors to monitor implementation of program by LIPA staff*
- ✓ *Oversee program through a risk management committee*
- ✓ *Trustee oversight of program*

Utilize the RPS as a Means to Diversify Fuel Supply (Recommendation 7.5)

LIPA has issued RFPs in an effort to acquire contracts for renewable energy and successfully contracted for hydro pumped storage that resulted in a doubling of the energy supplied to LIPA customers from renewable resources. By issuing these RFPs, we believe the supply of renewables is encouraged. On a similar basis, the establishment of and support of an RPS in the State of New York provides a stimulus for investment in renewable generation and other development efforts. LIPA recommends continuing efforts to stimulate and encourage renewable resources, such as through the use of RFPs and other in state efforts, to support additional fuel diversification.

Develop a Long Term Fuel Supply and Fuel Management Plan for the Caithness Project (Recommendation 7.6)

The Caithness project is expected to be commissioned during 2009. The fuel management plan recommends developing a long term plan to provide fuel as a means to mitigate project risks for customers. LIPA recommends that an RFP be issued to investigate the current market for performance of fuel management services.

Key Goals:

- ✓ *Draft a fuel supply and management plan to support the Caithness Power plant*
- ✓ *Contract for short term fuel management services*
- ✓ *Contract a fuel management services vendor by way of RFP*
- ✓ *Contract for Natural Gas Supply by way of RFP*

Targets:

- ✓ *Internal fuel management plan complete by April 2009*
- ✓ *Short term fuel management services contract by April 2009*
- ✓ *Issue fuel management service provided RFP by May 2009*
- ✓ *Select Fuel Management Service provider by September 2009*
- ✓ *Commence Fuel Management Services by January 1, 2010*
- ✓ *Issue gas supply RFP by May 2009*
- ✓ *Select Gas Supply provider by September 2009*
- ✓ *Commence Gas Supply Services by January 1, 2010*

Means:

- ✓ *Short term fuel management plan*
- ✓ *Gas Supply Contract*
- ✓ *Fuel Management Service Contract*

3.4.2 Planned Initiatives

Planned elements are those still under active discussion, negotiation, or development. While the intention is to proceed with these projects, LIPA may adjust the timing, size or design of the element as conditions change.

Adopt Renewable Energy Resources to Reduce Risk of Fuel Price Volatility and Shortages (Recommendation 7.1)

Diversifying the fuel sources used to power Long Island's homes and business is expected to help LIPA reduce the potential impact of shortages or price volatility in any single fuel source. For example, if 100% of generation relied on natural gas, then all increases in price would impact the price of power. With more fuel diversity in which nuclear, gas, oil and hydro each represented 25% of the supply requirements, an increase in any one fuel source would have significantly less impact on the price of power.

LIPA has issued RFP's for renewables in the recent past and the response has been somewhat disappointing to date as the proposed projects were not as economically beneficial to LIPA customers as had been anticipated. LIPA will not enter into contracts that it deems uneconomical for its customers – and in the cases of many of these RFPs, the premiums for renewable power were unjustifiably high.

LIPA recommends continuing its efforts to encourage renewable generation through the use of RFPs and other contracting approaches to bring renewable power and the potential diversity it represents to Long Island. LIPA is committed to continuing to participate in this market with the hope that renewable technology costs will include less of a premium compared to traditional generation costs.

Address the Deteriorating Fuel Supply Infrastructure on Long Island (Recommendation 7.7)

Long Island is experiencing reduced access to fuels as a result of limited investment in infrastructure on Long Island. Reduced infrastructure capability can impact the price of delivery and availability of supply in the longer term. In order to develop a long term plan to address infrastructure issues and their implications for LIPA customers, LIPA recommends working with NYSERDA to study the current status of and capability of fuel supply infrastructure to Long Island. Such a study should assess the trend in infrastructure capacity, condition of the current infrastructure, expectations for infrastructure investment, implications of the findings and recommendations for mitigation if necessary.

Key Goals:

- ✓ *Assess the infrastructure capability, condition, and expectations*

Targets:

- ✓ *Form joint study group with NYSERDA by September 2009*
- ✓ *Select contractor for infrastructure study by March 2010*
- ✓ *Complete study by September 2010*
- ✓ *Develop long term fuel supply plan by March 2011*

Means:

- ✓ *Use a consultant to identify possible solutions to infrastructure problems based on a range of LIPA's projected fuel needs*
- ✓ *Select solutions to develop LIPA's long term fuel supply plan*

3.4.3 Initiatives Under Study

Under study elements are those that are under discussion or in the early stages of development, with no contractual commitment from LIPA. Those programs found in the following sections are the elements, or initiatives of the Fuel Management Plan that are categorized as under study.

Continue to Maximize Fuel Diversity Opportunities (Recommendation 7.2)

LIPA has taken action to minimize the volatility of fuel costs and their impact on customers by utilizing dual fuel capabilities at generation facilities where economic, investigating the potential for repowering existing plants as compared to other investments, and initiating fuel hedging activities to mitigate price risk.

LIPA is currently assessing the feasibility of repowering two existing National Grid units, as well as four National Grid units which LIPA has the option to purchase.

LIPA should continue to investigate the opportunities for fuel diversity at existing facilities and through the continued integration of market purchases that provide alternative fuels.

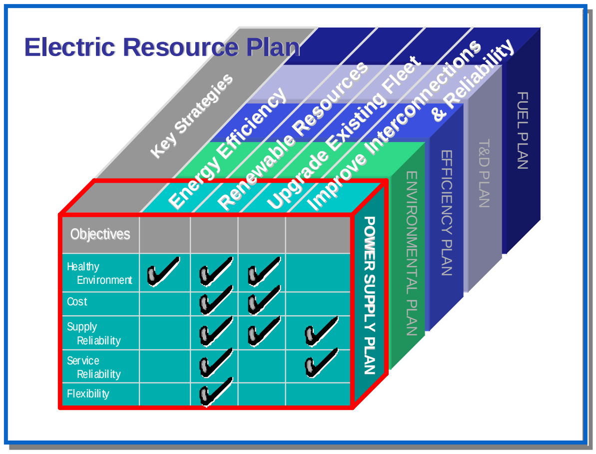
Investigate the Economics of Biofuel Projects (Recommendation 7.4)

LIPA expects that new alternative fuels will provide long term benefits and recommends that investigations should include the economics of biofuel projects. Biofuels are fuels derived from recently dead plant matter that are processed into fuel products such as ethanol. Biofuels are expected to produce energy without causing a net increase of atmospheric carbon. This is because as new plants are grown to produce fuel, they remove the same amount of CO_2 from the atmosphere as they will release as fuel. LIPA should continue to investigate opportunities for investment and development of biofuels for their application and economics for the LIPA system.

LIPA recognizes that the biofuels market is developing and as such the market is not well developed at this time. There are numerous issues that require further research and investigation including the quality of the fuel, delivery mechanisms and infrastructure, pricing implications and fuel availability. LIPA should stay abreast of market developments in order to adequately evaluate the market potential.

In addition to these considerations, LIPA should include in its assessment of biofuels the lifecycle impacts of the creation of biofuels. For example, in order to create the fuel there are many steps in the process and the end result may not be as energy efficient as other fuel sources. The process requires harvesting the plant matter, processing the plants into fuel, transporting the fuel, storing the fuel and then burning the fuel. LIPA's evaluation approach should compare and contrast the implications across fuel source choices.

3.5 Power Supply Plan



This section focuses on the elements that make up the Power Supply Plan. Additional resources are necessary in order to maintain the reliability of the bulk power system. This power supply strategy will provide LIPA with capacity as summarized in Exhibit 3-7.

This Power Supply Plan is designed to address traditional generation resources as well as renewable technologies. LIPA is committed to the advancement of new energy technologies. Diversifying energy sources is beneficial to customers because it has the potential to lower costs, reduce risks of over reliance on any power source, and aid in improving air quality. Standard fossil fuel-fired generation will be augmented with new energy sources that include wind, photovoltaic, and landfill gas technologies.

Exhibit 3-7 Power Supply Plan – Incremental Resource Additions (MW)

Plan Element Type	In -Service Year			
	2009	2010	2011	2012-2018
Committed	350[1]	660[2]		
Planned	50[3]			
Under Study				140-700[4] (4)

3.5.1 Committed Initiatives

Committed to elements are either under firm contract, have approved funding, or are currently available. The following sections contain the committed to components of the Power Supply Plan.

Marcus Hook (Recommendation 8.2)

LIPA has contracted for the purchase of capacity and energy from FPL Energy Marcus Hook, L.P. utilizing the Neptune Cable. The facility is located in Marcus Hook, Pennsylvania. The proposed PPA with FPLE would be for the purchase of 685 MW of firm capacity for a twenty year term starting in 2010, and beginning in the sixth year, an option for energy from FPLE's Marcus Hook combined cycle generating plant.

Key Goals:
- ✓ *Successful deliviery of Brookfield Energy hydro electic power (300,000 GWh)*
- ✓ *Successful delivery of PPL landfill gas power (25,000 GWh)*

Targets:
- ✓ *Implement Marcus Brookfield Energy contract by January 2009*
- ✓ *Implement PPL landfill Gas Contract by July 2009*

Means:
- ✓ *Power Purchase Agreement*

[1] Caithness Power Plan
[2] Marcus Hook
[3] Photovoltaic RFP
[4] Decision pending results of Repowering Study, which reviewed the potential benefits and costs associated with repowering certain National Grid units over the 2014 to 2016 time frame.

Backyard Wind (Recommendation 8.4)

LIPA recently announced the creation of a Backyard Wind initiative for its customers in 2009. The new program will provide rebates to homeowners, businesses, municipalities, and nonprofits that install "backyard" wind sources through the use of land-based wind turbines. LIPA's wind initiative will help transform the market for wind systems on Long Island by:

Key Goals:

- ✓ *Provide rebates to homeowners, businesses, municipalities, and nonprofits that install "backyard" wind sources through the use of land-based wind turbines.*

Targets:

- ✓ *Achieve 1 MW of backyard wind by 2013*

Means:

- ✓ *Backyard wind program*

- Increasing customer awareness and market demand for wind systems;
- Encouraging the development of a robust, self sustaining local infrastructure for the delivery and the maintenance of quality wind systems;
- Developing a mechanism to overcome financial market barriers; and
- Accelerating the cost reduction of wind systems while increasing reliability and performance.

The initiative is consistent with Governor David Paterson's recently announced 45 x 15 program that establishes the goal of New York State meeting 45% of its electricity needs through improved energy efficiency and renewable sources by the year 2015.

LIPA committed $1.2 million to the wind initiative in its 2009 operating budget. This wind program builds off a federal program that provides federal tax credits for small wind systems through 2016. The wind program rebate will work as follows:

1. New residential installations for 2009 will be rebated at the lesser of $3.50 per kWh for the first 16,000 kWh or 60% of the total installed cost;
2. New commercial installations for 2009 will be rebated at the lesser of $3.50 per kWh for the first 16,000 kWh and $0.50 per kWh thereafter up to a maximum of 175,200 kWh or 60% of the total installed cost; and
3. New municipalities and non-for-profit installations for 2009 will be rebated at the lesser of $4.50 per kWh for the first 16,000 kWh and $1.50 per kWh thereafter up to a maximum of 175,200 kWh, or 60% of the installed cost.

LIPA will continue to investigate appropriate enhancements to the backyard wind program through investigation of federal opportunities created through a national energy plan, if adopted, through partnerships to encourage wind delivery infrastructure and through educational opportunities for its consumers. The initiative is consistent with Governor David Paterson's recently announced 45 x 15 program that establishes the goal of New York State meeting 45% of its electricity needs through improved energy efficiency and renewable sources by the year 2015. A summary table of LIPA's backyard wind targets can be found on the next page in Exhibit 3-8.

Exhibit 3-8 Backyard Wind Targets

Year	Cumulative MW Installed	Cumulative Energy Generated (MWh)
2009	0.07	983
2010	0.22	2949
2011	0.44	5898
2012	0.73	9830
2013	1.10	14745

Net Metering Program (Recommendation 8.6)

> ***Key Goals:***
> - ✓ *Implement new tariff provisions that allow commercial customers who install solar generating equipment on their facilities, to sell excess generated power back to LIPA.*
>
> ***Targets:***
> - ✓ *Begin Net Metering program January 1, 2009*
>
> ***Means:***
> - ✓ *Amend Tariff to provide net metering opportunities for customers up to 2 MW in size*

LIPA amended its electric service tariff to further encourage the use of solar generating resources and became the first utility in the state to make commercial net metering available to commercial customers. Under the changes, LIPA introduced new tariff provisions to allow for net metering of energy for commercial customers who install solar generating equipment at their facilities and expanded existing tariff eligibility provisions for net metering to residential customers as well. LIPA's tariff conforms largely to the legislation spearheaded by Long Island lawmakers, Senator Owen J. Johnson and Assemblyman Steve Englebright that passed both houses of the Legislature and that authorizes utilities to implement these changes statewide. Under LIPA's net metering program, residential customers who generate electricity with solar power can in effect see their electric meters "spin backwards" and receive full credit for the electricity they generate with an opportunity to sell back any excess power they produce to LIPA. Net metering provides a significant economic incentive to customers considering the installation of solar generating resources in their homes and businesses.

LIPA expects these modifications to generate a significant number of "green collar" jobs for renewable energy manufacturers and installers. LIPA hopes to generate the momentum for a market transformation on the commercial side, as it already has for installation of residential solar power systems under its successful Solar Pioneer Program that has seen the installation of more than 1,200 photovoltaic systems since the program's inception and has resulted in more than $30 million in customer rebates. Recently LIPA announced an RFP seeking the largest block of solar power (50 MW) in the state, to be generated on Island, and produce enough energy to power approximately 6,500 homes and reduce carbon dioxide emissions by 20,000 tons.

Under LIPA's previous tariff the net metering program was not available to business customers. In addition, residential customers were limited to the amount of solar they could install and still be eligible for net metering. The amendments would included the following:

1. To authorize net metering for non-residential customers with an overall capacity of up to the lesser of the customers peak demand, or 2 MW

2. Increase the overall capacity for net metering on residential solar customers from 11 kW to 27.5 kW
3. Increase the combined total allowed overall capacity for residential and non-residential net metering on LIPA's transmission and distribution system from 3.6 MW to 51.2 MW

Residential Photovoltaic "Solar Pioneer" Program (Recommendation 8.7)

This program is targeted at achieving energy and capacity savings for LIPA, while promoting the use of photovoltaic systems (solar electric cells or PV) among LIPA's residential and small commercial customers. The intent of the Solar Pioneer Program is to transform the market for rooftop photovoltaic systems on Long Island by removing or lowering market barriers and helping to accelerate reduction in the cost of PV systems. Key to transforming the solar power market on Long Island and streamlining the PV installation process is the development of short-term and long-term solutions to the numerous permitting (building and electrical inspections), interconnection, and financing issues associated with PV installations.

Key Goals:
- ✓ *Increase annual funding for incentives under its Solar program to $13.1 million.*
- ✓ *Expand solar initiatives through the creation of a new Solar Entrepreneur program for businesses and municipal solar installations with capacities of up to 100 kW.*

Targets:
- ✓ *Expand Eligibility by January 2009*
- ✓ *Increase funding of program*

Means:
- ✓ *Modification of program design*

The program's objectives focus on:

- Increasing consumer awareness and market demand for PV,
- Developing and implementing streamlined procedures for PV net metering interconnections,
- Providing technical assistance and vendor linkages for consumers,
- Offering rebates and low interest financing to promote the program, and
- Providing contractor training.

Caithness Project (Recommendation 8.10)

The Caithness Long Island Energy Center proposal, capable of generating up to 350 MW of power, represents the best on-Island generation proposal with the greatest long-term benefits for Long Island and is an important component of a diverse portfolio of resources for Long Island. LIPA has entered into a Power Purchase Agreement for 277 MW of the plant's output, reserving 49 MW for merchant transactions. This will be the first power plant on Long Island with a dedicated merchant power component. The Caithness project is expected to be in service by May of 2009.

Key Goals:
- ✓ *Begin Caithness Commercial operation*

Targets:
- ✓ *Commercial Operation under contract to LIPA by June 2009*

Means:
- ✓ *PPA Contract*

3.5.2 Planned Initiatives

Planned elements are those still under active discussion, negotiation, or development. While the intention is to proceed with these projects, LIPA may adjust the timing, size or design of the element as conditions change.

Endorse the Adoption of a LIPA RPS Program that supports the Statewide Goal (Recommendation 8.1)

LIPA has been pursuing an RPS program since 2006 that supports the PSC RPS goal of 25% by 2013. As outlined in this Electric Resource Plan, LIPA supports the adoption of a LIPA RPS program that parallels the statewide RPS goal and expands its commitment to 30% renewables by 2015.

> ***Key Goals:***
> - ✓ *30% renewables by 2015*
>
> ***Targets:***
> - ✓ *Achieve LIPA Share of Statewide 25% renewables target by 2013*
> - ✓ *Achieve LIPA Share of Statewide 30% renewables target by 2015*
>
> ***Means:***
> - ✓ *Contract for on-Island qualified renewable resources through RFP process*
> - ✓ *Contract for off –Island qualified renewable resources through RFP process*

Under the PSC program, credit is taken for the renewable resources that were already in existence in 2003 and for the green choice programs. The PSC adopted a target to bring the statewide total to 25% and allocated the total to each of the utilities in New York State. The 25% allocation column in Exhibit 3-9 shows the target that the PSC allocate to LIPA through 2013. LIPA has been pursuing this target since 2006. After 2013, this target assumes that LIPA would increase its renewable energy position by an amount equivalent to 25% of its growth in energy requirements.

The PSC is examining the possibility of increasing the RPS targets to 30% by 2015. This combined with the 15 x 15 energy efficiency program would meet Governor Pattison's 45 x 15 goal for energy efficiency and renewable energy resources. At the time the LIPA Draft Electric Resource Plan was developed the PSC had not developed a firm plan or targets for a 30% renewable energy target. For study purposes, LIPA developed the 30% RPS Allocation targets in Exhibit 3-9. These targets begin accelerating the procurement of RPS energy starting in 2010 with the goal of increasing LIPA's energy contributions from renewables by 5% points in 2015. After 2015, this target assumes that LIPA would increase its renewable energy position by an amount equivalent to 25% of its growth in energy requirements. Until a PSC program is adopted, LIPA's planning for a 30% RPS target will be based on this type of goal. The goals will be adjusted as load forecast projections change or when the PSC adopts a statewide program.

LIPA has issued RFPs in an effort to acquire contracts for renewable energy. By issuing these RFPs, we believe the supply of renewables is encouraged. On a similar basis, the establishment of and support of an RPS in the State of New York provides a stimulus for investment in renewable generation and other development efforts. LIPA recommends continuing efforts to stimulate and encourage renewable resources but on and off Long Island through the use of RFPs. LIPA's annual RPS Goals are shown in Exhibit 3-9.

Exhibit 3-9 Annual RPS Goals

Year	25% RPS Allocation	30% RPS Allocation
2006	0.96%	0.96%
2007	1.95%	1.95%
2008	2.94%	2.94%
2009	3.90%	3.90%
2010	4.86%	5.16%
2011	5.83%	6.86%
2012	6.76%	8.53%
2013	7.71%	10.21%
2014	7.94%	11.28%
2015	8.19%	12.37%
2016	8.52%	12.54%
2017	8.76%	12.62%
2018	9.05%	12.77%

Investigate Utilizing Transmission Inter-Ties to Import Cost-Effective Renewable Energy from Off-Island Sources (Recommendation 8.2)

In 2008 LIPA entered into two new contracts for renewable energy sources from off-Island sources. The first contract is for hydro-electric electricity from a series of hydro facilities as provided by Brookfield Energy that will begin providing approximately 300,000 GWh of energy annually to LIPA in 2009. This is a ten year contract. The second renewable contract is for power produced at a landfill gas and provided by PPL. This contract will begin during 2009 for a ten year period and will provide approximately 25,000 GWh annually for LIPA customers.

Key Goals:

- ✓ *Issue additional RFPs for off-Island rewable energy delivered to Long Island over interties*

Targets:

- ✓ *Issue RFP by March 2010 to supply projected RPS requirements for 2011, 2012 and 2013*
- ✓ *Issue RFPs every two years to supply RPS requirements*

Means:

- ✓ *RFPs for off-Island power supplies*

In 2008 LIPA also issued an RFP for acquisition of solar resources for to support further diversification of its system resources. The proposals are in the process of being evaluated with decisions expected in early 2009. LIPA recommends continuing its efforts to encourage renewable generation through the use of RFPs and other contracting approaches to bring renewable power and the potential diversity it represents to Long Island.

Photovoltaic 50 MW RFP (Recommendation 8.5)

Key Goals:
- ✓ *50 MW of Solar PV by 2011*

Targets:
- ✓ *Trustee review and approval of contracts by September 2009*
- ✓ *Installation of 13 MW in 2010*
- ✓ *Installation of 37 MW in 2011*

Means:
- ✓ *Completion of RFP process*

The Long Island Power Authority solicited proposals through this Request for Proposals (RFP) to reduce dependence on fossil fuel electric generation resources by purchasing the full output of power and associated energy produced by up to 50 MW of photovoltaic solar photovoltaic generating systems. LIPA is also seeking the Renewable Energy Credits ("RECs") associated with such generation.

Proposals submitted pursuant to this RFP were required to meet both of the following threshold criteria; 1) Projects located at one or more sites each rated at 100 KW or higher for which the total aggregate amount of the proposal is 500 KW, or higher and 2) Projects must be located at LIPA non-residential customer sites connected directly to the LIPA system without net metering or on a stand alone site connected to directly to LIPA's transmission or distribution grid. LIPA's Board of Trustees authorized negotiation with a short list of 4 proposers to acquire 50 MW of solar capacity. The objective is to negotiate these contracts and receive Trustee approval by September of 2009. Current targets are to have 13 MW installed in 2010 and 37 MW installed in 2011 for a total of 50 MW installed by 2011.

Utilize the RPS as a Means to Diversify Fuel Supply (Recommendation 8.8)

LIPA has issued RFPs in an effort to acquire contracts for renewable energy and successfully contracted for hydro pumped storage that resulted in a doubling of the energy supplied to LIPA customers from renewable resources. By issuing these RFPs, we believe the supply of renewables is encouraged. On a similar basis, the establishment of and support of an RPS in the State of New York provides a stimulus for investment in renewable generation and other development efforts. LIPA recommends continuing efforts to stimulate and encourage renewable resources, such as through the use of RFPs and other in state efforts, to support additional fuel diversification.

Investigate Repowering Existing Older Plants to Address Enviromental Issues and Improve Efficiency (Recommendation 8.9)

Key Goals:
- ✓ *Determine technical viability, as well as economic and environmental implications*

Targets:
- ✓ *Repowering of Barrett Unit 1 before Summer 2016*

Means:
- ✓ *Acquire site*
- ✓ *Issue RFPs for repowering at Barrett Site*

LIPA is investigating the repowering of older power plants to produce more electricity with far fewer emissions from the same amounts of fuel. LIPA has, in conjunction with National Grid, been evaluating six existing generating units for potential repowering. The benefits of repowering existing plants include greater fuel efficiency, increased generating capacity and reduced emission rates. The repowering process rebuilds all key components of the power plant such that if LIPA determines that it is technically viable, economical and environmentally sound to acquire and repower these plants, the result will be an efficient, newly rebuilt facility that produces fewer emissions than in past operations.

Exhibit 3-10 Repowering Schedule

Event	Target Month
Trustee Approval of Repowering Project	June 2009
RFP Issuance	September 2009
RFP Responses Due	December 2009
LIPA Acquires Repowering Project Site	March 2010
Comptroller Approval of Site Purchase	June 2010
Proposal Selection and Trustee Approval	June 2010
PPA and Lease Execution	February 2011
Comptroller Approval of PPA and Lease	May 2011
Evaluate and Adjust Project Timing Based on Assessment of Need	June 2011
Commencement of Repowering Project	June 2011
Complete Environmental Review	June 2012
Evaluate and Adjust Project Timing Based on Assessment of Need	June 2012
Start Construction	June 2012
Start-up and Testing	December 2014
Achieve Commercial Operation	June 2015

Issue a Competitive RFP to Address Potential Greenfield Plants and/or Repowering/Retiring Existing Plants (Recommendation 8.10)

LIPA is currently assessing the feasibility of repowering two existing National Grid units, as well as four National Grid units which LIPA has the option to purchase. If LIPA determines that it is technically viable, economical and environmentally sound to acquire and repower these plants LIPA should issue a RFP to continue to investigate the opportunities for potential cost-effective greenfield plants and/or repowering/retiring exist facilities.

Key Goals:

- ✓ *Issue competitive RFP to continue to investigate the opportunities for potential cost-effective Greenfield plants and/or repowering/retiring existing facilities*

Targets:

- ✓ *Issue RFPs for new capacity 7 years before projected need date*

Means:

- ✓ *Issuance of RFP with the built in flexibility to adjust the timing of the plant at certain milestone dates.*

NUSCO Cable Upgrade (Recommendation 8.12)

Reinforcements in both southern Connecticut and Long Island would be required to increase the interconnection transfer capacity beyond the current 200 MVA level. Alternatives are under study for the 2009 time frame and beyond. One option would bring the cable to its full 300 MVA rating. Another option would eliminate the emergency capability and use the backup cable to provide a total of 450 MVA.

Key Goals:

- ✓ *Complete investigation of alternatives to increase transfer capacity beyond the current 200 MVA level. One option would bring the cable to its full 300 MVA rating. Another option would eliminate the emergency capability and use the backup cable to provide a total of 450 MVA*

Targets:

- ✓ *File NYISO SRIS Scope by July 31, 2009*
- ✓ *File ISO-NE SRIS by September 30, 2009*
- ✓ *Completion of SRIS studies by March 31, 2010*
- ✓ *Decision on whether to proceed by September 30, 2010*
- ✓ *Install Project by May 1, 2015*
- ✓

Means:

- ✓ *Use NYISO and ISO-NE study process to develop cost estimates for upgrade costs*
- ✓ *Based on decision on whether to proceed, use NYISO and ISO-NE processes to build upgrades*

3.5.3 Initiatives Under Study

Under study elements are those that are under discussion or in the early stages of development, with no contractual commitment from LIPA. Those programs found in the following sections are the elements, or initiatives that are categorized as under study.

Offshore Wind (Recommendation 8.3)

LIPA is part of an Offshore Wind Collaborative that is studying the potential for an offshore wind project that would be situated at least ten miles off the Rockaway Peninsula. The anticipated size of this project is 350 to 700 MW and is currently targeted for operation in 2015. This project, which originated from Governor Paterson's Renewable Energy Task Force, could provide significant market development benefits to the wind industry, create clean-tech jobs, and help diversify the State's electricity system. In addition, any project resulting from this work could demonstrate that we can meet the State's energy supply needs in an environmentally sound manner while benefiting the State's economy by reducing dependence on imported energy. Current members of the collaborative include LIPA, Con Edison, NYPA, New York City, New York State Energy Research and Development Authority, the Metropolitan Transit Authority, the Port Authority of New York and the New York Department of Environmental Conservation.

Key Goals:

- ✓ *Assessment of the viability of building a 350 MW to 700 MW wind farm of the shores of Long Island*
- ✓ *If feasible develop the project to provide energy toward meeting LIPA's RPS targets.*

Targets:

- ✓ *Issue a request for information by June 30, 2009*
- ✓ *Issue and RFP for an offshore wind farm by December 31, 2009*
- ✓ *LIPA to contract for a share of the 350 MW to 700 MW project*

Means:

- ✓ *Create a collaborative to study and if feasible contract for an offshore wind farm*
- ✓ *Issue an RFI to obtain input from industry on the potential project*
- ✓ *If no fatal flaws are discovered, issue an RFP for a 300 MW to 750 MW offshore wind farm delivered to Long Island and New York City*

LIPA is committed to increasing New York State's supply of clean, renewable energy as evidenced in their involvement with the Governor's Renewable Energy Task Force, which was charged with identifying barriers to increased production of renewable energy, recommending policies and financial incentives to overcome those barriers, and identifying future markets where additional research and development investment is necessary. The Task Force issued its first report in February 2007. The report contained several recommendations for increasing the State's renewable energy supply, including this project.

The Offshore Wind Collaborative will study, among other things, suitable locations for an offshore wind project, transmission and interconnection capabilities, and the availability of wind as an energy source. The information gathered from the Collaborative will be used to provide a better understanding of the opportunities for such a project and, if feasible, the development of a jointly issued request for proposals whereby both utilities and end use customers could share the cost of the project as well as the power generated from the project. Collaborative members issued a draft report identifying the best interconnection point for an offshore wind farm that would be used to supply power to Long Island and New York City and have filed an SRIS application with the NYISO. Wind developers, industry representatives and other interested parties will also be invited to participate in a RFI process to provide input into the study.

Future Solar Photovoltaic RFPs (Recommendation 8.5)

LIPA plans to evaluate the first Solar RFP and, if the it proves to be successful, issue a similar RFP for an additional 50 MW of solar capacity to be installed on Long Island. If the study indicates that the first Solar RFP is not a good model for solar power development, LIPA will evaluate the lessons learned and, if appropriate, revise its goals and targets.

Key Goals:

- ✓ *An additional 50 MW of Solar PV by 2015*

Targets:

- ✓ *Issue a 2nd Solar RFP by the Summer of 2010.*
- ✓ *Install an additional 50 MW of capacity between 2012 through 2015*

Means:

- ✓ *Completion of RFP process*

Determine the Best Site for Peaking Unit Retirements (Recommendation 8.11)

As part of its overall strategy to upgrade the generation resources on Long Island, LIPA is investigating the possibility of retiring and/or replacing a few of its older peaking facilities.

The oldest and most inefficient units on Long Island are peaking facilities. These units typically operate only on a limited basis however they perform a vital function during periods of high demand or system instability.

With the addition of newer more efficient sources of generation and improvements in the transmission system some of these peaking units may no longer be required. To the degree this is found to be the case LIPA recommends retiring and/or replacing those units.

4 Energy Efficiency Planning Analysis

Building on its past successes with the Clean Energy Initiative ("CEI"), the Long Island Power Authority (LIPA) launched on January 1, 2009, a new $924 million, 10-year investment program to acquire additional cost-effective energy efficiency resources. This market transformation program, referred to as "Efficiency Long Island" (ELI), has been designed to address the needs of LIPA's customers in a manner that provides the most value to the Long Island community. It will substantially increase energy and peak demand savings, reduce greenhouse gas emissions, defer investments in traditional supply-side resources, and create employment; without increasing participating customer's bills. The long-term, sustained investment in energy efficiency is expected to result in significant net societal benefits by reducing cumulative energy consumption and summer peak demand by approximately 1,600 GWh's and 520 MW's, respectively, in 2018. LIPA's investment in energy efficiency programs will also reduce CO_2 emission by nearly 20 million tons, diminish the State's reliance on fossil-fuels and serve to strengthen the local economy through the development of a clean energy delivery sector.

The scope of the Energy Efficiency Planning study consisted of the following:

- Reviewing current and past CEl programs to identify the most promising opportunities for the ELI initiative
- Accounting for new technologies that provide new efficiency opportunities
- Developing aggressive program penetration rates, supported by sufficient incentive levels to meet the demand reduction goal, for each proposed efficiency measure
- Use of a Portfolio Screening Tool to determine cost-effectiveness, and savings potential from each measure
- Developing budgets to support the envisioned level of activity and customer participation
- Performing the analysis for four blocks or scenarios, of various customer participation permutations and, optionally, inclusion of funding for a natural gas efficiency initiative
- Including post-initiative market effects in the modeling
- Generating projected energy savings in the form of hourly outputs through the 20-year time horizons, to serve as inputs for MAPS power planning modeling

The analytical methodology distinguishes between three components: markets, measures, and initiatives. Energy efficiency measures are the technology options, including high efficiency refrigerators or compact fluorescent technology; although measure characteristics, for example, the cost of the technology and the expected savings, depend on the market in which the technology is applied. Markets include the non-residential new construction market or the low-income market. Initiatives are implementation efforts that address collections of measures targeted to specific markets.

4.1 Rationale for Energy Efficiency

Over the next 12 years, LIPA expects electric demand growth of between 95 and 145 MW each year, an average annual growth rate of 1.9 percent. Between 2009 and 2018, this translates to an increase of over 1,200 MW. Clearly, there is an expectation that the economy of Long Island will call for more electric resources. There are several options to address electric system needs on Long Island, such as new generation supplies on the island, including offshore wind, new submarine transmission links such as the Neptune project from New Jersey, distributed generation, and energy efficiency. Each of these has associated advantages and risks. For example, siting new electric facilities is difficult. Even when approvals are granted, the length of time from initial planning to final approval, let alone completed construction, is long and unpredictable. This is true for both generation and transmission facilities, whether on land or off-shore. Construction of new facilities also entails the risk that forecasted load growth is overstated, raising concern over possible over-supply conditions if utilities over-invest in large generation assets.

As a result of its experience with CEI and its analysis of program potential, LIPA believes that investing in energy efficiency is a cost-effective approach to ensure electric grid reliability. In 2009, the case for investing in efficiency is more compelling than ever, with the introduction of new market complexities. Concerns over climate change have become widely discussed and fossil-fuel prices have been quite volatile in recent years. And while there have been recent concerns raised over the level of investment in clean energy initiatives from a subset of LIPA constituents due to today's economic concerns, LIPA has incorporated the clean energy initiatives within its balanced electric resource plan as they are one of the more cost-effective resource options available. The proposed ELI programs are designed to provide consumers with greater options to take more control over their own energy consumption. Through the ELI programs, residential and business customers can choose from an array of services to help reduce their energy usage; resulting in energy savings on future participants bills.

Investment by LIPA in ELI is projected to reduce peak electric demand by 520 MW by 2018. Such a reduction would result in the deferral or elimination of one large or two medium-sized power plants from LIPA's capacity expansion plan; and avoid higher-cost, on-peak energy production equivalent to saving 2.2 million barrels of oil. From an environmental perspective, the rationale for ELI is appealing for Long Island residents because implementation is expected to reduce CO_2 emissions by nearly 20 million metric tons when compared to the CO_2 emissions that would be produced from new power plants burning natural gas.

The rationale for increasing investments in clean energy initiatives also rests on fairly recent political and regulatory actions to address rising concerns over the environment and our Nation's economic security. New York policy-makers have presented several new resource challenges to electric utility companies over the last few years including specifically the Renewable Energy Portfolio Standard, the Regional Greenhouse Gas Initiative, and the Energy Efficiency Portfolio Standard. Of particular importance to LIPA is the New York Public Service Commission's ("NY PSC") proceeding with respect to the Energy Efficiency Portfolio Standards. Thus far, the NY PSC has determined that LIPA is expected to achieve 2,101 GWh of savings through a combination of efficiency investments, codes and standards, and other pertinent measures or initiatives. The State's Energy Efficiency Portfolio Standard ("EEPS"), as well as the other policy changes, is expected to significantly reduce emissions from fossil-fuel generated electric generators and help to reduce consumers' electric bills in the longer term. The same initiatives are also designed to establish a set of objectives that are intended to accelerate the formation of a vibrant clean-energy industry in New York and thus improve consumers' perceptions about the security of our Nation's economy and job prospects.

In addition to these policy initiatives, Governor Paterson issued Executive Order No. 2, on April 9, 2008, establishing a new state energy planning board with the authority to create and implement a state energy plan. Among its various responsibilities, the planning board has been directed by the Governor to issue a statement of long-run energy policy objectives and strategies to increase energy supply and reduce energy demand.

Adding to the complexity over how the State intends to ensure adequate electric energy resources is the issue of electric power demand. Similar to the remaining portions of New York State, Long Island faces a crossroads in its electric future. Electricity consumption in New York is projected to continue increasing by approximately 1.3 percent per year through 2015. At this rate of growth, electric energy usage in New York is expected to surpass 183,000 GWh annually, roughly 13 percent higher than current levels.

Clearly, there is an expectation that the economy of Long Island will call for more electric resources over time irrespective of the current downturn in the economy. But more importantly, consumers' concerns over climate change and the significant fluctuations in fossil-fuel prices have elevated a collective interest in further developing a US-based clean energy industry as a means to bolster economic security. While there may be several options to address the expanding electric system needs of Long Islanders, such as building new renewable and traditional generation, introducing distributed generation, and enhancing energy efficiency; each has advantages and risks that need to be taken into account. For example, siting new generation can be a lengthy process due to the permitting approvals needed and the local community approval requirements. This is true for both generation and transmission facilities, whether on land or off-shore. Efficiency investments are typically more flexible, allowing LIPA to make annual adjustments that reflect the ebb and flow of the region's economic performance.

As a result of the concerns over growth in demand, LIPA's planners explored a series of viable efficiency investment alternatives. Each alternative, which are discussed further in this section, can be designed to pair available efficiency options to LIPA's resource needs with regard to size of and timing of need. Efficiency investments can be planned in advanced but can also be implemented quickly, and do not require large up-front capital expenditures. Furthermore, they are scalable, and may be implemented gradually to match load growth. This also allows demand-side measures to be scaled back in the event of lower-than-expected demand growth without the financial risk of idle generation capacity. These additional benefits contributed to the decision to pursue aggressive efficiency savings; however, the benefits of incorporating demand-side resources into LIPA's overall planning processes are well known and documented.

4.1.1 Efficiency Efforts in Other Geographic Areas

Investments in energy efficiency mitigate several of the risks mentioned above. Efficiency programs have developed a record of performance that is highly reliable. Efficiency can eliminate or moderate the need for new assets, reducing the pressure and pace to get these assets permitted, built and commissioned. Efficiency programs can be ramped up as needed to match load growth and are therefore a prudent approach to providing least cost resources in the face of uncertainty. For all of these reasons, utilities are increasingly planning to use efficiency as an alternative to generation or T&D investment. Since the California energy crisis, and especially since rising natural gas prices have put severe upward pressure on electric rates, several states have made aggressive efforts to produce more savings from energy efficiency.

Some examples of aggressive demand side efforts elsewhere:

- California's energy policy has been built around procuring all cost-effective energy efficiency. California's principal energy agencies have joined to create an Energy

Action Plan that establishes a "loading order" to guide decision-making. It calls for optimizing all strategies for increasing conservation and energy efficiency to minimize increases in electricity and natural gas demand as the preferred strategy to meet demand, before any generation resources are considered. Significant efficiency investments by the utilities beyond levels supported by the statewide wires charge are the result. For example, PG&E committed close to $1 billion for efficiency, more than system benefit charge receipts.

- Connecticut, Vermont, New Jersey and Pennsylvania are implementing new ways to accomplish more energy efficiency through increasing budgets, using efficiency as a resource for T &D systems, or including efficiency in a portfolio standard.
- ISO-New England and PJM stakeholders have negotiated successfully to include efficiency and other demand-side resources in the forward capacity market.
- Niagara Mohawk is implementing a time-sensitive pricing program to control demand.
- States that have not traditionally been leaders in energy efficiency, such as Ohio, Missouri, Arkansas, Indiana, and Kansas, are beginning to advance their efforts, demonstrating the strength of the argument to invest in energy efficiency.

Beyond the fact that many utilities and state utility commissions are pursuing energy efficiency, there is abundant evidence that efficiency represents a substantial energy resource. Analyses of energy efficiency include both prospective potential studies and retrospective evaluations of the effects of implemented programs. Using these, we can develop the basis for estimates of the energy efficiency potential for LIPA.

In 2003, a study performed for the New York State Research and Development Authority (NYSERDA), estimated the 10-year economic potential on Long Island at 1,874 MW. As discussed above, several states are already aggressively pursuing energy efficiency or are beginning to substantially increase their investment.

4.1.2 Clean Energy Portfolio Objectives

In the original plan to launch the Clean Energy Initiative, LIPA articulated a set of policy objectives. In the document *Clean Energy Initiative* (approved by the LIPA Board on May 3, 1999) the following rationale supported the CEI initiative:

- Improve customers' ability to control their energy bills beyond the rate reduction received through the LIP A-LILCO transaction;
- Provide stimulus to the local economy;
- Increase customer retention;
- Defer or reduce capacity needs;
- Build customer trust and LIPA brand loyalty;
- Promote a positive image for LIPA and differentiate it from LILCO;
- Reduce emissions from power plants; and
- Contribute to a sustainable energy future.

The same report's Clean Energy Initiative Policy Statement read:

> "Acquisition of Energy Supply Resources: LIPA is committed to competitively bidding all new power resources requirements, including demand side management/energy efficiency, to bring the benefits of competition to Long Island. LIPA will establish a process for competitively bidding new power supply resources, providing opportunities for conventional, energy efficient, and renewable power supply alternatives and load management and energy conservation measures to compete in an open market."

These policy objectives demonstrate that LIPA already has dedicated itself to pursuing clean, competitively priced, and capacity-deferring resources. Efficiency Long Island, the proposal described in this document, represents the next generation of LIPA's efforts to continue pursuing these objectives.

4.2 Summary of Analytical Approach and Methodology

LIPA's energy efficiency plan was developed to provide lower cost resources to serve customer needs. The appropriate efficiency plan has been developed through a review of LIPA's load shape to identify preferred solutions, evaluating alternative energy efficiency and demand reduction strategies, and developing a portfolio of customer solutions that meet the identified needs. The steps of the analysis are summarized below; each is described in detail later in this section. A screening tool was used to formulate alternative measure portfolios to compare and contrast their costs and benefits in order to select the preferred efficiency plan for LIPA.

- Avoided costs were developed for five energy costing periods: summer peak, summer intermediate, summer off-peak, winter peak, and winter intermediate; for summer demand capacity costs; and for fuel costs. The value of energy and demand savings from any measure or portfolio of measures was determined using these avoided costs.
- More than 100 different energy efficiency technologies were analyzed for various markets and building types for a total of 2,032 targeted efficiency measures. Each measure was characterized by
    - anticipated measure life,
    - incremental installed cost,
    - customer incentive level necessary for measure adoption,
    - projected annual energy and demand savings,
    - associated fossil fuel savings,
    - operation and maintenance benefits, and
    - deferred replacement benefits for some retrofit measures.

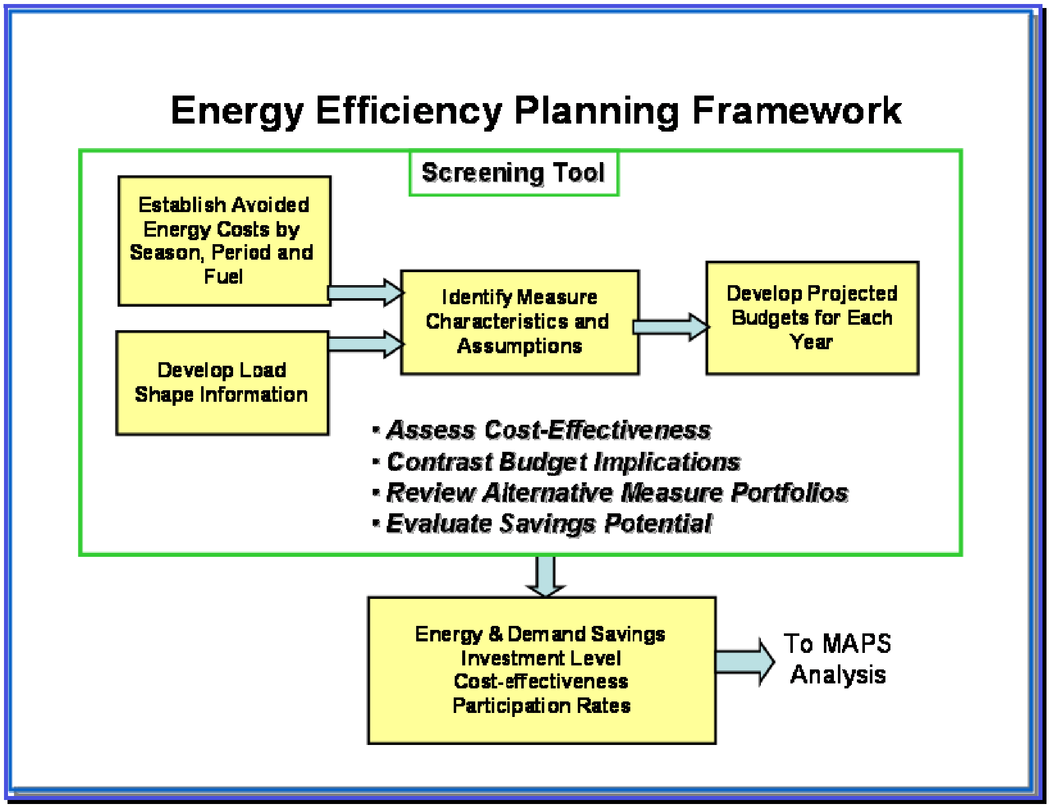
  Customer penetration rates were developed for each measure and market.
- Load shapes were developed through which each measure's energy savings were allocated to the five energy periods, and the demand savings determined for the summer capacity period.

- Budgets were developed for each initiative suitable for the given levels of activity and incentives for the 10- or 20-year initiative period. Budget levels were largely based on experience with successful efficiency initiatives elsewhere.
- The avoided costs, measure characterizations, load shapes and initiative budgets served as inputs to the Screening Tool, which performs the cost-effectiveness and related calculations for each measure and initiative and for the overall portfolio.
- The screening outputs include: total monetized benefits and costs; cost-effectiveness using the Societal Test and Utility Test; electric energy savings by energy period; summer peak demand savings; and other useful metrics. Measures were only included in the analysis if found to be societally cost-effective.
- Electric energy savings for each of the five defined energy periods were parsed into hourly outputs for each year of the 20-year analysis horizon. These served as inputs to LIPA's MAPS model.

Using the screening tool, analysis of each measure or grouping of measures produced an assessment of their cost-effectiveness as measured by standard industry tests. The tests used in the screening tool are the Societal Test and the Utility Test. The Societal Test compares the total costs and total benefits to society which includes the utility and its customers. The Utility test compares the costs and benefits only to the utility. Typically the cost-effectiveness of a measure or initiative is expressed in a ratio of the benefits to the costs or in the net present value of a stream of program benefits and costs; for each a value greater than one or a value greater than zero reflect a good measure or initiative. All benefits and costs are expressed as present value 2006 dollars.

Exhibit 4-1 provides an overview of the methodology used for the efficiency screening and savings analysis.

Exhibit 4-1 Energy Efficiency Planning Framework



4.3 Selected ELI Initiatives

Concerns over volatile fossil-fuel prices, climate change, and the economic downturn have resulted in increased public interest in government action to address these issues. The public's concerns have turned into a renewed and enhanced interest in developing a US-based clean energy industry that would substantially improve the energy efficiency of homes, businesses and municipal buildings, expand the supply of renewable energy, and contribute to the creation of local jobs.

The federal government, under President Obama's leadership, passed economic stimulus legislation in early 2009 that would invest billions of taxpayers' dollars in efficiency programs and renewable energy projects. The "American Recovery and Reinvestment Act of 2009" is a significant new federal commitment to expand energy efficiency programs and extend tax benefits to provide assistance to consumers and businesses.

New York's policy-makers have commenced various

The American Recovery and Reinvestment Act of 2009

The Act includes three main efficiency provisions of interest including:

1. State Energy Programs (SEP)
   a. To expand existing efficiency and renewable programs
   b. $3.1B funding
2. Weatherization Assistance Programs
   a. Expand the reach of existing programs, minimum eligibility criteria increased.
   b. $4.0 B funding
3. Conservation Block Grants
   a. Assist municipalities reduce energy consumption and
   b. increase efficiency in buildings
   c. $3.2B funding

Source: *Environment NorthEast-2/13/09* policy initiatives over the past several years that will reduce electricity consumption by 15 percent by 2015 (referred to as the "15 x 15" goal) and diversify the state's energy portfolio. These initiatives include, among others, the Renewable Energy Portfolio Standard, the Regional Greenhouse Gas Initiative, and the Energy Efficiency Portfolio Standard. For each of the state-sponsored initiatives, policy makers have established a set of objectives that are intended to accelerate the formation of a vibrant clean-energy industry in New York, reduce the state's dependence on fossil fuel generated electricity, and contribute to the creation of jobs. LIPA continues to actively monitor the progress that New York's energy officials are making with respect to policies that may affect LIPA's long-term energy efficiency investments, and participates in such proceedings when appropriate.

LIPA has been actively pursuing energy efficiency opportunities since 1999, when the Board of Trustees first authorized the $160 million Clean Energy Initiative (CEI). After the initial CEI programs proved to be cost-effective, the Board of Trustees extended CEI's charter in 2004 for an additional five years and also increased LIPA's investment in energy efficiency to $355 million.

Investing ratepayer funds in energy efficiency over the past ten years has yielded significant returns to Long Island's consumers. For the year ending December 31, 2008, the CEI has saved 144,514 MWhs of energy and reduced summer peak demand by 22 MW.[1] Along the way, LIPA's sustained support of progressive efficiency and renewable energy initiatives has earned it respect across the Nation. Many of the CEI programs are considered to be exemplary in the industry for their comprehensive approaches and cost-effectiveness.

4.3.1 Developing Efficiency Long Island

Planning for a successor program to the CEI commenced as part of an annual review of Long Island's energy and demand forecasts. These long-term forecasts indicated that the growth in electric demand would range between 95 and 145 MW each year, or approximately 1.9 percent per year on average. Additional analysis determined that if the rate of growth in demand continued, Long Island customers would need to finance approximately 1,200 MW in additional supply resources by 2018, at a cost of approximately $1,293 per kW, or $0.15/kWh[2] for fossil fueled resources.

To address the implications of the forecast, LIPA investigated additional resource options including the potential for efficiency to slow the trend in demand growth. Over the course of its investigation, LIPA assessed ten scenarios of efficiency potential on Long Island. Efficiency potential is typically referred to as that level of efficiency that could be realized with sufficient investment to achieve all economical efficiency. In 2006, when this investigation began, technical potential studies demonstrated that a sustained investment in efficiency could displace more than 2,350 MW and approximately 8,340 GWh in 2012 for ISO NY Zone K, which is the Long Island load zone. This efficiency potential study was corroborated by similar studies in the region.

Pursuing all economically achievable efficiency, however, would require significant investment by LIPA with potentially unpopular effects on customer rates. LIPA instead sought to pursue a strategy that appropriately balances the inherent tensions between the need to reduce retail energy consumption and customer bill impacts. As a result of this balancing, LIPA developed a 10-year,

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[1] *See December* 2008 CEI YTD Performance *Report.*
[2] Long-Run Avoided Costs provided by the NY Department of Public Service for Long Island.

$924 million initiative called Efficiency Long Island that is comprised of five programs that have been screened for cost-effectiveness. Each of the programs yields positive net societal and utility benefits as demonstrated in Exhibit 4-2.

Exhibit 4-2 Summary of ELI Program Benefits

Sector	Societal Cost-Effectiveness				Electric Utility Cost-Effectiveness			
	Benefits	Costs	Net Benefits	B/C Ratio	Benefits	Costs	Net Benefits	B/C Ratio
Residential	1,127	218	910	5.18	610	121	489	5.04
Commercial	1,892	601	1,291	3.15	1,081	288	792	3.75
Total Program	3,019	819	2,200	3.69	1,691	409	1,281	4.13

The results of the final resource efficiency scenario upon which ELI is based, indicates that the cost of displacing traditional supply-side resources would be no more than $0.043/kWh.[3] Cumulatively, the ELI programs are expected to cost approximately $721 million in 2006 dollars or $924 million in nominal dollars. When compared to the cost of supply-side resources, energy efficiency was determined to be an investment strategy to be pursued vigorously.

LIPA also investigated the cost-effectiveness of a 20-year efficiency program based on ELI programs. The results of this longer term efficiency scenario indicate that savings would amount to 2,026 MWh, and 860 MW, in 2028; at a total cost of $2.5B in nominal dollars. The savings anticipated from the 10 and 20 year efficiency programs analyzed are demonstrated in Exhibits 4-3 and 4-4.

Exhibit 4-3 Summary of Total Demand and Energy Savings for 10 Year Program

10 Year Efficiency Program	Peak Demand Savings (MW)	Energy Savings (GWh)	Natural Gas Savings (mmbtu 000)	Investment ($2006 millions)
Year End 2018	520	1,660	2,419	$721
Year End 2028	304	765	2,205	$721

[3] *See*, Summary Tables 2-10. Assumes first year costs of $0.43 kWh amortized over an average measure life of 10 years

Exhibit 4-4 Summary of Total Demand and Energy Savings for 20 Year Program

20 Year Efficiency Program	Peak Demand Savings (MW)	Energy Savings (GWh)	Natural Gas Savings (mmbtu 000)	Investment ($2006 millions)
Year End 2018	520	1,662	2,419	$721
Year End 2028	860	2,026	5,320	$1,657

4.3.2 ELI Program Design

After establishing the investment level and associated savings goals for ELI, the next step was to design a set of programs that would address various market channels on Long Island. Knowing that ELI would be pursuing aggressive savings goals, LIPA needed to incorporate leading-edge concepts into the delivery of program services. The next generation of efficiency programs focuses on a “markets approach” to attain higher levels of efficiency and invests heavily in market transformation efforts that continue to pay dividends even after the program’s end-date. This market transformation approach seeks to intervene on the basis of when, and how, customers make energy related purchasing decisions rather than an approach based upon expedient administrative structures; as such the approach is designed from the customer’s perspective.

From a practical vantage point, this approach means that there are no traditional program silos with vertically organized implementation structures that require customers to understand how they may fit into an administrative program. Under the new approach, once a customer contacts LIPA, they will instead be seamlessly passed on to the appropriate staff or implementation contractor who will tailor a solution to fit their specific requirements. Efficiency program staff’s responses to meet a customer’s needs may be as simple as providing information or sending an application to the customer. Alternatively, ELI representatives may provide a more comprehensive energy assessment and other forms of technical and financial assistance. A real-time data tracking system will also provide ELI staff with customer information, a running log of customer interactions, and other data to assist ELI staff and subcontractors in forging effective relationships with Long Island residents and businesses.

In addition to its work with consumers, ELI staff will work closely with a variety of market participants to enhance their understanding of LIPA’s efficiency programs and to encourage their participation and support of ELI to promote applicable end-use efficiency measures. These partnerships will include:

- Retailers of products that have energy-efficient alternatives, particularly of lighting, appliances, and other consumer products;
- Distributors and vendors of equipment used in equipment replacement, renovation, or new construction;
- Contractors in all trades, including general, electrical, and mechanical; and
- Architects and engineers.

Ultimately, these market players work with or make decisions for customers who otherwise lack the time or expertise to assess energy-efficient options. Engaging these market actors in a way that helps them with their business is critical to promoting energy efficiency on Long Island.

4.3.3 ELI Initiatives

ELI consists of five key initiatives, two of which address the residential sector and two address the commercial and industrial sectors. One initiative—the Efficient Products Program—addresses all three sectors—residential, commercial and industrial. For the year 2009, the projected annual incremental savings and budgets for each of the five programs are shown in Exhibit 4-5. Each of the initiatives is described in this section.

Exhibit 4-5 ELI Program Initiative Budget for 2009

ELI Program Initiative	Energy Savings	Demand Savings	Annual Budget
Residential New Construction	584	0.3	$2,428,656
Residential Efficient Products	90,513	8.4	$8,437,600
Residential Existing	9,026	5.1	$9,898,000
C&I Existing	28,729	6.9	$2,705,354
C&I New Construction	8,271	1.9	$6,523,418
Annual Incremental Totals	137,123	22.5	$29,993,028

Residential New Construction Initiative

The Residential New Construction (RNC) initiative intends to acquire savings by increasing the efficiency of residential new construction in both the single-family and multi-family building sectors. Savings for this initiative are projected by calculating the difference in expected energy consumption from new efficient buildings that comply with Energy Star standards and those that do not comply with ENERGY STAR® standards. To earn an ENERGY STAR rating, homes are required to meet guidelines for energy efficiency set by the Environmental Protection Agency. Such homes are at least 15% more energy efficient than homes built to the 2004 International Residential Code (IRC), and include additional energy-saving features that typically make them 20–30% more efficient than standard home construction.

An important strategy that this program intends to pursue is to support efforts to increase building code levels in order to lock in savings for all new homes, while also encouraging voluntary implementation of building practices that exceed current building codes. The RNC program shall set the recently revised standards for ENERGY STAR homes as the minimum acceptable level of efficiency in order to qualify for incentives and will address all relevant health and life safety considerations.

Within the RNC program, LIPA has established four tiers of participation and each pursues achieving a comprehensive, whole-house assessment of energy usage. The first tier, or base tier, which is referred to as the ENERGY STAR tier, has been adopted in many towns on Long Island for new construction.[4] The intent of the EPA's three additional ENERGY STAR tiers is to encourage even greater savings and motivate builders to voluntarily adopt the ENERGY STAR as a building code standard for homes they build.

Residential Existing Homes Initiative

The Existing Homes initiative seeks to develop and support a sustainable market for whole-house energy efficiency retrofits and a skilled contractor infrastructure to implement the initiative. Three program efforts serve as the core of the service delivery plan: Home Performance with ENERGY STAR (HPwES), Cool Homes, and Residential Affordability Partnership (REAP).

HPwES is an EPA sponsored initiative seeking to drive market-based promotion of comprehensive home assessments that lead to cost-effective and properly installed energy upgrades. LIPA has recently launched a series of pilot efforts extending from HPwES to gain more immediate energy savings through a "Direct Install" component in high electric-use homes solicited by LIPA for free site visits. REAP similarly offers comprehensive home assessments and support for follow-up energy upgrades targeted specifically at income-eligible homes. Cool Homes is focused on high efficiency central cooling equipment, and identifying and encouraging those methods that will ensure quality installation of products to optimize the equipment operating efficiency.

Combined, these three approaches to the Existing Homes Initiative specifically target electricity capacity and energy savings from efficient lighting and appliances, proper installation of high efficiency central cooling equipment, and enhancement of thermal efficiency and distribution systems of existing homes by improving the building shell and ductwork. The initiative will target both those who pay for energy efficiency services either upfront or over time through loans, although incentives will be offered for participation, and needs-qualified households that are eligible for full or partial subsidies.

Efficient Products Initiative

The Efficient Products Initiative is a market transformation effort that aims to make energy efficiency preferences a routine part of consumers' decision-making process when purchasing lighting, consumer electronics, and appliances. While a large majority of participants is expected to be residential customers, institutional and commercial customers shall also be targeted for specific promotions. The initiative intends to leverage the consumer awareness of the U.S. EPA's ENERGY STAR labeling brand, and will rely, wherever possible, on the relevant ENERGY STAR standard as the basis for determining program eligibility. The program's success will likely depend on the ability of LIPA's implementation contractors to develop strong relationships with established retailers, manufacturers and other key trade allies, such as buyer groups for independent appliance retailers.

C&I New Construction Initiative

The C&I New Construction initiative will target all new buildings and significant building expansions. Major renovations which are defined as complete replacement of at least one major building system are also included; smaller renovation opportunities will be covered under the C&I

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[4] No incentives are offered in towns that have adopted the base tier as code.

Existing Buildings Initiative. This Initiative shall offer comprehensive services including: financial incentives covering measure, design, and analysis costs; technical and design assistance; and coordination services to assist consumers, design professionals, vendors and contractors to overcome various transaction barriers. The program shall also promote the installation of comprehensive efficiency measures using a "whole-building" and "total-systems" approaches, which both capitalize on the interactions of technologies serving multiple end-uses and building envelopes. Optimizing multiple building systems requires an effort to recognize the appropriate sizing of technologies given a set of current and expected future building parameters, as well as other interactions between systems such as: interior and exterior lighting, HVAC, motors, domestic hot water, building envelope conditions, and refrigeration. Efficiency savings shall be acquired through appropriate equipment selection, control equipment and strategies, fuel choice, the design process, and commissioning.

Top Energy Saving Measures in the Commercial New Construction and C&I Existing Buildings
1. Integrated Building designs 2. High Efficiency Lighting fixtures/designs 3. Heating Ventilation and Air Conditioning (HVAC) 4. Optimized Unitary HVAC distribution and control systems 5. Refrigeration 6. Commissioning.

C&I Existing Buildings Initiative

The C&I Existing Buildings market consists of all existing C&I buildings on Long Island, regardless of type or end-use. Within this market there are significant differences between large customers and small or medium size customers: differences in management, building operation expertise, and the capacity to undertake capital projects. Recognizing this, the initiative is divided into two customer segments: on to address the large segment and the second to assist the small and medium facility sizes. Within each, the initiative will address both lost opportunity events which are those that occur at the time of new purchase or natural replacement, and retrofit events which occur during discretionary equipment replacement. ELI staff or contractors will establish direct relationships will LIPA's large customers to maximize the capture of both retrofit and lost opportunity projects. The goal of these relationships is to integrate initiative staff into the capital planning activities at as many Large C&I customers as possible so that their expertise will be leveraged by the customers during retrofit decisions.

For small and medium-sized customers, the initiative will address retrofit and lost opportunity events separately. Local contractors will implement the retrofit component through direct installation of efficient equipment. While the primary focus of the retrofit efforts will be on lighting, it will also address other measures as opportunities arise at customer locations. To capture efficiency opportunities when small and medium-sized customers purchase new equipment, whether for expansion or for natural replacement, the initiative will provide prescriptive incentives either directly to the consumer or passed down to them through upstream incentive programs.

4.4 Detailed Methodology Description

As used in this report, markets comprise various sectors of the economy in which decisions are made affecting energy use, and which are thus suitable for the focused promotion of energy efficiency efforts. Markets can be identified along different economic dimensions. First there are the residential, commercial and industrial markets. Another dimension frequently divides energy decisions between new construction and existing buildings. Owners of existing homes or business facilities are faced with different decisions than potential owners of new homes or business facilities, particularly when evaluating the costs of different options that would affect energy use.

The market for existing buildings can be subdivided into three submarkets: retrofit, purchase/replacement, and remodel/renovation:

- ***Retrofit Opportunities***: In this market, home or business owners have existing, working equipment that could be kept in service. However, the owner may choose to replace this equipment for the benefits of energy efficiency, and possibly for other benefits (reliability, product quality, etc.). When considering retrofit efficiency measures, a building owner must compare the benefits of new equipment against the full cost of installation.
- ***Purchase of New or Replacement Equipment***: In this case, the home or business owner makes a decision to install new equipment due to equipment failure, expansion, performance concerns, or other drivers. For a homeowner this could be replacement of a failed refrigerator, or the first-time purchase of a chest freezer. Typically, the window of opportunity (in terms of time) to influence the energy efficiency of this decision is very narrow, much narrower than in the retrofit market. Success in this market relies heavily upon the efforts of retailers (for retail products), design professionals (particularly engineers), and trade allies (*i.e.*, contractors, vendors, suppliers). When considering the purchase of higher-efficiency equipment, the building owner is comparing the efficiency and other benefits of this equipment against the incremental cost as compared to standard efficiency equipment.
- ***Remodel/Renovation***: This market is similar to equipment purchase or replacement, but affects an entire system, or multiple systems, within a given home or building. For example, a renovation effort could allow for a switch from one type of space conditioning system to another *e.g.*, furnace to boiler, package rooftop units to a chilled water system. This market also affords the opportunity to evaluate system interactions, such as how reducing waste heat from lighting in a refrigerated warehouse also reduces refrigeration load, allowing the installation of smaller compressors.

Energy efficiency measures may have very different characteristics depending upon the market. In the residential sector, a homeowner would evaluate the full cost of a new ENERGY STAR® refrigerator when considering the replacement of an old, inefficient, but serviceable unit. For someone already planning to buy a new refrigerator, the cost of the ENERGY STAR® unit is only the additional, or incremental, cost above a standard efficiency unit. The energy and demand savings also differ; the savings for a retrofit are compared to the old, inefficient unit at least until the homeowner would have needed to replace the unit at the end of its life, while the savings for new construction or replacement are compared to a new, standard unit.

Finally, "initiatives" are strategies that affect energy-related decisions in each of these markets. The goal is to craft initiatives, each with its respective budget, that complement one-another to efficiently reach the target markets.

4.4.1 Measure Characteristics

There are two basic approaches to determining the energy efficiency or generation potential of an efficiency measure: "bottom-up" and "top-down."

- The "bottom-up" approach develops savings information for a specific measure *e.g.*, the installation of one compact fluorescent lamp, and then multiplies those costs and savings by the number of measures, or lamps, installed.
- The "top-down" approach starts with forecasts of total electric energy sales, and then determines what percentage of those sales may be offset by installations of a given energy efficiency measure in each year. The top-down approach develops costs relative to energy savings, and then multiplies that "cost per energy saved" by the measure's energy savings each year to determine each year's installed costs.

In the ELI analysis, the residential sector DSM uses the bottom-up approach, since data are available to estimate the number of residential buildings and the expected adoption rates for efficiency measures. In contrast, commercial and industrial buildings vary greatly in size and in their energy usage, and suitable data are not available to use the bottom-up approach. The C&I initiatives thus use a top-down approach to determine the potential of each efficiency measure.

Regardless of approach, all methodologies need to develop factors for the following measure characteristics:

- **Applicability.** This represents either the number of customers eligible for a given measure, which is a bottom-up approach, or the fraction of the end-use level sales for each building type that is attributable to equipment that could be replaced by the high efficiency measure, which is the top-down approach. . As an example of the top--down method, for packaged air conditioners it is the portion of total building type cooling electrical load consumed by packaged systems.
- **Feasibility. T**he fraction of the applicable number of customers or end-use sales for which it is technically feasible to install the high efficiency technology is the feasibility. Numbers less than 100% reflect engineering or other technical barriers that would preclude adoption of the measure. Feasibility is not reduced for either economic or behavioral barriers that would reduce overall penetration estimates. Rather, feasibility reflects technical or physical constraints that would make measure adoption impossible or ill advised.
- **Turnover.** This represents the number of or percentage of existing equipment that will be naturally replaced each year due to failure, remodeling, or renovation. Turnover only applies to replacement or purchase and remodel or renovation markets. In general, turnover factors are assumed to be 1 divided by the measure life. For example, this calculation would assume that 10% of the existing stock of equipment is replaced each year for a measure with a 10 year estimated life.
- **Baseline Adjustment.** This factor is used to adjust the savings for retrofit measures. During the period when the replaced equipment would have remained in service without the program's influence to replace, the energy savings are relative to the old or replaced equipment. The baseline adjustment occurs when the old equipment would have reached its end-of useful life, at which point the energy savings are adjusted to be relative to newer, standard efficiency equipment.
- **Savings Fraction.** This factor is used only in the top-down approach and represents the percent savings as compared to either existing stock or new baseline equipment for retrofit and non-retrofit markets, respectively, of the high efficiency technology. Savings fractions are calculated based on individual measure data and assumptions about existing stock efficiency, standard practice for new purchases, and high

efficiency options.

- **Free Ridership.** This factor is used in the bottom-up approach, and represents the portion of customers who accept incentives who would have invested in the efficient technology without the incentive.
- **Spillover.** This effect is used in the bottom-up approach, and represents the portion of customers who invest in the efficient technology due to the initiative or due to marketing or increased availability as a result of the initiative, but who do not apply for and receive an incentive.
- **Annual Net Penetrations.** These are the difference between the Base Case measure penetration and the measure penetrations that can be achieved with maximum sustained efficiency initiatives. In a bottom-up approach, these penetrations are the number of installed measures each year, net of free rider and spillover effects. In a top-down approach, these are percentages of the total economic potential savings achieved for each measure for each year.

4.4.2 Cost-Effectiveness Tests

Results of the screening analysis are provided with regard to two cost-effectiveness tests, the Electric Utility test and the Societal Test. The Electric Utility test compares the costs and benefits to the electric utility. The Societal Test compares the total costs and benefits to society, including the utilities and their customers. Cost-effectiveness is measured by the Net Benefits, equal to the gross benefits minus the costs, and by the Benefit/Cost Ratio (BCR), equal to the benefits divided by the costs. All benefits and costs are expressed in present value 2006 dollars. This report only presents DSM savings for which the Societal Test benefits are greater than costs.

Electric Utility costs considered in these tests include financial incentives offered to customers to install measures and the administrative costs of delivering the efficiency initiatives. Electric Utility benefits include the avoided costs of producing electric energy and electric generating capacity.

Societal costs include measure installed costs, fossil fuel costs with their environmental externalities (for increase usage), and the administrative costs of delivering the efficiency initiatives. Societal benefits include the avoided costs of producing electric energy and electric generating capacity, electric environmental externalities, fossil fuel savings with their environmental externalities (for decreased usage), water savings, operation and maintenance savings or costs, treated as negative benefits, and deferral replacement credit for some retrofit measures.

4.4.3 Value of Energy and Demand Savings

The cost effectiveness of any efficiency program is significantly impacted by the value attributed to the energy and demand savings. Such savings are determined by the electric energy avoided costs. For this report, avoided cost, which were provided by LIPA, reflect five energy periods: summer peak, intermediate and off-peak, and winter peak and intermediate. All electric avoided costs are stated in 2006 dollars at the generator.

Emissions costs were also provided by LIPA for each metric ton of CO_2, NO_X and SO_2. The quantities of these emissions per kWh of electric energy were calculated using available factors, which enabled calculation of monetized emission benefits per kWh of saved energy. Emissions are typically considered externalities, which are not included in utility cost-effectiveness tests. However, the Regional Greenhouse Gas Initiative (RGGI) provides monetary benefits to utilities for reductions of CO_2 as a greenhouse gas, thus the emissions reductions will provide a direct benefit to utilities subject to the RGGI program. The CO_2 emissions benefits were thus factored into the electric avoided costs, so that these benefits would be included in both the Societal and Electric Utility cost-effectiveness tests.

4.4.4 Load Shapes and Peak Demand Coincidence Factors

Load shapes were generated from Itron eShapes™ data, which provide hourly energy usage per square foot for 24 building types and 18 end use categories. The 2002 data set was acquired for developing the ELI load shapes, for consistency with the MAPS models (which are also based on 2002 data, though from a different source). The Islip weather station was selected to be representative of Long Island. A total of 104 load shapes were developed corresponding to the efficiency measures included in the ELI analysis. Each load shape distributes the total annual energy savings (kWh) for a measure across the five energy periods (summer peak, summer off-peak, summer intermediate, winter off-peak, winter intermediate). The energy savings for each period is then converted to monetized savings using the avoided cost data for each year.

The load shape data was also used to compute the summer peak demand reductions. Summer peak demand coincidence factors are computed from the hourly eShapes data based on the "kWh/kW" ratio within each peak demand period. For the weather-dependent end uses of cooling and heating, it is assumed that the peak demand in the eShapes hourly data will correspond with the system peak, thus the maximum demand reduction during the peak demand period is used to estimate the demand savings. The peak savings for other end uses are not expected to coincide with the system peak, thus for other end uses the average demand reduction during the demand period is used to estimate the reduction at the system peak.

4.4.5 Production Simulation (MAPS Analysis)

To analyze the effect of ELI on power production and emissions, LIPA uses a production simulation model. The Multi-Area Production Simulation Software (MAPS) simulates each hour of the year for the entire 2009 to 2028 study period. The model optimizes the weekly commitment and dispatch to operate the system at the lowest cost while respecting transmission constraints and unit operating characteristics. For each monitored generating unit, the model records the projected hourly electric generation output, amount and cost of fuel consumed other operating costs, and flue gas emissions of SO_2, NO_X and CO_2. The model uses a database of hourly customer loads, fuel prices, generating unit operating characteristics, and transmission system topology and constraints.

The Portfolio Screening Tool calculates energy savings for each of the five defined energy periods for each year of the analysis, and the peak demand savings. Because the MAPS model requires hourly input data it was necessary to distribute each year's calculated savings across all 8,760 hours of the year. The LIPA sales forecast from the MAPS model was used as the load shape to accomplish this distribution. While the savings distribution would not be expected to exactly match the hourly sales forecast from MAPS, a major emphasis of ELI is to reduce peak demand. Therefore, we expect a high degree of correlation between the savings and system load forecast. In particular the peak demand savings calculated by the Portfolio Screening Tool is expected to coincide with the system peak demand. Using the sales forecast as the load shape for generating the hourly outputs assured that the savings peak would coincide with the system peak demand.

For each output year, the hourly sales load shape was applied to distribute the energy savings for each energy period across the hours comprising that period. This was done by calculating the fractional contribution of each hour from the hourly load shape within each energy period, in order to preserve the total energy savings within each energy period. The hourly output therefore conformed to the savings calculated by the screening analysis.

4.5 Results

This section provides an overview of the efficiency potential and cost-effectiveness analyses that form the basis for launching Efficiency Long Island. During the investigation into alternative resource configurations, LIPA modeled numerous efficiency potential scenarios. In many respects, the scenarios were similar except for 1) the types of specific program initiatives that were included, 2) the funding period considered, and 3) whether or not natural gas utility participation was incorporated.[5] In the end, LIPA determined that two efficiency targets, a ten and a twenty year plan, reflect an appropriate mix of investments that balance the competing interests between increases in efficiency investments and controlling customer rate impacts. A ten year efficiency plan was deemed the "Base" case scenario and has been adopted as the new goal for LIPA to pursue. An alternative case is an identical program but assumes that level funding of efficiency programs would continue through 2028.

Each efficiency plan includes only initiatives that pass the societal test and the electric utility test, however, the low income initiative is included even though it does not pass the utility test, and the initiatives reflect the anticipated natural gas savings in the cost-effectiveness test. The difference between the ten and twenty year scenarios is that the ten year funding plan includes 10 years of savings plus 10 years of post-initiative market effects without additional funding while the twenty year scenario includes 20 years of level funding at no more than the 2018 funding level for the post-10 year period.

Exhibit 4-6 presents a summary of cumulative energy results for the ten year initiative by major sector. C&I programs typically account for two-thirds of the total energy savings and all demand savings are during the summer peak at the generation level. That is, the values represent the reduced customer demand plus the associated avoided line losses, which together equal the generating capacity avoided as a result of efficiency.

Exhibit 4-6 Electric Demand and Energy Savings by Sector

Cumulative Savings in 2018	Demand Savings (MW)	Energy Savings (MWh)
Residential	274	644,972
Commercial & Industrial	246	1,016,885
Total	520	1,661,857

[5] Traditional efficiency efforts have used the term "program" to refer to the different components of the overall efficiency program (*e.g.*, "New Construction Program," "Efficiency Lighting Program," etc.). To date, many efficiency efforts have suffered from artificial distinctions drawn between programs, creating "silos" between which coordination is lacking. As a result, consumers wishing to pursue efficiency investments falling under multiple programs have had to deal with different organizations, creating an unnecessary barrier. To avoid these barriers, LIPA uses the "initiative" to refer to the different components of ELI.

Exhibit 4-7 summarizes the level of investment for the ten year ELI initiative. Exhibit 4-8 provides detail by initiative with respect to investment, incremental annual energy savings, and summer peak demand savings by year.

Exhibit 4-7 Summary of Investment in 10-Year ELI Initiative

Initiatives	2009	2010	2013	2015	2018
Residential New Construction	$2,428,656	$3,763,160	$4,476,778	$5,325,032	$6,601,898
Residential Efficient Product	$8,437,600	$9,863,339	$13,826,639	$12,891,718	$12,097,388
Residential Existing	$9,898,000	$13,005,240	$16,974,329	$19,652,650	$24,571,675
C&I Existing	$2,705,354	12,679,798	$18,193,324	$17,895,191	$14,371,890
C&I New Construction	$6,523,418	$14,907,408	$34,444,350	$53,767,927	$89,526,617
Annual Incremental Total	$29,993,028	$54,218,945	$87,915,420	$109,532,517	$147,169,457
Cumulative Investment		$84,211,973	$318,877,132	$526,518,453	$924,776,007

Exhibit 4-8 Summary of ELI Initiative

Investment and Incremental Annual Energy and Peak Demand Savings

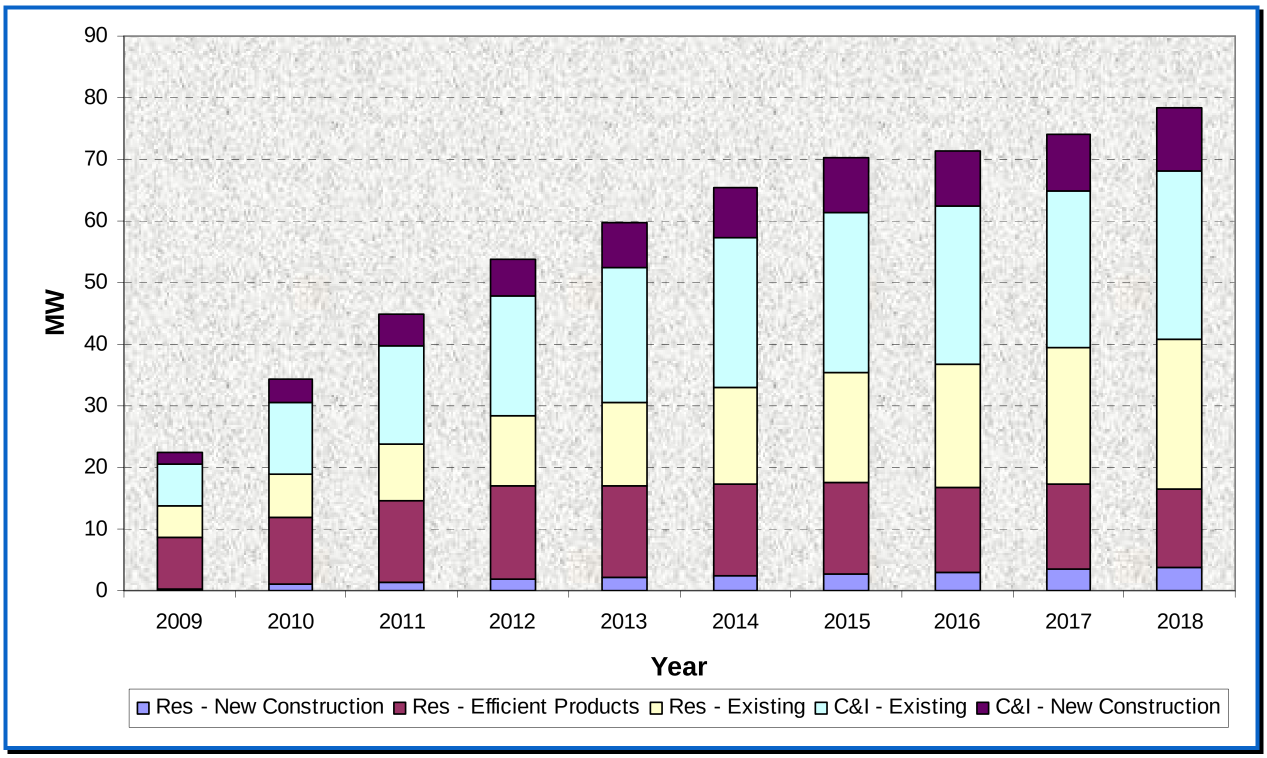
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Residential Existing[6]										
Investment	$9,898,000	$13,005,240	$14,903,796	$16,373,837	$16,974,329	$18,351,568	$19,652,650	$20,829,286	$22,651,591	$24,571,675
MWH	9,026	8,164	9,618	10,176	11,572	12,967	14,362	15,758	17,153	18,549
MW	5.07	7.09	9.25	11.36	13.52	15.69	17.85	20.01	22.18	24.34
Residential New										
Investment	$2,428,656	$3,763,160	$4,128,404	$4,336,737	$4,476,778	$4,747,996	$5,325,032	$5,529,242	$5,948,547	$6,601,898
MWH	584	810	1042	1273	1504	1735	1965	2196	2426	2655
MW	0.27	1.13	1.45	1.77	2.10	2.42	2.74	3.06	3.38	3.70
Efficient Products[7]										
Investment	$8,437,600	$9,863,339	$11,873,790	$13,070,419	$13,826,639	$12,858,014	$12,891,718	$11,951,273	$12,371,806	$12,097,388
MWH	90513	83463	88667	92121	72012	71934	71908	71989	72968	73162
MW	8.37	10.79	13.05	15.14	14.97	14.95	14.93	13.81	13.88	12.77
Commercial Existing										
Investment	$2,705,354	$12,679,798	$17,800,422	$16,524,767	$18,193,324	$18,929,057	$17,895,191	$15,814,619	$13,898,989	$14,371,890
MWH	28729	51261	71221	86710	95078	103644	108117	105728	104578	113095
MW	6.88	11.58	16.02	19.46	21.94	24.21	25.76	25.45	25.39	27.40
Commercial New										
Investment	$6,523,418	$14,907,408	$21,470,332	$26,267,233	$34,444,350	$43,222,170	$53,767,927	$65,171,105	$76,921,629	$89,526,617
MWH	8271	14472	20108	24457	28400	30959	34142	35243	36744	39736
MW	1.93	3.71	5.10	6.12	7.29	8.04	8.94	9.08	9.35	10.09

[6] Includes Residential Existing, Cool Homes, and REAP programs.
[7] Includes Info Ed.

4.5.1 Demand Savings

Efficiency initiatives of the scale contemplated by ELI require time to "ramp up" to mature penetration levels and generate savings. In each year, savings accumulate from investments made in that year, plus the savings from previous years.[8] However, some efficiency savings are discontinued over time as measures reach the end of their useful lives and are not replaced. As a result, annual demand savings increase steadily throughout the 10-year implementation period but at a slower rate than might be expected. For the ELI initiative, annual incremental savings are expected to exceed 70 MW in 2015 and 78 MW in 2018. Exhibit 4-9 demonstrates the contribution by each initiative to the projected incremental annual demand savings in each year resulting from each year's investment from 2009 through 2018.

Exhibit 4-9 Incremental Annual Demand Savings for 10 Year ELI Initiative



[8] All measures have an associated "measure-life" which describes the amount of time the measure operates under normal conditions. For most measures this exceeds the length of the initiative and of the analysis, but for some (*e.g.*, compact fluorescent lights) it may be less. Our analysis incorporates the effects of measure expiration.

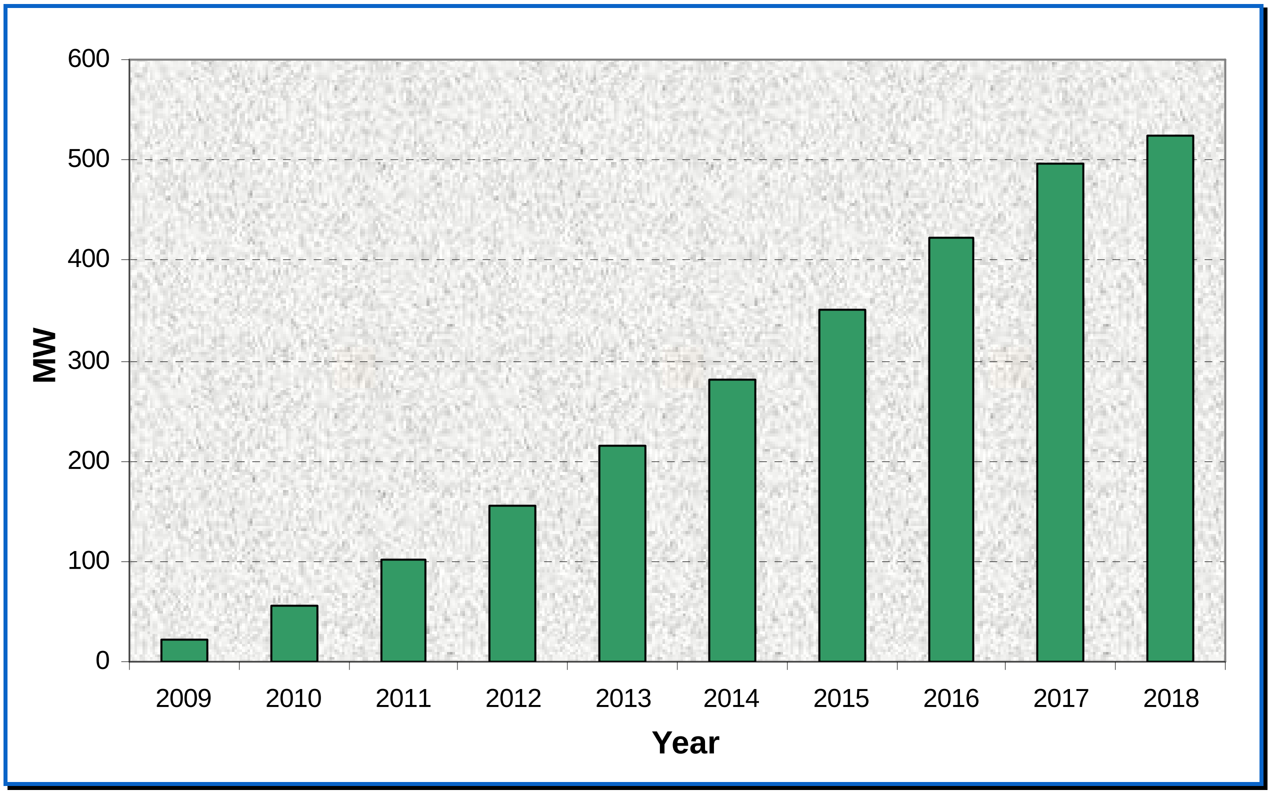
Exhibit 4-10 demonstrates that the majority of the annual incremental demand savings are eventually harvested from the C&I and Residential Existing programs. This exhibit reflects the contribution of each initiative in absolute terms sorted in descending order of savings. The right-most column shows the percent of savings for each initiative and all initiatives above it in the table. As shown, the Commercial and Residential existing programs account for 66 percent of the annual incremental demand savings in 2018. This distribution of demand savings across initiatives is relatively stable over the 10 year implementation period.

Exhibit 4-10 Annual Incremental Demand savings by Initiative in 2010 and 2018

ELI Initiatives	2010			2018		
	Incremental Annual Demand Savings (MW)	Percent of Annual Incremental Savings	Cumulative Percentage Savings	Incremental Annual Demand Savings (MW)	Percent of Annual Incremental Savings	Cumulative Percentage Savings
C&I Existing	11.6	34%	34%	27.4	35%	35%
Residential Existing	7.1	21%	55%	24.3	31%	66%
Residential Efficient Products	10.8	31%	86%	12.8	16%	82%
C&I New Construction	3.7	11%	97%	10.1	13%	95%
Residential New Construction	1.1	3%	100%	3.7	5%	100%
Total Program Savings	34.3			78.3		

Cumulatively, demand savings through 2018 are expected to surpass 520 MW by 2018 as shown in Exhibit 4-11. As noted above, the cumulative and annual incremental demand savings differ by the amount of decay in annual expected efficiency savings, meaning that as measures reach their expected useful lives, demand savings are reduced for the purposes of establishing long-term savings goals.

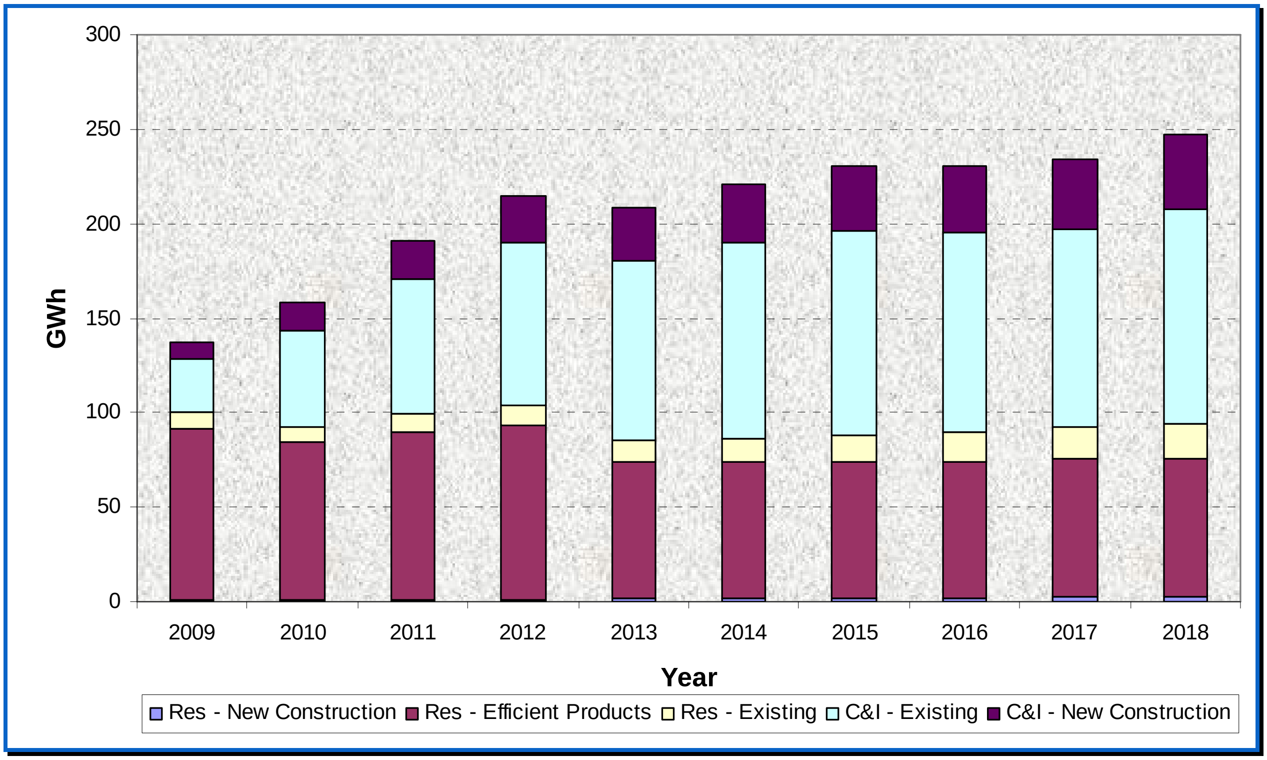
Exhibit 4-11 Cumulative Demand Savings – 2018



4.5.2 Energy Savings

The pattern in the growth of energy savings (MWh) is similar to that of demand savings. After 2013, much of the growth in annual incremental energy savings flows from the C&I Initiatives. Exhibit 4-12 summarizes the annual incremental energy savings associated with the annual investment level for the ten year program through 2018.

Exhibit 4-12 Incremental Annual Energy Savings for 10 Year ELI Initiative



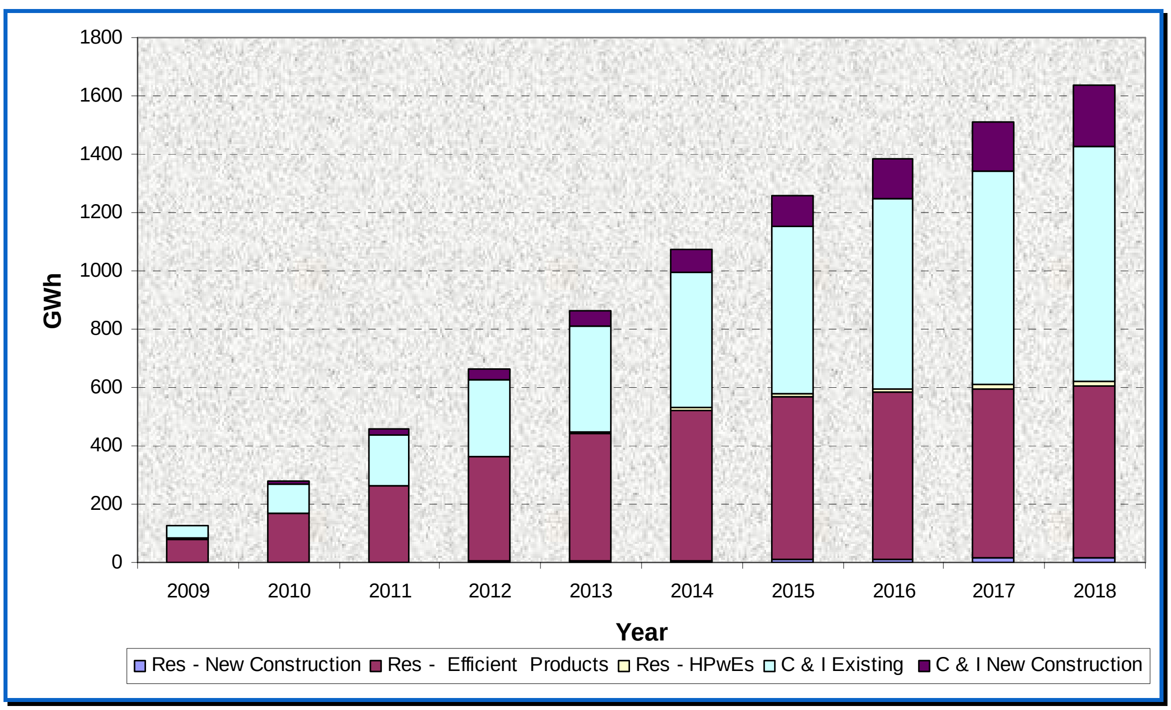
As with demand savings, the majority of the savings are harvested from two programs; in this case however they are the C&I Existing and the Efficient Products programs. Exhibit 4-13 shows the contribution of each initiative in absolute terms, and is sorted in descending order of savings.

Exhibit 4-13 Incremental Annual Energy savings by Initiative in 2018

ELI Initiatives	2010			2018		
	Incremental Annual Energy Savings (MWh)	Percent of Annual Incremental Savings	Cumulative Percentage Savings	Incremental Annual Energy Savings (MWh)	Percent of Annual Incremental Savings	Cumulative Percentage Savings
C&I Existing	51,261	32%	32%	113,095	46%	46%
Residential Efficient Products	83,463	53%	85%	73,162	30%	76%
C&I New Construction	14,472	9%	94%	39,736	16%	92%
Residential Existing	8,164	5%	99%	18,549	8%	99%
Residential New Construction	810	1%	100%	2,655	1%	100%
Total Program Savings	158,170			247,196		

Cumulatively, energy savings through 2018 are expected to surpass 1,600 GWh by 2018 as shown in Exhibit 4-14.

Exhibit 4-14 Cumulative Energy Savings



4.5.3 Effect of DSM on Utility Dispatch and Emissions (MAPS Analysis)

As described elsewhere in this section of Appendix A, the ELI program was developed using a cost benefit analysis based on fixed marginal costs of displacing power during different seasons and times. This approach is an effective way to evaluated and select energy efficiency measures from a wide array of alternatives. However, the interaction of these measures, or a program consisting of many measures together, is not captured with this type of analysis. Once the measures representing the ELI program were selected, the program as a whole was evaluated in the context of the power system.

LIPA uses a production simulation model (GE-Multi Area Production Simulation Software, or "MAPS") to determine the effects of ELI's energy and demand savings on power production, plant dispatch, and emissions of CO_2, NO_X and SO_2. Two scenarios were developed: the Reference Case, which simulates what would happen if the ELI program was not implemented, and the ELI Case, which assumes that the ELI program is implemented and defers the construction of new capacity. Exhibit 4-15 shows the projected emissions for both cases for two representative years.

During the first period—2009 to 2015—there is no need for capacity expansion in either the Reference Case or the ELI Case; the generating units simulated are identical for both scenarios. The effect of reduced energy demand under ELI is less energy generation by existing generating units. Less fuel is burned and emissions of SO_2, NO_X and CO_2 are reduced.

The second year analyzed, 2023, is representative of the time period after 2016. The effects of reduced energy demand in the ELI Case in this simulation year cause an increase in SO_2 and NO_X emissions and a decrease in CO_2 emissions. This counter-intuitive result is caused by the deferral of new generation capacity; under LIPA's expansion plan for the ELI Case, construction of new capacity is deferred. New gas-fired combined cycle units typically run at a capacity factor of 75 percent. That is, each MW of generating capacity produces an average of 6,570 MWh of electricity over the course of the year (0.75 MW x 8,760 hours = 6,570 MWh).

The ELI program is expected to reduce electricity demand at a 50 percent capacity factor "generating" approximately 4,380 MWhs per MW of peak demand savings. In a year where capacity is deferred by ELI, 6,570 MWh less electricity is produced for each MW of deferred expansion capacity, but only 4,380 MWh are saved by DSM. The remaining 2,190 MWh of energy must come from other existing generating units on the system, which will run more than if new capacity had been added. These existing generating units have higher emission rates than the new plants, particularly for SO_2 and NO_X. When the average emission rate of an existing unit is more than three times greater, as is the case in this example, than the rate of a new unit, air emissions will increase despite the decreased overall generation. The difference in CO_2 emission rates between existing and new units is not as great, allowing net emissions of CO_2 to decrease.

Section 9.3 of this appendix evaluates the ELI program and other energy efficiency program options over a 20-year analysis period. The analysis indicates that, compared to a reference plan without continued energy efficiency programs, the ELI program is projected to save customers $2.8 billion (net present value 2009$) over the evaluation period and reduce LIPA's CO_2 footprint by 9 million tons.

Exhibit 4-15 Change in Flue-Gas Emissions from Adoption of ELI

	Long Island System Emissions			Regional System Emissions		
	SO_2 (tons)	NO_X (tons)	CO_2 (kilotons)	SO_2 (tons)	NO_X(tons)	CO_2 (kilotons)
Year 2015						
Reference Case (CEI)	8,190	5,650	8,383	112,070	439,290	490,054
ELI Case	8,310	5,910	7,875	112,270	439,780	489,816
Change	120	260	(508)	200	490	(238)
Year 2023						
Reference Case (CEI)	4,400	4,600	11,463	109,800	459,000	529,441
ELI Case	5,400	4,900	10,356	110,900	459,500	529,089
Change	1,000	300	(1,107)	1,100	500	(352)

4.5.4 Program Costs

The total program expenditures in 2009 are nearly $30 million rising to $54 million in 2010 and increasing to annual incremental investment of $147 million in 2018. Exhibit 4-16, shows total spending over time for each of the programs.

Exhibit 4-16 Annual Incremental Spending by Program

Initiatives	2009	2010	2013	2015	2018
Residential New Construction	$2,428,656	$3,763,160	$4,476,778	$5,325,032	$6,601,898
Residential Efficient Products	$8,437,600	$9,863,339	$13,826,639	$12,891,718	$12,097,388
Residential Existing	$9,898,000	$13,005,240	$16,974,329	$19,652,650	$24,571,675
C&I Existing	$2,705,354	$12,679,798	$18,193,324	$17,895,191	$14,371,890
C&I New Construction	$6,523,418	$14,907,408	$34,444,350	$53,767,927	$89,526,617
Annual Incremental Totals	$29,993,028	$54,218,945	$87,915,420	$109,532,517	$147,169.467
Cumulative Spending		$84,211,973	$318,877,132	$526,518,453	$924,776,007

Within each program, spending is generally categorized into Incentives (78%), outside services (16%), marketing (4%), and evaluation (1%) although these numbers may be allocated differently over time. The proportion of annual incremental spending on incentives as a percent of total program spending increases over time mostly due to the growth in investment in the Commercial sector. Exhibit 4-17 shows the program cost breakdown in dollars and as a percentage of total program costs. Exhibit 4-18 provides a visual of the relationship of program costs.

Exhibit 4-17 Program Cost Categories

Cost Categories	2009	2010	20113	2015	2018
Incentive	$16,195,965	$32,135,626	$60,776,776	$79,937,891	$115,453,427
Incentive Percentage	54%	59%	69%	73%	78%
Marketing	$2,080,500	$4,826,643	$5,310,719	$5,612,332	$6,032,478
Marketing Percentage	7%	9%	6%	5%	4%
Outside Services	$10,863,517	$15,741,896	$20,050,303	$21,943,367	$23,654,393
Outside Services Percentage	36%	29%	23%	20%	16%
Evaluation	$853,046	$1,514,781	$1,777,622	$2,038,928	$2,029,170
Evaluation Percentage	3%	3%	2%	2%	1%
Total	$29,993,028	$54,218,945	$87,915,420	$109,532,517	$147,169,467

Exhibit 4-18 Program Cost by Sector

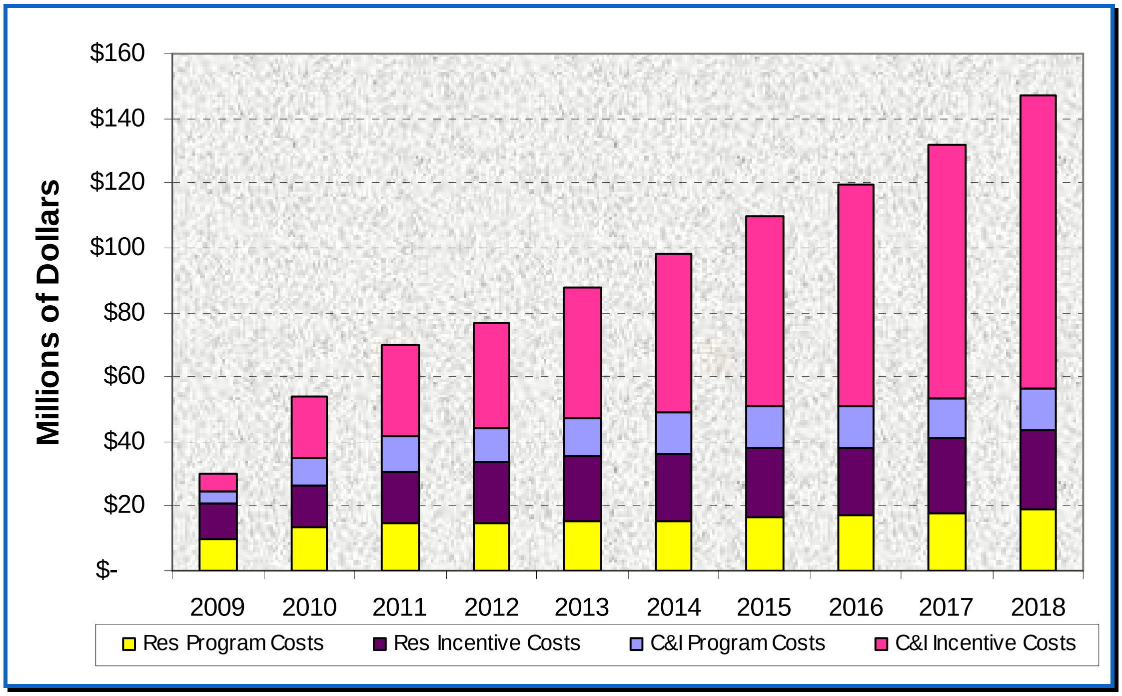
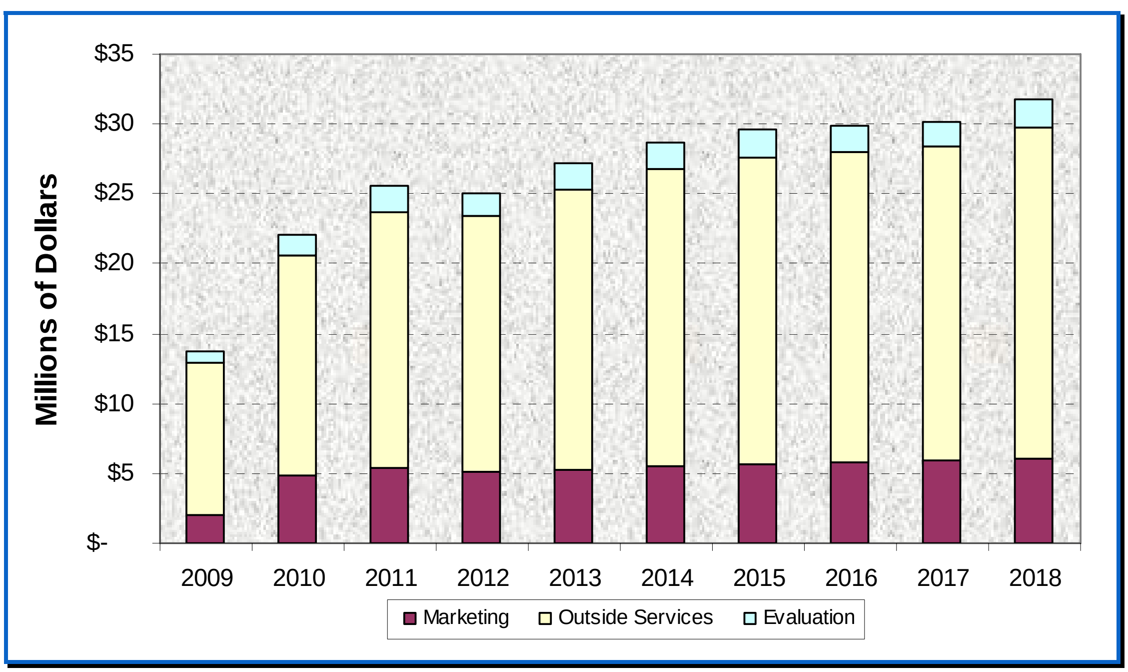


Exhibit 4-19 shows the non-incentive program budgets (combined Residential and C&I) over time. Growth in the program budget is largely driven by growth in the budgets for the C&I implementation contractors. These expenses are necessary in order to effectively manage each large commercial customer account.

Exhibit 4-19 Utility Non-Incentives Costs, through 2018 ($2006)



4.5.5 Net Benefits and Benefit-Cost Ratios

In the aggregate, all the initiatives presented here yield positive net societal and electric utility benefits. As demonstrated in Exhibit 4-20, the C&I Sector initiatives cost more but generate significantly higher benefits. From the societal perspective, the Residential Sector initiatives have higher relative benefits, as measured by the Benefit-Cost Ratio (BCR). Electric utility net benefits are higher because the analysis does not include costs borne by the end user.

Exhibit 4-20 Benefits and Costs (in 2006$, except BCR)

Sector	Societal Test				Utility Test			
	Benefits (Millions)	Costs (Millions)	Net Benefits (Millions)	BCR	Benefits (Millions)	Costs (Millions)	Net Benefits (Millions)	BCR
Residential	$1,127.3	$217.8	$909.5	5.2	$609.8	$120.9	$488.9	5.0
Commercial	$1,891.6	$601.1	$1,290.6	3.2	$1,080.8	$288.4	$792.4	3.8
Total ELI	$3,019.0	$818.9	$2,200.1	3.7	$1,690.6	$409.2	$1,281.3	4.1

4.6 Findings and Conclusions

LIPA will dramatically expand their efforts to capture energy efficiency potential on Long Island for many reasons: managing load growth, fostering the development of a US-based clean energy industry on Long Island, addressing challenges in siting new generation, reducing the risk posed by constrained natural gas supplies, and reducing its greenhouse gas footprint. This report presents the results of an analysis performed in support of LIPA's efforts to plan for these efforts. By assessing the economic and electric system impacts of leading-edge efficiency programming, LIPA can plan for a future where efficiency provides a stable, secure, and cost-effective resource for its customers.

The analysis finds that over 520 MW of cumulative summer peak demand reduction can be acquired through a comprehensive approach to efficiency services delivery. Although this will require a substantial financial commitment on the part of both LIPA and its customers, the energy savings and demand reductions that result will generate an even greater amount of financial benefit. LIPA firmly believes that ELI represents a critical component in their efforts to acquire clean, competitively-priced, and capacity-deferring resources for their customers.

Exhibit 4-21 provides a comparison of the Investment in energy efficiency with the incremental annual summer peak demand reduction for the 10 year ELI initiative. A similar comparison of the annual investment and the incremental annual energy savings is provided in Exhibit 4-22.

Exhibit 4-21 ELI Investment and Summer Peak Demand Savings (Annual Incremental)

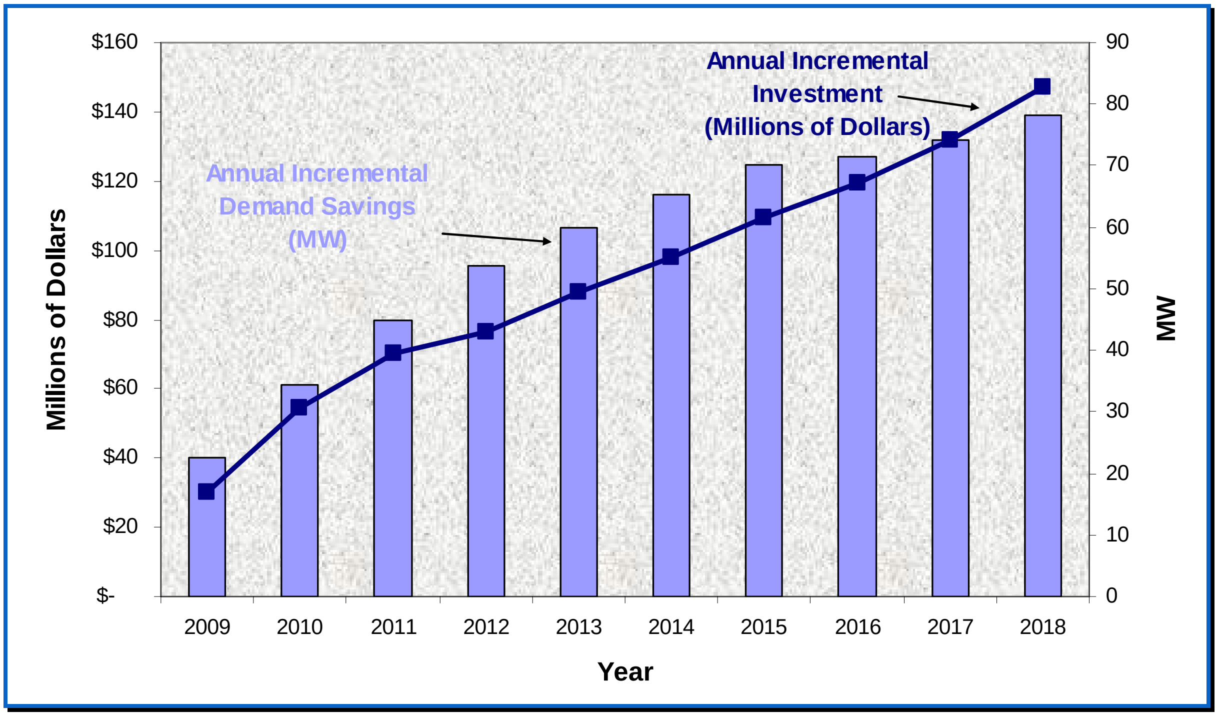
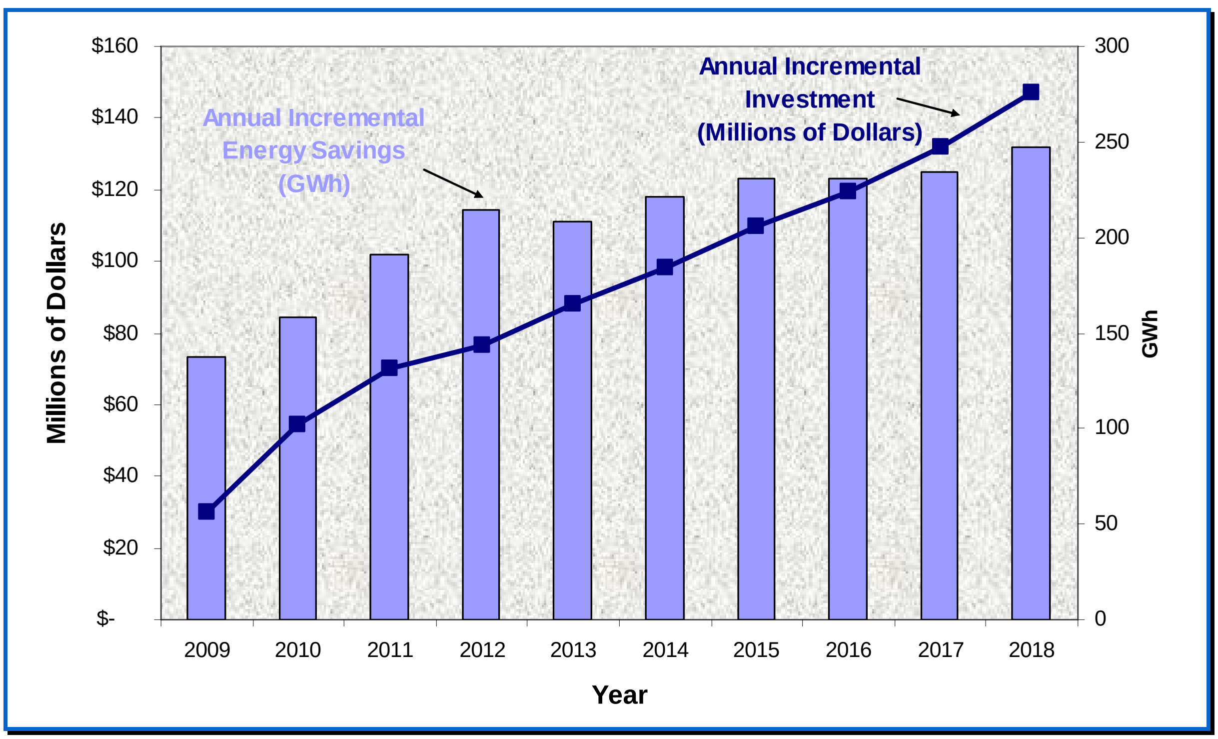


Exhibit 4-22 ELI Investment and Energy Savings (Annual Incremental)



5 Fuel Management Plan

Fuel, especially natural gas, is important to LIPA for several reasons. LIPA is directly responsible for fuel purchases for a number of gas or dual-fired (gas or oil) electric generating units on Long Island. Fuel and fuel prices are also important because the costs of LIPA's electric purchases from third parties are also based at least in part on the cost of fuel.

LIPA, which owns the electric transmission and distribution system on Long Island, has historically obtained most of its electricity supply through two types of agreements, both of which require LIPA to be responsible for the fuel used to generate the electricity. Under a Power Supply Agreement (PSA), National Grid, which owns and operates the electric generation facilities on Long Island as well as the natural gas utility, sells electricity to LIPA from some eighteen oil and gas-fired generating units at cost-based wholesale rates. The cost of fuel for power purchased under the PSA is embedded in the PSA rate structure. LIPA's largest generating units, which all utilize boiler steam technology, are under the PSA. All the steam units can burn either natural gas or residual fuel oil (No. 6), with the exception of the 110-MW Far Rockaway Unit, which burns gas only. Accordingly, most of LIPA's energy supply comes from the units included in the PSA, which provide more than 4,000 MW of capacity.[1]

LIPA also obtains just over 1,000 MW of power from units governed by Power Purchase Agreements (PPA), also with National Grid. Under the PPAs, LIPA is directly responsible for fuel delivery and costs (rather than indirectly through rates). The PPAs include twelve combined-cycle and simple-cycle gas and oil generating units. These PPA units, like the PSA units, are on Long Island. Thus, the vast majority of the generating capacity under either form of contract is located on Long Island, and over 40 percent of this capacity is dual-fuel (natural gas, plus residual No. 6 fuel oil or distillate No. 2 fuel oil).

With the construction of the 326 MW Caithness Long Island Energy Center, scheduled to begin operating in the latter part of 2009 or early 2010, LIPA's fuel responsibilities will move yet more to the forefront, as LIPA will be the actual purchaser of fuel for Caithness, through supply contracts with third-party fuel providers. A Request for Proposal to supply natural gas for Caithness is currently in development.

With this portfolio of electric generation capacity, the focus for LIPA is on serving the important goals of assuring reliability and managing the costs of fuel to generate electricity. In fact, these key considerations will be prime drivers in shaping the actions and policies for LIPA in the future. This puts emphasis on the careful development of a fuel management plan as an integrated component of the Electric Resource Plan.

With a primary objective of reliability, an important part of these goals will be the careful management of fuel supply to meet the requirements of the generating plants in order to meet fluctuating load. A fuel management plan is integral to controlling fuel costs within the overarching requirement of reliability, and to assuring future fuel sourcing so that LIPA can meet its customers' energy needs in a safe, reliable, economical, and environmentally responsible manner.

[1] Throughout this document, capacity is defined in terms of summer Dependable Maximum Net Capability (DMNC).

Among other issues, this Fuel Management Plan (the Plan) considers potential fuel supply constraints that could impact LIPA's ability to generate sufficient power. These potential constraints include infrastructure (pipelines and storage), delivery, and maintaining adequate fuel diversity.

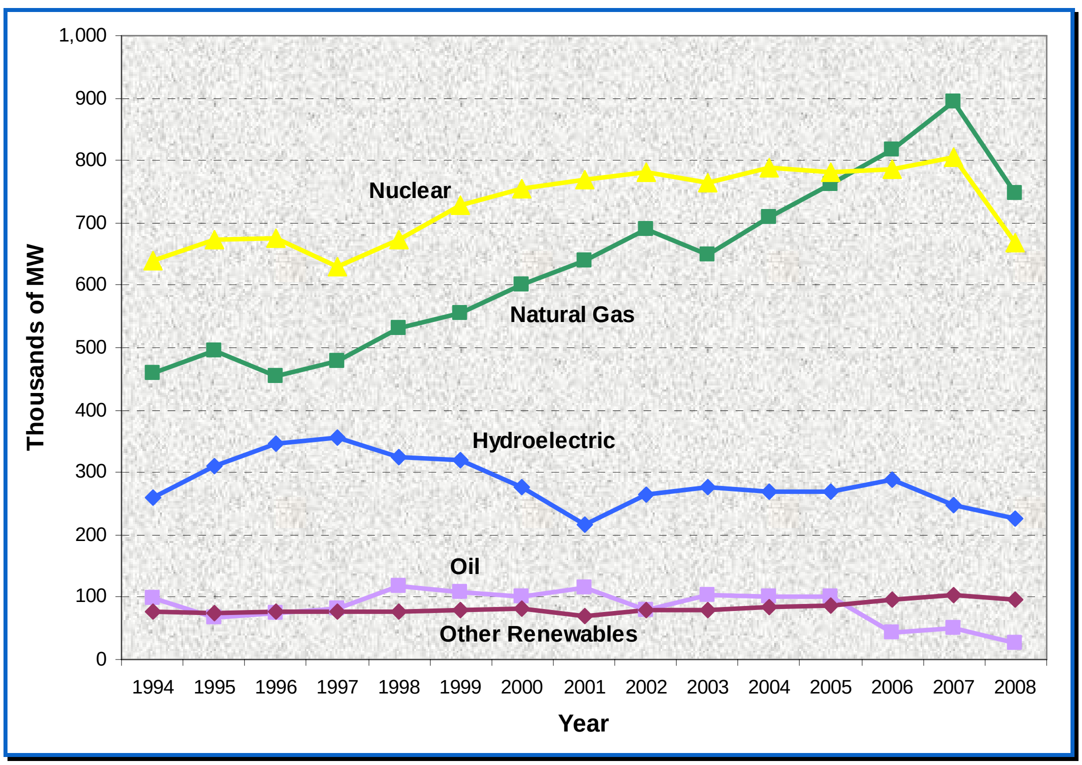
The Plan considers price risk mitigation opportunities.

The Plan also addresses strategic issues, most notably climate change. All indications are that utilities such as LIPA will be required to reduce their Greenhouse Gas emissions substantially over the period covered by this Plan, and even more substantially in later years. The interplay of climate change initiatives and demand growth has deep implications for generation technology, siting, fuel selection, and non-generation alternatives such as demand response and customer energy efficiency.

LIPA is investigating a number of alternatives to meet growing electricity demand, including energy efficiency, renewable generation technologies such as solar and wind, and emerging generation technologies that are on the cusp of commercial availability. These alternatives may provide fuel diversity benefits that may help LIPA control fuel costs and avoid fuel-related rate increases while satisfying reliability requirements and addressing the necessity of Greenhouse Gas reduction.

Throughout the United States, including New York, natural gas has become the preferred fuel for electric generation. The increase in the use of natural gas as an electric generation fuel in the United States can be seen in Exhibit 5-1.

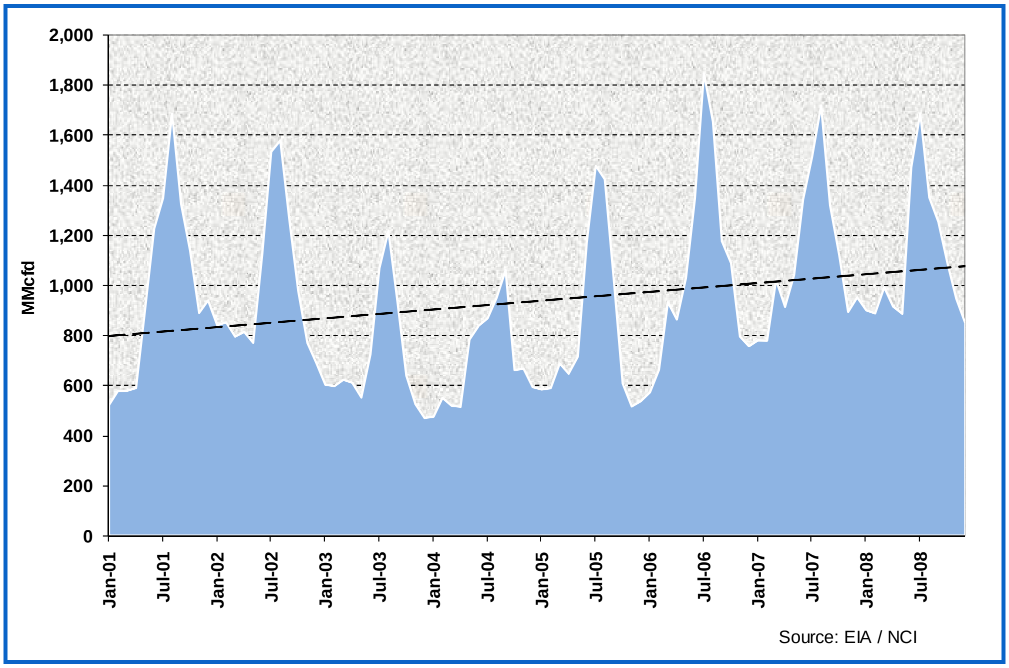
Exhibit 5-1 United States Net Generation by Energy Source[2]



[2] Source: EIA, January 15, 2009. The "Other Renewables" line after 2001 does not include non-biogenic municipal solid waste or tire-derived fuels; it does include biogenic municipal solid waste, geothermal, solar thermal, photovoltaic energy, and wind.

The increase in the use of natural gas as an electric generation fuel in New York State is shown in Exhibit 5-2 below.

Exhibit 5-2 New York State Electric Power Natural Gas Consumption[3]



5.1 Strategic Overview of LIPA's Access to Fuel Supply

The unique geography of LIPA's service territory affects its energy options.

On the one hand, the Northeast has historically been the most constrained area in the United States for natural gas delivery. It is at the tail end of the pipelines that originate from its predominant sources of gas, the Gulf of Mexico and western Canada. Other major gas producing regions, notably the Rocky Mountains, have to date been inaccessible.

The Northeast's dense population makes it difficult to expand pipeline capacity. There is no underground natural gas storage close to New York City and Long Island. This constrained infrastructure, combined with cold winters, means that New York is subject to the highest natural gas prices in North America. Daily natural gas prices can spike significantly during winter cold spells, and monthly prices can also be driven up by demand competition. Electricity demand for air conditioning means that summers as well as winters are vulnerable to high natural gas prices. At present, most new generation being built, such as Caithness, is primarily gas-fired because gas-fired generation has the lowest Greenhouse Gas profile of generation that can be brought on line timely to meet demand growth. (Caithness also has the capability to burn oil.) In the future, renewable generation will play an increasing role.

On the other hand, the Northeast has ample access to the Atlantic Ocean and its robust imported oil market. New York Harbor is the most active oil import location in the United States outside the Gulf of Mexico. Additional oil enters the New York market via Colonial Pipeline from the Gulf Coast. Once in

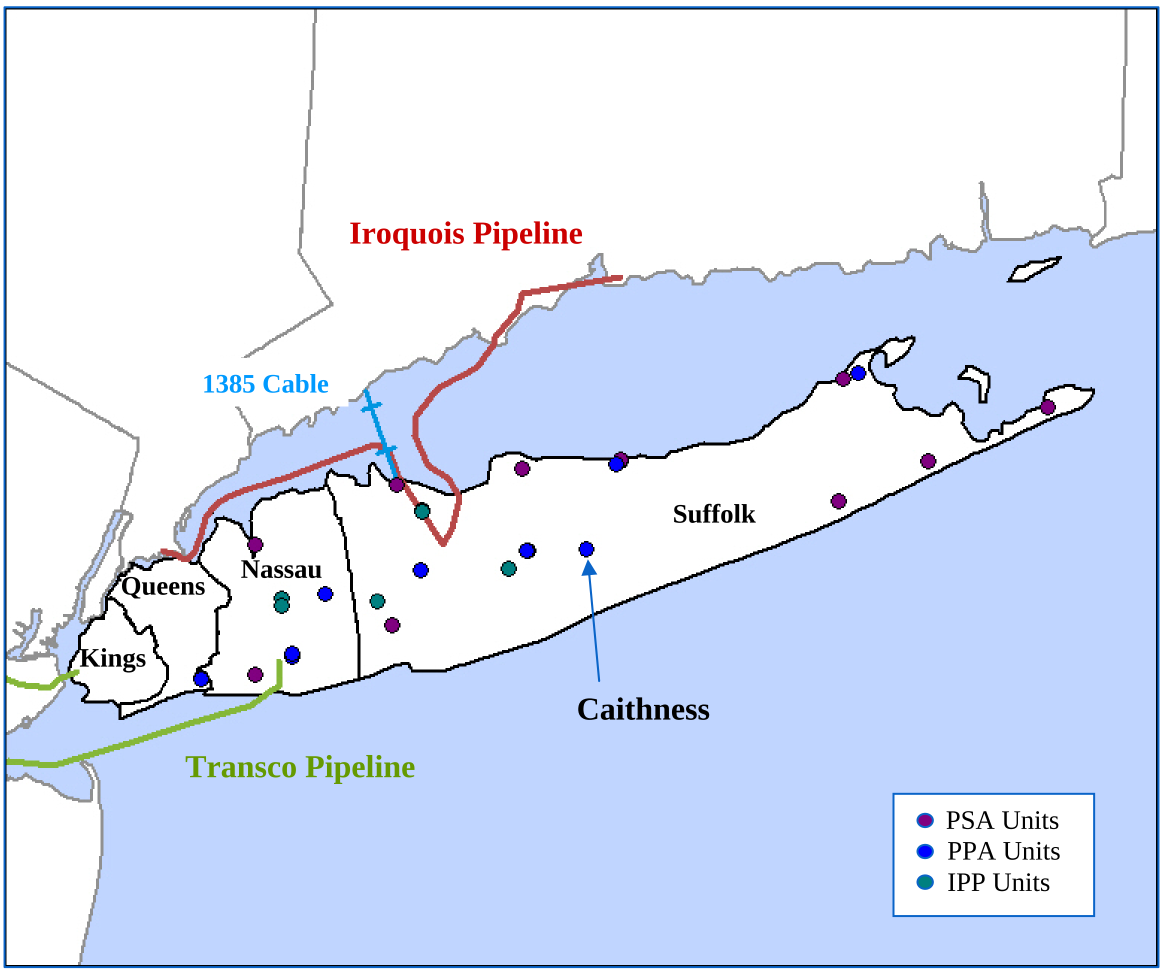
[3] Sources: U.S. Energy Information Agency, Navigant Consulting

the area, oil can be delivered to generating sites by land with trucks or by water on ships and barges. However, oil has certain drawbacks. Oil is generally more expensive than natural gas, even in the New York area. It is more carbon-intensive, and its delivery in the New York City/Long Island region is constrained by environmental concerns. It is subject to geopolitical risks that may curtail availability and increase price, and in the winter is subject to demand competition similar to natural gas, because a significant portion of heating load in New York is met with heating oil.

Coal is not a realistic option as a generation fuel for LIPA. Existing plants are not designed to use coal. In addition, coal presents insurmountable transport, storage, and Greenhouse Gas problems within LIPA's service territory.

Exhibit 5-3 provides an overview of LIPA's generation facilities and the fuel supply infrastructure that is connected or proximate to it. LIPA's power supply sources are listed following the map.[4] A complete description of LIPA's existing facilities can be found in Appendix B, Energy Primer.

Exhibit 5-3 Map of LIPA Generation Facilities on Long Island[5]



[4] Symbols represent plants, which may contain several units
[5] Source: Ventyx Energy Velocity / Navigant Consulting

5.1.1 Composition of LIPA's Power Generation Fleet

Within a larger fleet of electric generating units, a portion of National Grid's generating units supply power to LIPA. The National Grid units include eighteen under the PSA, which provide 4,042 MW of generating capacity. These units include five reheat steam units and thirteen simple cycle combustion turbines. The larger share of these units is dual-fuel capable.

In addition to these units, LIPA also has under contract twelve generation units under two PPAs. These units are a combination of combined cycle and simple cycle combustion turbines. The PPA units also include the 326 MW Caithness Long Island Energy Center generating facility that is scheduled for completion at the end of 2009 or early in 2010.

The table in Exhibit 5-4 shows the above units, and additional generating units that LIPA has under contract, which are generally small, simple-cycle and internal-combustion turbines and listed as Independent Power Plants (IPP). These IPP facilities make up an additional 164 MW of capacity to LIPA. Finally, LIPA owns additional electric resources through its interest in the Nine-Mile Point Unit 2 nuclear generating facility and in a jointly-owned cable transmission facility. These two facilities provide access to 405 MW of load-serving capacity.

Exhibit 5-4 Generating Units Under Contract to LIPA on Long Island

PSA (National Grid) Units	Capacity[6] (MW)	Type Facility	Fuel
E.F. Barrett 1,2	385	ST	Gas, Resid
Far Rockaway 4	111	ST	Gas
Glenwood 4,5	239	ST	Gas, Resid
Northport 1,2,3,4	1,552	ST	Gas, Resid
Port Jefferson 3,4	383	ST	Gas, Resid
E.F. Barrett 1-12	305	SC	Gas, Resid
Wading River 1-3	241	SC	Distillate
East Hampton 1	18	SC	Distillate
Glenwood 1-3	115	SC	Distillate
Holtsville 1-10	524	SC	Distillate
Northport GT-1	13	SC	Distillate
Port Jefferson GT	12	SC	Distillate
Shoreham 1-2	64	SC	Distillate
Southampton 1	7	SC	Distillate
Southhold 1	12	SC	Distillate
West Babylon 4	49	SC	Distillate
East Hampton 2-4	6	IC	Distillate
Montauk 2-4	6	IC	Distillate
Total PSA Capacity	**4042**	**CC**: Combined Cycle **ST**: Steam **IC**: Internal Combustion **SC**: Simple Cycle Combustion Turbine **PS**: Pumped Storage	

[6] Based on summer Dependable Maximum Net Capability (DMNC)

Exhibit 5-4 Generating Units Under Contract to LIPA on Long Island (cont.)

PPA Units	Capacity[7] (MW)	Type Facility	Fuel
Calpine Bethpage	77	CC	Gas
Equus Freeport	47	SC	Gas, Distillate
FPLE Bayswater	54	SC	Gas
FPLE Jamaica Bay	55	SC	Gas, Distillate
Pinelawn	75	CC	Gas, Distillate
PPL Global Shoreham	76	SC	Distillate
PPL Edgewood - Brentwood	79	SC	Distillate
Village of Freeport	10	SC	Gas, Distillate
NYPA Flynn	136	CC	Gas, Distillate
Global Common Greenport	48	SC	Distillate
Caithness	326	CC	Gas, Distillate
Glenwood	80	SC	Gas, Distillate
Total PPA	**1063**	**CC**: Combined Cycle **ST**: Steam **IC**: Internal Combustion **SC**: Simple Cycle Combustion Turbine **PS**: Pumped Storage	

IPP Units	Capacity (MW)	Type Facility	Fuel
Babylon Resource Recovery	14	ST	Refuse
Hempstead Resource Recovery	71	ST	Refuse
Huntington Resource Recovery	24	ST	Refuse
Islip Resource Recovery	9	ST	Refuse
Smithtown Landfill	N/A	IC	Methane
Trigen NDEC	46	CC	Gas, Distillate
Total IPP	**164**	**CC**: Combined Cycle **ST**: Steam **IC**: Internal Combustion **SC**: Simple Cycle Combustion Turbine **PS**: Pumped Storage	

Buyer-Owned Power Supply Resources	Capacity (MW)	Type Facility	Fuel	Cable Resource?
Nine-Mile Point Unit 2	205	ST	Nuclear	No
1385 Cable*	200	Scheduled AC Tie	Transmission	No
Total Buyer-Owned	**405**			

* Jointly owned by LIPA/Northeast Utilities, Inc.

Of the PSA units, the largest are reheat steam units and are dual-fueled. This means they can burn whichever fuel—natural gas or No. 6 oil—is more advantageous, based on price, emissions, availability, and operating requirements. Dual-fuel capability provides critical price stability and electric system reliability advantages. For example, in 2005 when natural gas prices spiked due to Gulf of Mexico gas production facility damage from Hurricanes Katrina and Rita, the ability to switch to oil saved Long

[7] Capacities in these tables are based on summer Dependable Maximum Net Capability (DMNC)

Island customers more than $180 million. Dual-fuel agility also decreases the likelihood that the vital large generators on Long Island will be forced offline by a gas supply failure or a reduction in oil supply.

The other units under the PSA are limited to liquid fuels only, usually No. 2 oil or kerosene, with the exception of the E.F. Barrett units, which can also burn natural gas.

5.1.2 Fuel Switching Capabilities

In composite, 42% of LIPA's contracted generating capacity has the ability to burn either oil or natural gas.[8] LIPA can take advantage of whichever of these fuels is the lowest cost at any particular time, thereby managing its exposure to the risks associated with fuel price volatility day-to-day. The ability to switch between fuels also allows LIPA to meet or exceed environmental constraints.

The Northport, Port Jefferson, and E.F. Barrett facilities can be fired with 100% low-sulfur No. 6 residual oil, 100% natural gas, or a combination of the two at virtually any proportion. Historically, low-sulfur No. 6 oil and natural gas have varied in relative price depending on seasonal demand for the fuels (natural gas tending to be higher during winter) and on regional commodity prices. In some years, No. 6 oil has enjoyed a relative price advantage and in other years natural gas has had the price advantage. Over the years, the ability to consume the most economic fuel has resulted in hundreds of millions of dollars in fuel cost avoidance.

Low-sulfur No. 6 oil is a boiler fuel. It cannot be used in the combustion turbines of highly efficient combined cycle generating plants, which are essentially jet engines. Such engines fire either natural gas or distillate fuel, such as No. 2 oil and kerosene. Distillate prices are generally higher than natural gas or No. 6 oil.

5.2 Near-Term Fuel Management Issues

This section discusses the near-term issues that LIPA faces in managing its fuel requirements for its existing fleet and for facilities currently under construction (e.g., Caithness). Long-term issues are discussed at Section 5.3, Long-Term Fuel Management Issues.

5.2.1 Portfolio Approach

Because of the dual-fuel capabilities of LIPA's generation fleet, its geographic constraints, and the overarching reality of Greenhouse Gas reduction requirements, LIPA's fuel management situation is quite complex. In response, LIPA has taken a portfolio approach, with a three-part fuel management strategy:

1. Investing in long term supply contracts to assure specific fuel supplies and provide price stability
2. Applying appropriate hedging tools to minimize risk
3. Utilizing spot purchases to take advantage of short term price reductions as they become available.

This three-part strategy, applied across the portfolio of fuel resources in LIPA's generation portfolio, is expected to yield higher reliability and lower costs over the long run than would reliance on a smaller subset of actions. From a cost standpoint, the same diversity that protects the fuel portfolio from high costs also means that the portfolio cannot be expected to achieve the lowest costs possible. Portfolios, by definition, find a middle ground between cost/value extremes.

[8] Draft Electric Resource Plan 2009-2018, Appendix B, Energy Primer, pg 2-12

LIPA uses the services of National Grid as Fuel Manager to assist in implementing its strategy.

As LIPA implements its three-part strategy, certain strategic and market realities and risks must be considered. First, reliability is discussed, followed by a discussion of price risk management.

5.2.2 Reliability

Dual-fuel capability provides potential for an excellent reliability hedge because it protects against the risk of supply shortages in any given fuel. In general, natural gas is the preferred fuel to use in the dual-fuel units. Oil used when its price is lower than natural gas (consistent with environmental constraints) or if natural gas deliveries are constrained.

There are ongoing issues with the reliability of each fuel that are largely a function of infrastructure and the capabilities of physical market participants. Each fuel is discussed below.

Fuel Oil

As Fuel Manager, National Grid manages the delivery and storage of fuel oil for LIPA's oil-capable plants in accordance with its Quality Assurance Program. The Quality Assurance Program ensures that the purchased fuel oils meet specifications for safe and efficient operation of the generation equipment and that address applicable environmental requirements. This program is applicable to all fuel oil used by National Grid's generation fleet.

For all deliveries of fuel oil, National Grid as Fuel Manager is responsible for contracting and administering the services of Independent Petroleum Inspectors to perform all activities in support of the Quality Assurance Program. Independent Petroleum Inspectors test the fuel oil to ensure contract/permit specifications are met. Three separate Independent Petroleum Inspectors have been awarded contracts through an RFP process to allow for inspection flexibility and the ability to meet all inspection requirements in an expeditious manner.

The Independent Petroleum Inspectors provide the analyses for the Basic Seven—sulfur, gravity, viscosity, pour point, flash point, bottom sediment / water, and sodium—approximately six hours after completion of sample collection at the delivery location. The Independent Petroleum Inspectors provide loaded barge composite specifications prior to arrival at the delivery point. Each analysis is verified that it complies with parameters of established residual fuel oil specifications.

The National Grid Fuel Procurement Procedure details all guidelines and responsibilities for activities associated with fuel oil deliveries via ship or barge to LIPA's generation facilities and storage locations. Fuel Oil Tanker and Barge Instructions inform the owners, masters, and agents of vessels of all requirements of unloading fuel oil at the power plants facilities. The Fuel Manager nominates product from suppliers in response to price variations, generation requirements, and maintenance schedules, both planned and unplanned. Storage tank levels and fuel oil burn information is provided by personnel at the generating stations on a daily basis. These levels are reviewed and delivery schedules are developed.

For marine deliveries, the Fuel Manager notifies fuel oil suppliers in writing of the delivery requirements and obtains written confirmation of their acceptance of a five-day delivery window. The notification includes sulfur grade and oil specifications, delivery quantity, and delivery range. Marine deliveries to Northport are in cargo lots of approximately 250,000-350,000 barrels for ships, and 100,000 barrels for barges. Deliveries to Port Jefferson, which is subject to ship draft restrictions, are limited to approximately 80,000 barrels while the restriction is in place. Dredging around the unloading dock at Port Jefferson Power Plant is to be completed this year. This effort will facilitate larger marine deliveries, which will allow for more economic product pricing, as the product price reflects costs associated with difficulties and limitations in delivery caused by the restrictions. Deliveries to E.F. Barrett are in lots of 10,000 barrels. Deliveries to E.F. Barrett are also constrained by draft restrictions, and present additional delivery challenges due to the ever changing/shifting of the channel of the East Rockaway Inlet.

When fuel oil suppliers propose to commission a new barge or ship to be used for deliveries of fuel oil, the Fuel Manager reviews and approves its design to ensure compatibility with the docking and receiving facilities.

For truck deliveries, the Fuel Manager checks with the fuel oil suppliers prior to ordering to verify fuel oil product has not been changed or been depleted. During peak electric demand periods caused by air conditioning demand in hot weather, which may require additional oil-fired units to come online, additional efforts are required to manage and prioritize truck deliveries to generating sites.

All delivered fuel oil, residual fuel oil and distillate oils are sampled and analyzed and the test results are reviewed by Independent Petroleum Inspectors before acceptance and delivery to generating sites.

Communication is closely maintained with all plant personnel as well as fuel oil suppliers and transporters. If the delivery size, fuel oil specifications, or any other requirement is not in compliance with the contract terms, National Grid may reject the fuel oil cargo and request the fuel oil supplier to furnish a fuel oil delivery in compliance with contract terms, specifications, and conditions.

As a general rule, steam boiler plants, which are baseload plants, have the storage capacity to operate up to 25 days on oil, while turbines have the capacity to operate up to two days.

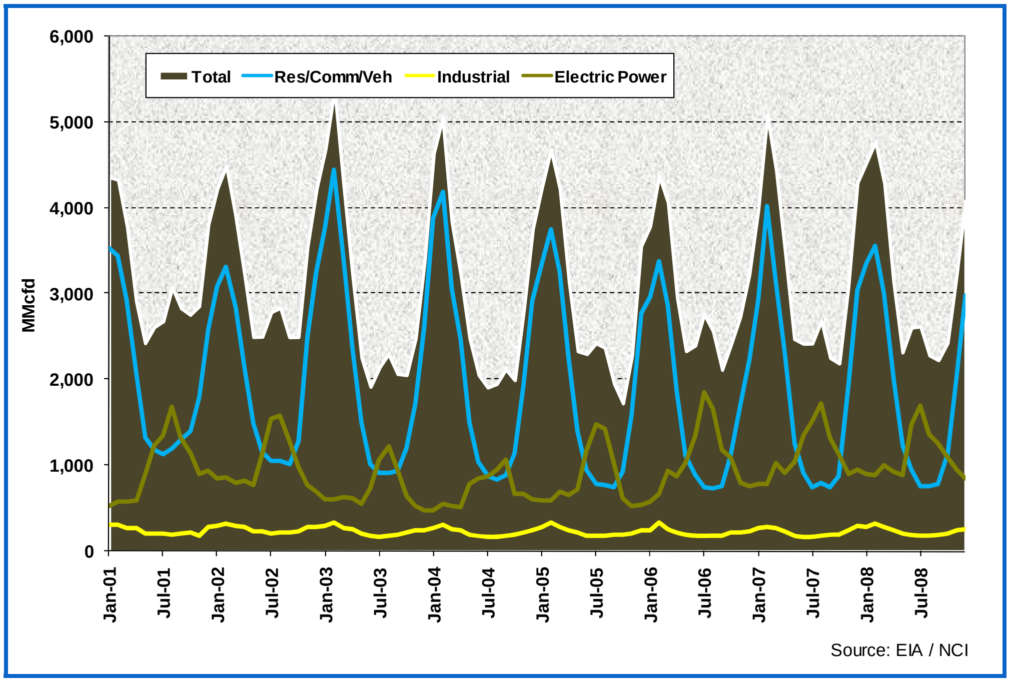
Storage and Inventory Management of Fuel Oil

National Grid monitors and manages the daily residual fuel oil inventory at all of the National Grid generating sites located on Long Island. Deliveries are scheduled to maintain inventories at pre-established levels, and take plant maintenance and outage schedules into consideration. Communication is maintained with plant personnel to ensure efficient delivery operations. As noted above, Independent Petroleum Inspectors are assigned and samples are taken, analyzed, and reviewed prior to the oil delivery acceptance.

Natural Gas: National Grid Infrastructure

Exhibit 5-5 shows that gas demand in New York State is winter-peaking. The National Grid gas system is designed to provide firm service at ambient temperatures down to 0°F. Firm service mostly comprises residential and commercial customers, who have no alternative fuel. Excess gas system capacity that may be available at warmer temperatures is offered as an interruptible service, generally to industrial and power generation customers that have access to alternate fuel, or are able to withstand a certain level of interrupted service.

Exhibit 5-5 New York State Natural Gas Consumption by Sector[9]



Historically, the LIPA power plants on National Grid's gas system have operated under a 30-day interruptible or fully interruptible contract, or under an interruptible tariff which provides for service on a best-efforts basis.[10] The more interruptible the service, the lower the cost. If required to maintain firm service to residential, commercial, and other firm service customers, interruptible customers are interrupted in the following order: customers with no contracts (i.e., under tariff), then fully interruptible customers, and finally 30-day interruptible customers.

Generally, the steam plants serving LIPA from the National Grid gas system take advantage of their dual-fuel capability to obtain low cost service by being fully interruptible. Other plants may have different levels of service, depending on their situation. All of LIPA's gas-fired power plants are on the National Grid Long Island gas system except for the Northport Power Plant, which is supplied directly from the Iroquois Gas Transmission System.

Thirty-day interruptible plants are allowed to stay on the National Grid gas system at temperatures above 20°F, while fully interruptible plants and non-contract (tariff) plants may be interrupted at any temperature at any time, depending on system conditions. During May through September, when daily peak gas usage is lower than it is in winter, the gas system can typically support all customers.

In general, the Long Island gas system can supply the fuel requirements of all its plants at their current levels of service, with the exception of the Port Jefferson plant, whose lateral contains a 12" restriction. The maximum hourly flow that can be supplied to Port Jefferson is 3400 dekatherms/hour, while Port

[9] Source: EIA, Navigant Consulting
[10] A 30-day interruptible contract allows National Grid to curtail the customer's gas use up to 30 days per year. A fully interruptible contract or an interruptible tariff has no limit on the number of days that the customer may be interrupted.

Jefferson at full load would demand 4400 dekatherms/hour. The increment to full load can be met by co-firing with oil.

There are other restrictions that could affect gas for electric production at low temperatures. While the Glenwood and Far Rockaway plants can be fully supplied under warm weather conditions, the 16" main feeding the plants becomes constrained as the temperature drops. Currently, these plants can both be fully gas-fired only if temperatures are above approximately 60°F.

Caithness Long Island Energy Center will be the first power plant on the National Grid Long Island gas system to have a firm contract. A significant amount of reinforcement to the Long Island system will be necessary to supply this plant on a firm basis, and the cost of this reinforcement will be borne by Caithness.

If an increase in the level of gas service is needed for any presently operating plant, the constrained areas at Port Jefferson, Glenwood, and Far Rockaway would require system reinforcements. Also, most power plants would require local system reinforcements if firm service were desired, with the exception of E.F. Barrett. Any newly proposed plants or conversions would require gas system studies to determine if reinforcements are necessary based upon the proposed load, the location of the plant, and the level of service requested.

Natural Gas: Interstate Pipelines

To date, LIPA has not contracted for interstate pipeline transportation capacity services.[11] Consequently, all of LIPA's gas supplies are purchased at the New York Citygate, which comprises the terminuses of four interstate pipelines: Transcontinental Gas Pipe Line (Transco), Texas Eastern Gas Transmission (Tetco), Tennessee Gas Pipeline (TGP), and Iroquois Gas Transmission System (IGTS). These four pipelines deliver into the New York Facilities (NYF) system, which is a pipeline-header jointly owned and operated by the three downstate NY utilities: Con Edison (Con Ed), National Grid New York, and National Grid Long Island. The NYF system gathers gas supplies received from the interstate pipelines and distributes those supplies to the downstate utilities.

Transco, Tetco and TGP, commonly known as the "Three Ts," deliver gas from the Gulf Coast producing regions of Texas and Louisiana. IGTS delivers Canadian gas received at the Canadian/US border at Waddington, New York. The vast majority of LIPA's gas supplies are purchased at the terminuses of Transco and IGTS. Supplies from Tetco and TGP are limited because most of the capacity on these pipelines is dedicated to customers upstream of LIPA.

As a general rule, utilities that hold interstate pipeline capacity do so for one of two reasons: reliability or access to more economic supplies.

Given LIPA's unique geographical situation of being on the National Grid gas system, downstream of the terminuses of all four interstate pipelines, there is little benefit in holding annual interstate pipeline capacity for reliability purposes for most power plants, because the high-demand time of year for power plants is in the summer, when the pipelines have ample capacity and the New York Citygate market is dependably liquid. In the heart of winter, roughly mid-December through mid-February, when the National Grid gas system is at overall peak demand, having dedicated upstream access to supply would increase gas reliability and help LIPA avoid peak prices at New York Citygate. However, analysis to date has found that holding annual interstate capacity would be less economic than the current practice of fuel-

[11] National Grid has interstate capacity to support its firm customers.

switching for those few days in winter. The extent of fuel-switching may be constrained by air-quality limits.

Contracting for capacity on a new expansion pipeline could support additional pipeline infrastructure to Long Island, which may benefit LIPA by creating more liquidity and fewer, less pronounced price spikes. Therefore, this may be advisable sometime in the future. Such an opportunity would need to be analyzed for economics.

Natural Gas: Storage

LIPA currently holds no natural gas storage, as no gas storage capacity exists on Long Island.

Storage can take two general forms: on-system and off-system.

On-system storage can be extremely valuable for a utility. It is a powerful tool for reliability because it can supply large volumes to the burnertip almost instantaneously in a high-demand situation, and does not compete with other supplies for pipeline space. It also can serve a hedging function, by providing the opportunity to inject gas at lower prices for use in times of peak price. Unfortunately, the lack of on-system gas storage on Long Island eliminates the potential to utilize this service as a supply management tool.

Off-system storage has a lesser reliability function. While it does provide for a second source of gas in addition to a market source of supply, its usefulness for LIPA is minimal because gas storage volumes would need to be transported through the constrained upstream pipelines.

The lack of storage, like the lack of interstate pipeline capacity, implies that LIPA must rely on fuel switching to ensure reliability and for peak-day price management.

5.2.3 Fuel Procurement

Under the PSA and PPAs, all fuel for use in LIPA's contracted or owned plants is procured for LIPA by National Grid as LIPA's agent. In the future, this arrangement will change as LIPA takes on fuel procurement responsibilities for the Caithness Energy Center.

In essence, LIPA has two electric generation portfolios, which are coordinated by National Grid. The first comprises the generation units under the PSA, which are primarily large steam units, commonly referred to as the "National Grid units." The second consists of smaller units that include certain Fast Track Units (FTUs) that went into service beginning in the summer of 2002 under the PPAs, which have more restrictive gas balancing rules than the PSA. This subset of units also includes the Brookfield Energy hydro facility and the Florida Power Marcus Hook gas-fired facility (both of which are off-island) as well as the gas-fired Caithness Energy Center that is currently under development.

Fuel Manager's Role

LIPA's Fuel Manager, National Grid, is responsible for administering all of LIPA's fuel trading and scheduling needs. This function requires coverage seven days a week, including holidays. The fuel management role is a very important one for LIPA's customers, having a direct impact upon the reliability of electricity service. The Fuel Manager is responsible for many activities including:

- Working closely with the Power Supply Management (PSM) Service Provider to coordinate all fuel purchases and sales;
- Executing all purchases and sales;

- Scheduling all purchases and sales with LIPA's suppliers;
- Documenting all transactions in a transaction management system;
- Entering gas purchases into National Grid's electronic bulletin board (EBB); and
- Communicating all contracting needs with the Contracts Group.

Natural Gas

Natural gas commodity is currently procured for LIPA in the daily, monthly (bidweek) and intraday markets under NAESB (North American Energy Standards Board) contracts. A NAESB contract is a master agreement that sets out the general terms and conditions for physical gas purchases and sales. Each individual transaction is documented by a confirmation that becomes incorporated into the contract, and can have its own terms and conditions that qualify or replace the NAESB terms and conditions.

LIPA's gas supply transactions are executed by the Fuel Manager using the Intercontinental Exchange (ICE) electronic trading platform, a recorded telephone, or a recorded instant messenger session. The price for gas may be fixed or may be based on a variety of formulas for both daily and monthly purchases.

As in other regional markets, not all gas suppliers are willing and/or able to sell gas supplies delivered to the New York region. There are, however, approximately two dozen active suppliers who currently sell gas to LIPA via NAESB contracts. These suppliers consist of a variety of types, including producers, energy marketing companies, utilities, and banks.

Fuel Oil

Oil for generator fuel is procured under annual long-term contracts in a request-for-proposal (RFP) process. The process is slightly different for No 6 oil than it is for No. 2, because No. 6 tends to be delivered by barge to the boiler facilities, which have 20-25 days of fuel storage, while No. 2 is generally delivered by truck to turbine facilities, which have only one to two days of storage.

Twice yearly, the Fuel Manager provides a twenty-five-year price forecast for all fuel oil products, which includes No. 6 residual fuel oil (at three different sulfur grades: 0.37%, 0.7% and 1%) for E.F. Barrett, Northport, and Port Jefferson Power Station. Prices are also forecasted for truck and barge deliveries of No. 2 oil and kerosene. In addition, a monthly annual price forecast is provided in order to track prices for the LIPA fuel oil budget.

Residual Fuel Oil (No. 6)

LIPA's Fuel Manager is responsible to provide a sufficient supply of No. 6 residual fuel oil to the three boiler plants that use it: E.F. Barrett Power Station, Northport Power Station, and Port Jefferson Power Station. These plants receive residual oil by barge or ship. They can utilize residual fuel oil that is 0.37%, 0.70%, or 1.0% sulfur. The current management approach is to use one-year term contracts with an option for a one-year extension, and to perform an RFP for competitive bids annually.

The Fuel Manager issues the RFP to various qualified No. 6 fuel oil suppliers to cover the majority of LIPA's No. 6 oil burn requirements. Bid prices are reviewed, evaluated, and compared to the existing contract extension prices to determine the most economic supply source.

A percentage of the total residual fuel oil requirement is held open so it can be purchased in the spot market when it is more economic than long-term contract prices. Spot purchases also promote supplier diversity.

Under the long-term contracts, residual fuel oil deliveries are typically priced by averaging the daily New York Harbor spot prices from three major publications for the five day period around delivery: the date of delivery itself, plus the two days before and after. In addition, adders for delivery are embedded in the price.

The five-day pricing period parallels the "delivery window" that is agreed to by the Fuel Manager and the supplier. The five-day delivery window allows the supplier to manage its scheduling of barges and ships, which may require lead times of up to two weeks. A price protection clause is included in all oil contracts to ensure supplier compliance in delivering oil as scheduled. If the supplier delivers fuel oil either too early or too late, LIPA's obligation is only to pay the lower of (1) the price as of the last day of the delivery window or (2) the price as of the actual delivery date. Additionally, the contracts guarantee that the fuel will meet a minimum heating value.

Residual Fuel Oil: Ongoing Challenges

The goal is to maintain contracts with a minimum of two residual oil suppliers to ensure uninterrupted fuel oil delivery. More suppliers would be desirable. However, since natural gas is increasingly becoming the preferred boiler fuel due to environmental and other reasons, the use of oil is becoming less ratable and the volume of usage is declining. Thus, it is increasingly unattractive for suppliers to maintain historic levels of oil delivery service.

Residual oil deliveries also present marine-related challenges. Oil deliveries to the E. F. Barrett Power Station must pass though the East Rockaway Inlet, which is navigationally challenging due to frequent shoaling, weather, tide sensitivity, and a low, 12-foot draft which creates the risk of oil spill liability. This liability, coupled with the intermittency of LIPA's demand due to limited fuel-switching to oil from gas, means that very few suppliers are willing to deliver fuel oil to E.F. Barrett.

Distillate Fuel Oil (No. 2)

National Grid purchases various distillate products to support electric generation, including No. 2 fuel oil, low-sulfur diesel fuel oil, ultra-low-sulfur diesel fuel oil, kerosene, and biodiesel fuel oil. Similar to its management approach to residual fuel oil, LIPA's goal is to maintain one- or two-year term contracts for the supply of distillates, with an option for a one-year extension. The RFP process and minimum supplier requirements are the same as for residual fuel oil.

The pricing protocol for distillates differs slightly from that of residual fuel because distillate is generally delivered by truck on a day-ahead basis and in much smaller volumes than marine-delivered resid. Thus, distillate pricing is based on a three day average (rather than a five-day average) of various New York publications, with applicable price adders unique to each site.

5.2.4 Delivery Practices & Scheduling

Natural Gas Delivery and Scheduling

Day-ahead gas requirements for the National Grid units are determined each day by the Power Supply Management Service Provider and provided to the Fuel Manager in a timely manner to meet daily trading requirements. Day-ahead requirements for the FTUs are calculated using the day-ahead dispatch awards issued by the New York Independent System Operator (NYISO), which coordinates power dispatch and transmission. Day-ahead gas requirements are adjusted on an as-needed basis by the PSM Service Provider and given to the Fuel Manager. It is contemplated that similar fuel supply management functions will be performed for future generation plants committed to LIPA (i.e. Caithness).

The Fuel Manager uses its best efforts to limit any gas balancing requirements by purchasing gas in the daily and monthly markets, and tailoring those purchases to meet the specific gas requirements for each day. In addition, the Fuel Manager works closely with the PSM Service Provider to monitor all electric generating units throughout each day and purchases and sells intraday gas as needed to limit imbalances and minimize any cash-out costs.

National Grid Units - Balancing requirements for the National Grid units are administered by the Fuel Manager under an Energy Management Agreement (EMA) which provides for balancing on a best-efforts basis by National Grid. The Fuel Manager maintains a balancing account which tracks the difference between gas purchased on behalf of LIPA and gas consumed by the National Grid units. Generally, balancing for the boiler units is not problematic because the boiler units provide ongoing baseload electric power.

FTUs - Balancing requirements for the FTUs are handled by the Fuel Manager under an Omnibus Gas Transportation and Balancing Agreement (Omnibus Agreement). This agreement provides for a rolling daily 4% balancing account and daily cash out costs for imbalances outside of the 4% tolerance. In addition, any remaining imbalances at the end of the month are cashed out pursuant to the agreement. Balancing for the FTUs requires more active management due to the intermittent nature of their operation.

Shifting Gas Between National Grid Unit and FTU Portfolios – The Fuel Manager manages LIPA's overall gas supply portfolio as efficiently as possibly by shifting gas between the National Grid and FTU supply portfolios in order to minimize the premium associated with intraday gas supplies and potential cash-out costs for the FTUs under the Omnibus Agreement. The shifting of gas supplies between the National Grid and FTU portfolios is permitted at the Fuel Manager's discretion provided that such shifts do not harm National Grid's firm gas customers economically, operationally, or in any other way.

Interruptible Transportation Tariff Management – All of the electric generators committed to LIPA as of this time receive some level of interruptible transportation service from National Grid. The National Grid units as well as most of the FTUs have fully interruptible service; however, some of the FTUs are interruptible for up to 30 days if and when service territory temperatures drop to a certain level. The Fuel Manager works closely with the PSM Service Provider to anticipate potential transportation interruptions and manages the gas supply portfolio accordingly.

Pipeline Capacity Scheduling – LIPA's gas supply purchases are scheduled by the Fuel Manager in National Grid's EBB in a timely manner to meet the confirmation deadlines. The supplies are monitored carefully throughout the confirmation process and the Fuel Manager takes action to remedy any failure to deliver on the part of LIPA's suppliers.

Fuel Switching Gas to Oil – The Fuel Manager uses its best efforts to optimize LIPA's overall fuel portfolio by selling LIPA's gas supplies in the marketplace and burning fuel oil when economic conditions dictate. These opportunities usually occur on peak days during the winter period.

Fuel Oil Delivery and Scheduling

Fuel oil is scheduled and delivered as needed. Fuel suppliers must deliver the fuel oil within a specified "window" of three days (for distillate) and five days (for resid). As noted above, barge deliveries of resid require significant lead time, while distillate can generally be scheduled on a day-ahead basis.

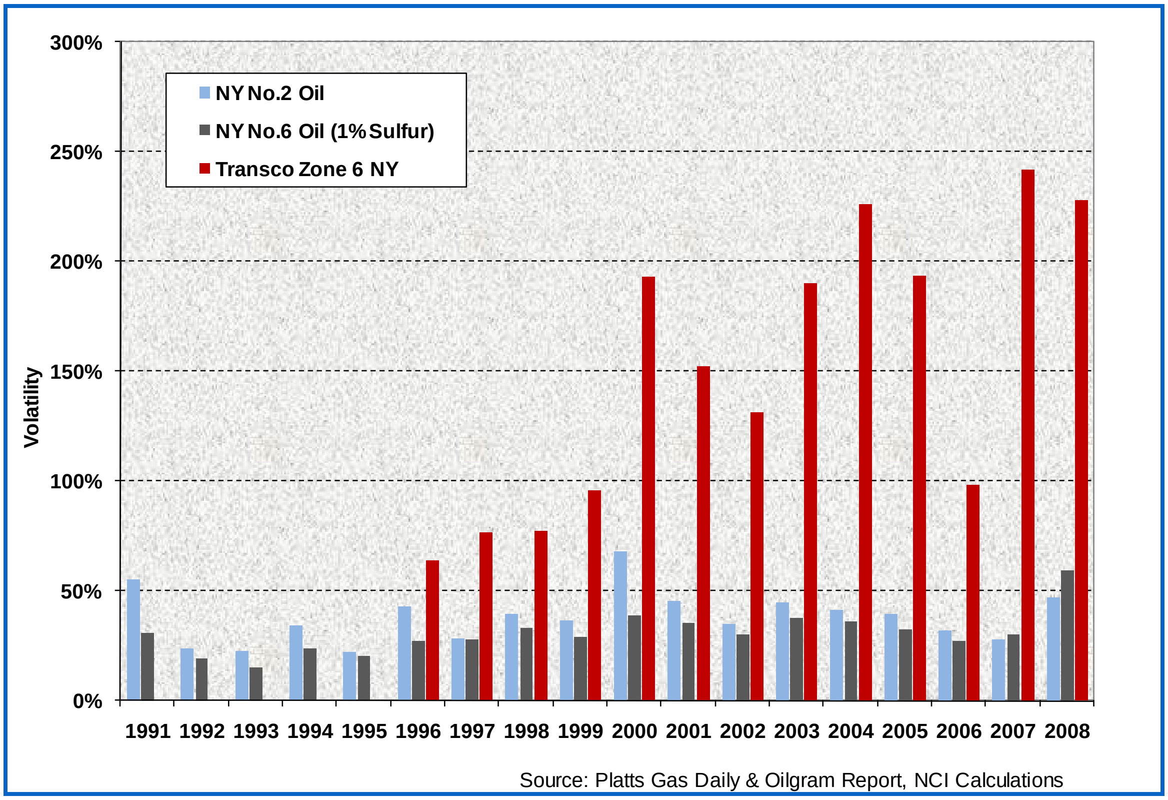
5.2.5 Price Risk Management

The LIPA generating fleet uses multiple fuels. The thermal efficiency of each individual generator varies from unit to unit. Also, power can be imported from the larger regional grid. The resulting risk management profile is dynamic and complex. This section is limited to fuel price considerations, and does not address power supply dispatch pricing.

Each of the fuels used in the generating units under contract with LIPA—natural gas, No. 6 residual oil, No. 2 distillate oil, kerosene, and biodiesel—is traded in an independent market. These markets are very dynamic, and their price movements have had varying degrees of correlation throughout history. Each presents unique pricing, as well as delivery, storage, and environmental issues that may affect cost.

As a baseline, Exhibit 5-6 compares the volatility of No. 2, No. 6, and natural gas. Natural gas prices are clearly more volatile than oil prices, and have become more volatile on average in this decade than in the previous decade.

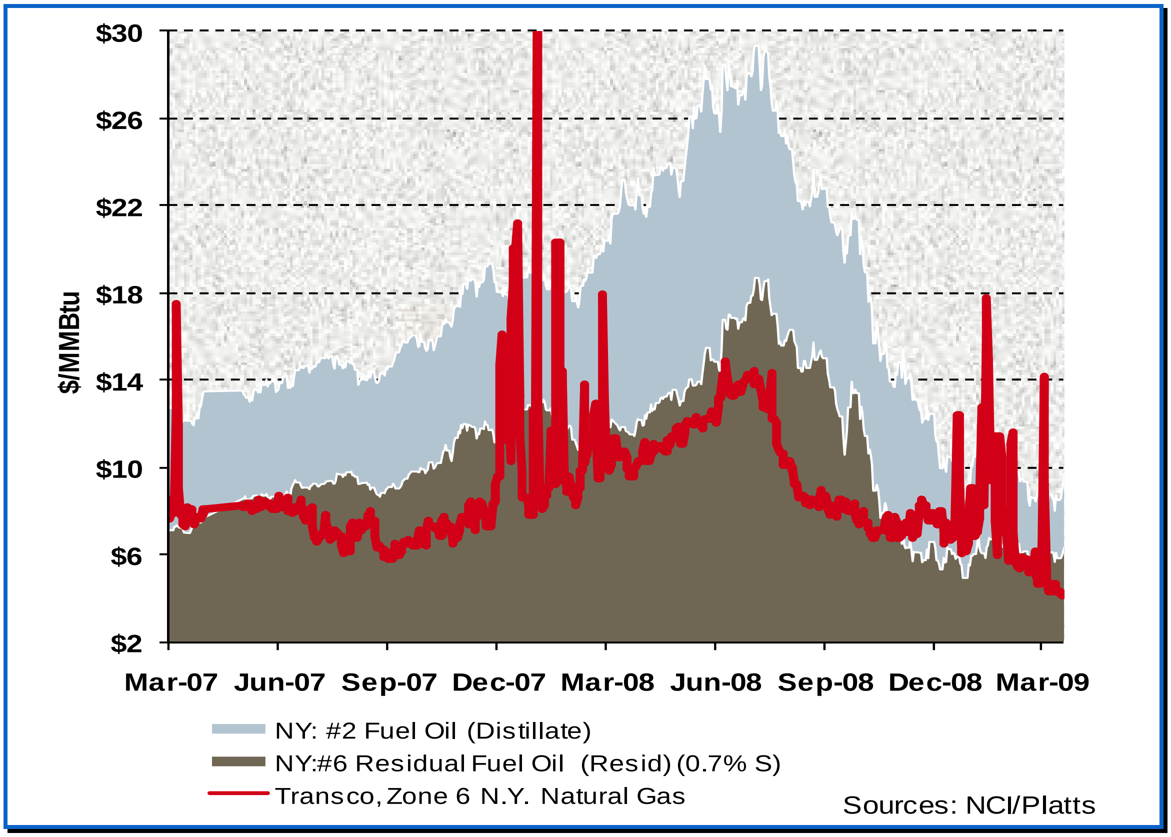
Exhibit 5-6 New York State Oil and Gas Annual Volatility[12]



[12] Source: Platts Gas Daily and Oilgram Report, and Navigant Consulting calculations. Based on daily price movements.

Oil prices are on average higher than natural gas prices, on a thermal basis (per MMBtu), as can be seen in Exhibit 5-7:

Exhibit 5-7 New York Oil and Gas Price Comparison per MMBtu[13]

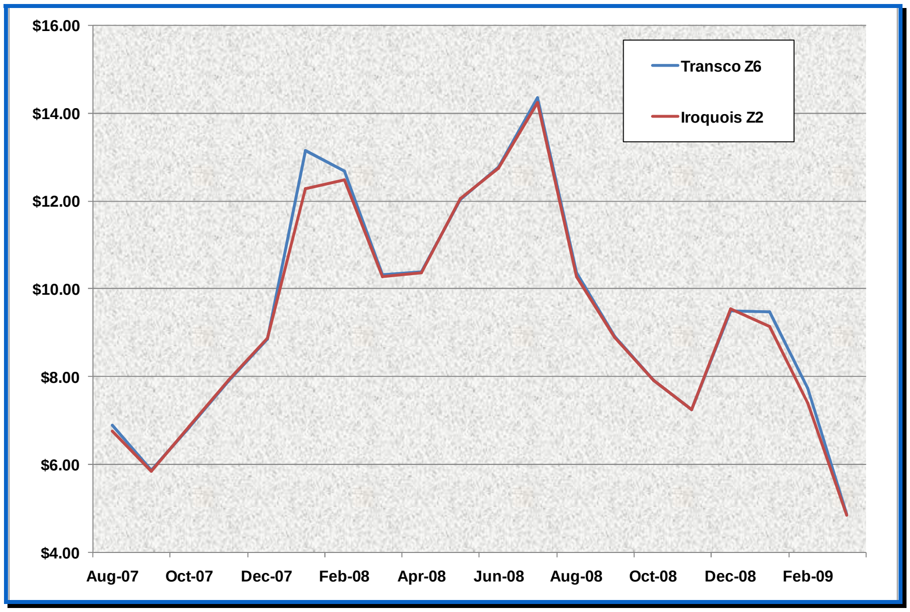


As a general price risk management strategy, LIPA attempts to baseload all of its power plants using natural gas, while reserving oil as a peak-price avoidance tool. Financial hedging is also employed to manage price volatility.

For Caithness, natural gas may be procured at Transco Zone 6 or Iroquois Zone 2. There has been very little price difference between the two points, as can be seen from Exhibit 5-8.

[13] Source: Platts Gas Daily and Oilgram Report / Navigant Consulting calculations.

Exhibit 5-8 Natural Gas Prices at Transco Zone 6 and Iroquois Zone 2[14]



5.3 Long-Term Fuel Management Issues

Satisfying electric demand growth while planning for impending mandatory and substantial reductions in Greenhouse Gas emissions is a major issue for any electric utility, and no less so for LIPA. While the long-term strategy to manage this critical issue is evolving, a general statement may be made. Natural gas is likely to be favored over oil in the future because it emits a lesser quantity of Greenhouse Gases per kilowatt hour. How the imposition of a carbon cost, whether through a cap-and-trade system, a tax, or other mechanism, affects the economics of fuel procurement requires ongoing study.

One implication of the impending Greenhouse Gas rules is that there is likely to be increased pressure for expanded natural gas infrastructure, unless future electric demand can be managed with energy efficiency, demand response, and renewable generation.

Lack of fuel supply infrastructure to support future generating needs could limit the size and type of fossil fuel plants built on Long Island going forward. Fuel supply management also needs to incorporate current and pending regulatory and environmental limitations, as well as keeping an eye towards potential fueling alternatives.

5.3.1 Sources of Natural Gas Supply for the US Northeast

Natural gas represents approximately 28% of the primary energy consumption in New York State.[15] Traditional supplies delivered to the Northeast come from the Gulf of Mexico region and the Western Canadian Sedimentary Basin (WCSB). Canadian supply represents 32% of the natural gas consumed in the Northeast, compared to approximately 15% of the total natural gas consumed in the U.S. as a whole.

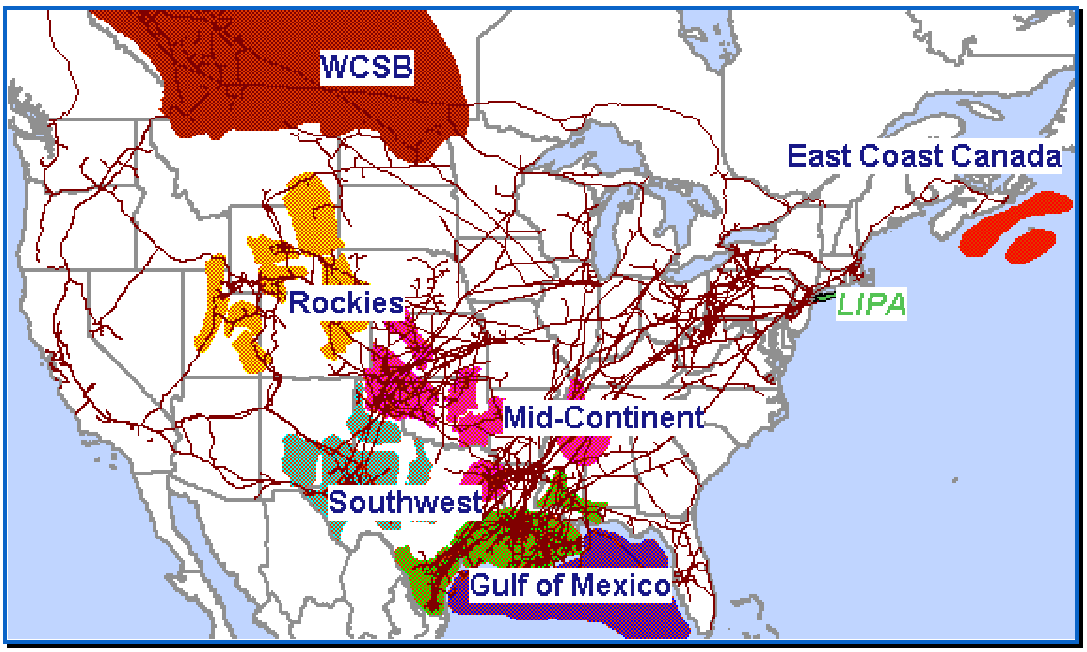
[14] Source: Ventyx Energy Velocity / Navigant Consulting calculations.
[15] Based on calculations of coal, petroleum, natural gas, nuclear, hydro, and biomass usage from EIA's State Energy Data System (SEDS) Table S1. Energy Consumption Estimates by Source and End-Use Sector, 2006

[16] Over the next 20 years, overall declines in the Gulf and the WCSB are expected to be offset by new sources of gas, particularly unconventional sources that have become economic due to new technology and higher natural gas prices. The production from these unconventional sources is potentially huge, but the timing and scope of its development is uncertain because it is in the very early stages. One of the largest unconventional producing areas is the Marcellus Shale, which covers western New York and most of Pennsylvania and West Virginia.

Current Sources of Gas Supply

The traditional sources of natural gas in North America are the WCSB, the Gulf of Mexico, Mid-continent, Rocky Mountains, and the Southwest as shown in Exhibit 5-9. In recent years, some Northeast supplies have come from the waters off the east coast of Canada.

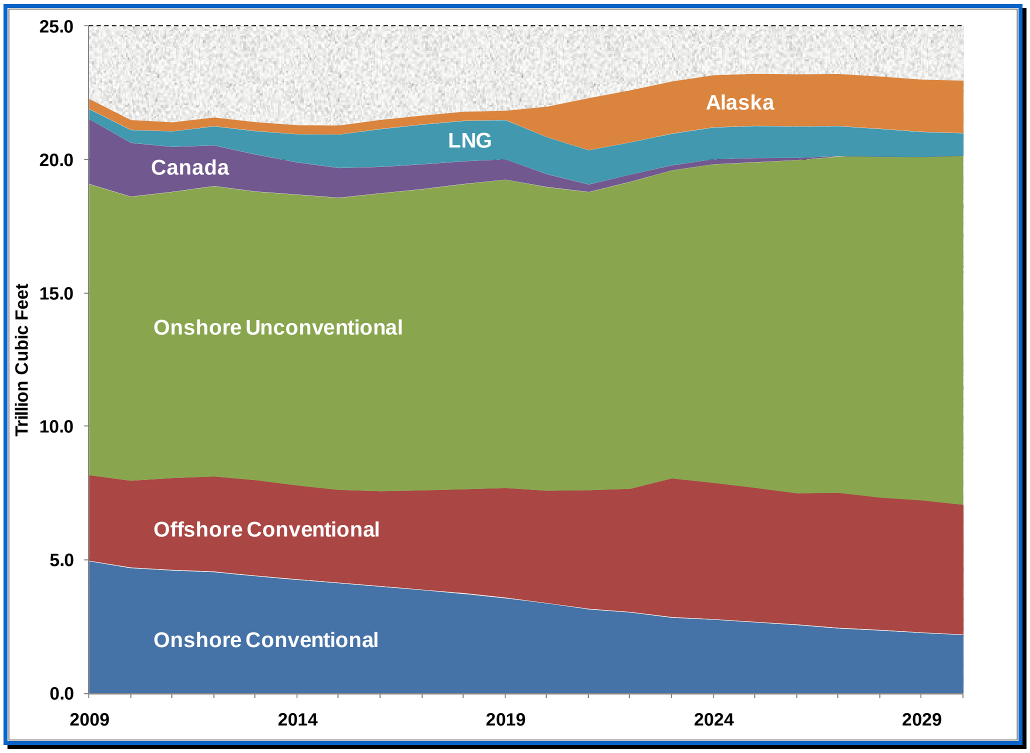
Exhibit 5-9 Historic Major Sources of Gas Supply[17]



The EIA reports that imported natural gas from Canada will decline from 15% of total U.S. demand in 2008 to approximately 1% by 2030, as shown in Exhibit 5-10, below. The EIA also expects declines in supplies from conventional onshore sources and the shallow-water Gulf of Mexico. East Coast Canada and deep-water Gulf of Mexico are predicted to remain relatively stable. The sources that will offset these declines are described in the following sections.

[16] Based on calculations from EIA's Natural Gas Consumption by End Use and U.S. Natural Gas Imports by Point of Entry, 2008
[17] Source: Energy Velocity / Navigant Consulting

Exhibit 5-10 U.S. Natural Gas Supply By Source[18]



Future Sources of Gas Supply

In the past two years, the outlook for natural gas supply has changed dramatically. Total U.S. production in March 2007 was 51.6 billion cubic feet per day (Bcfd); by March 2009, it had grown to 58.3 Bcfd, an increase of almost 13% over that period.[19] Virtually all of this incremental production comes from the unconventional sources of tight sands gas, coalbed methane, and most importantly, shale gas. Recent improvements in horizontal drilling technology have made shale gas much more economic to produce, requiring fewer wells and almost certain success in production. Also, the size and extent of shale formations is tremendous. In its study for the American Clean Skies Foundation last year, Navigant Consulting found that the recent U.S. shale discoveries may have expanded known reserves to 118 years of production at current levels.[20] In addition, significant gas shale formations have been identified and are being developed in Canada. While there are some emerging concerns around the effect of shale gas drilling on water supplies, the outlook at this time is that gas supplies should be ample for many years to come.

[18] Source: EIA Annual Energy Outlook 2009 with Projections to 2030, Table 13, Natural Gas Supply, Disposition, and Prices, and Table 14, Oil and Gas Supply
[19] Source: EIA Short-Term Energy Outlook, Custom Table Builder for Natural Gas
[20] North American Natural Gas Supply Assessment, July 4, 2008, prepared for American Clean Skies Foundation by Navigant Consulting, Inc.

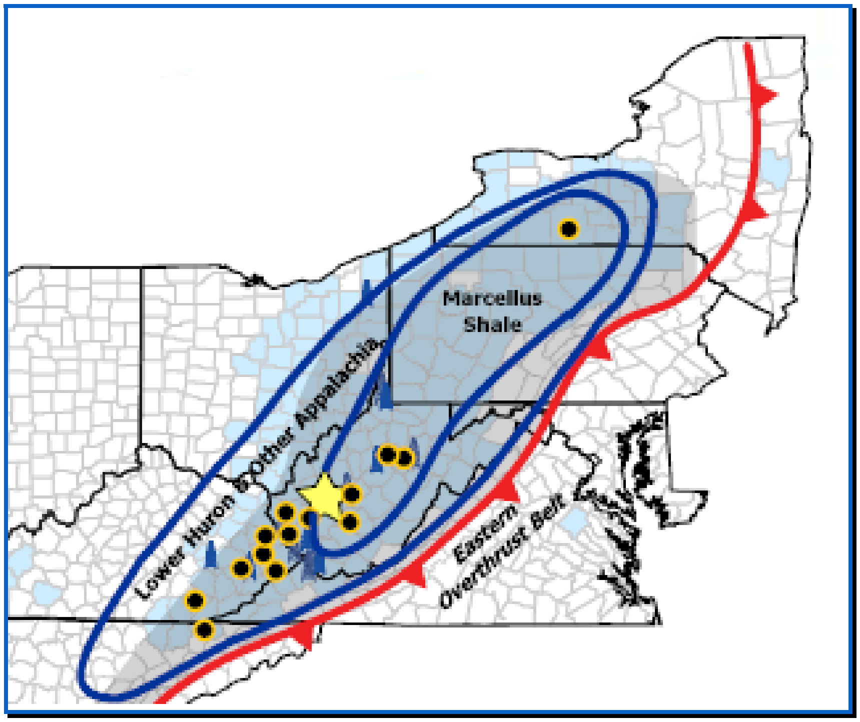
Exhibit 5-11 below shows the geographic extent of shale gas formations.

Exhibit 5-11 Shale Gas Formations in the United States[21]

The Rocky Mountain area, a locus of shale gas and tight sands development, is currently one of the fastest-growing gas resource plays in North America. Other major shale gas plays include the Barnett in Texas, the Fayetteville in Arkansas, the Haynesville in Louisiana, and of most interest to LIPA, the Marcellus in New York, Pennsylvania, West Virginia, and Ohio, shown in Exhibit 5-12.

[21] Source: American Clean Skies Foundation, compiled from various sources.

Exhibit 5-12 Marcellus Shale Location[22]



Production from the Marcellus Shale formation could significantly alter the supply availability and pricing dynamics of the gas market in the Northeast and in New York State in particular. Navigant Consulting's estimate of mean technically recoverable gas is 34.2 trillion cubic feet (Tcf). The estimate of maximum recoverable gas is 262 Tcf, with gas-in-place maximum estimates of 1,500 Tcf from the Marcellus. To put this in perspective, the entire United States in 2008 used 23.2 Tcf.[23] Such large quantities of gas available so close to the New York Metro area could possibly reduce prices substantially if they are developed to their potential.

How quickly and to what extent the Marcellus is developed depends on the economy, the unfolding of Greenhouse Gas policy, local water issues throughout the formation territory, and the development of pipeline infrastructure to transport the gas to market.

Given the current projections of supply and demand there is expected to be adequate amounts of natural gas for the foreseeable future. The challenge is how to get those new supplies to the Northeast, and in particular, to the New York metro area.

5.3.2 Upstream Natural Gas Transportation to the New York Region

Historically, the high-population, highly industrialized New York Metro region has been a growing gas demand area. Satisfying that demand by developing sufficient long-haul pipeline infrastructure continues to be a challenge.

[22] Source: Chesapeake Energy Corp.
[23] EIA, Natural Gas Consumption by End Use

As noted earlier in this document, four long-haul natural gas pipelines deliver to the New York Metro region, including Transco, Texas Eastern, Tennessee, and TransCanada/Iroquois. Transco and Iroquois actually connect to Long Island. These pipelines deliver gas that is sourced in the Gulf of Mexico region and in Western Canada.

There has been significant pipeline expansion in the Northeast over the past few years. Some of this new pipeline capacity serves the New York Metro region, while other capacity has been put in place to serve growing demand in adjacent regions such as New England (for example, the Maritimes and Northeast Pipeline which delivers gas from East Coast Canada). Pipeline capacity near New York that does not supply New York directly has provided the benefit of reduced competition for supply.

The Empire Connector recently came online, bringing more Canadian supply to the New York Metro area via Millennium Pipeline.

Proposed pipeline expansions include Williams Company's Sentinel Project, which will increase capacity on Transco in the New York-New Jersey-Pennsylvania area by 142,000 dekatherms in November 2009. Williams' proposed Northeast Supply Project through Pennsylvania includes an interconnect with Rockies Express Pipeline at Clarington, Ohio, and would terminate at Transco Station 195 southwest of Philadelphia. It would deliver up to 870,000 dekatherms per day of primarily Rocky Mountain gas, plus some volume of Marcellus gas. A companion project, Northeast Connector, will expand Transco from Station 195 to Zone 6 for an unspecified volume. It is uncertain what price effect the introduction of Rockies gas will have on East Coast markets. Some expect East Coast prices to soften, but the price effects will depend on upstream off-takes and downstream capacity to take additional gas.

These expansions are proposed to be on line in 2012. Transco is also proposing a new delivery lateral to National Grid on the Rockaway peninsula. The Rockaway Lateral will consist of three miles of 26-inch pipe and, like Northeast Supply, will be placed into service in late 2012.

5.3.3 LNG and Other Future Gas Sources

Liquefied natural gas (LNG) currently supplies the Northeast from two terminals near Boston (Everett and Northeast Gateway) with a combined sendout capacity of approximately 1.8 Bcfd.[24] This gas serves the New England market, and does not reach the New York market directly. It may be thought of as displacing demand for supplies and pipeline expansions that might compete for onshore supplies otherwise bound for New York.

LNG is imported by cryogenic sea vessels. The leading exporters to the United States are Algeria, Trinidad, Egypt, Norway, and Nigeria.[25] Qatar, a major exporter of LNG, is significantly expanding its liquefaction capacity and may be a larger player in the U.S. market in the near future.

LNG has long been eyed as a solution to the Northeast's energy supply needs. But many LNG projects face significant local and state opposition. Few are going into the construction phase—even projects that have been approved by the Federal Energy Regulatory Commission or the Coast Guard.[26] A case in point is Broadwater Energy, proposed to be built in Long Island Sound. Although Broadwater is approved by FERC, the State of New York has denied it a permit. Similarly, FERC-approved Crown Landing in New

[24] FERC, http://www.ferc.gov/industries/lng.asp.
[25] EIA, U.S. Natural Gas Imports by Country, 2008.
[26] FERC is responsible for approving onshore regas facilities. The Coast Guard is responsible for approving regas facilities sited in federal waters.

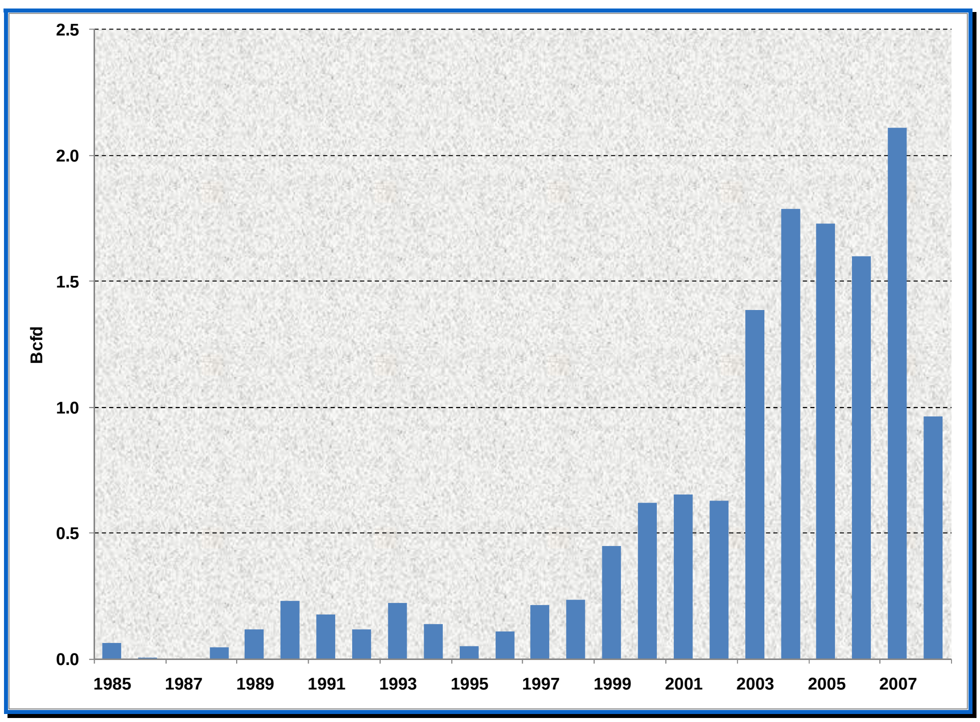
Jersey has been delayed by the state of Delaware, and FERC-approved Weavers Cove in Massachusetts is opposed by both Massachusetts and Rhode Island.

In the Northeast, the following LNG projects are under construction. Neither of them will deliver gas directly to New York.

Facility	Location	Sendout (Bcfd)	In Service Date
Canaport	St. John's, New Brunswick	1.0	2010
Neptune	Gloucester, Massachusetts	0.4	2010

The recent determination that North American shale gas may be far more plentiful and economic to produce than previously thought, and its recent and substantial contribution to ongoing production, make it yet more unlikely that LNG will be a significant contributor to U.S. gas supply for some time. The LNG market is dominated by Asian and European buyers, and tends to be priced using formulas that are based on the price of oil. The U.S. appears to be amply supplied by domestic sources, which should keep natural gas prices generally below oil prices for the foreseeable future, subject to occasional price spikes Exhibit 5-13 shows that LNG imports declined in 2008, driven by a combination of higher U.S. domestic gas production and lower U.S. gas prices relative to overseas markets.

Exhibit 5-13 LNG Import History[27]



[27] Data source: EIA, U.S. Natural Gas Imports by Country, 2008. Graph by Navigant Consulting.

As further evidence of the near-term diminishing role of LNG as a potential fuel, two regasification facilities in North America have applied to become exporters rather than importers of LNG: Kitimat in British Columbia and Cheniere in Louisiana.

5.3.4 Oil Sources

New York's oil products are supplied by regional refineries in New Jersey and Pennsylvania, by Colonial Pipeline from the Gulf Coast, and by foreign imports that principally originate in Canada, the Caribbean, South America, and Europe. The New York Harbor area has a refined product storage capacity of over 40 million barrels, making it the largest and most important petroleum product hub in the high-demand Northeast. New York Harbor acts as a central distribution center for the region, and many of the petroleum products delivered to the Harbor are later redistributed to smaller ports where they supply local demand. In particular, the Hudson River, which meets the Atlantic Ocean in New York Harbor, provides a major inland water route for petroleum product barges supplying eastern New York and parts of western New England.

New York, along with much of the Northeast, is vulnerable to distillate fuel oil shortages and price spikes during winter months due to high demand for home heating. One-third of New York households use fuel oil as their primary energy source for home heating.

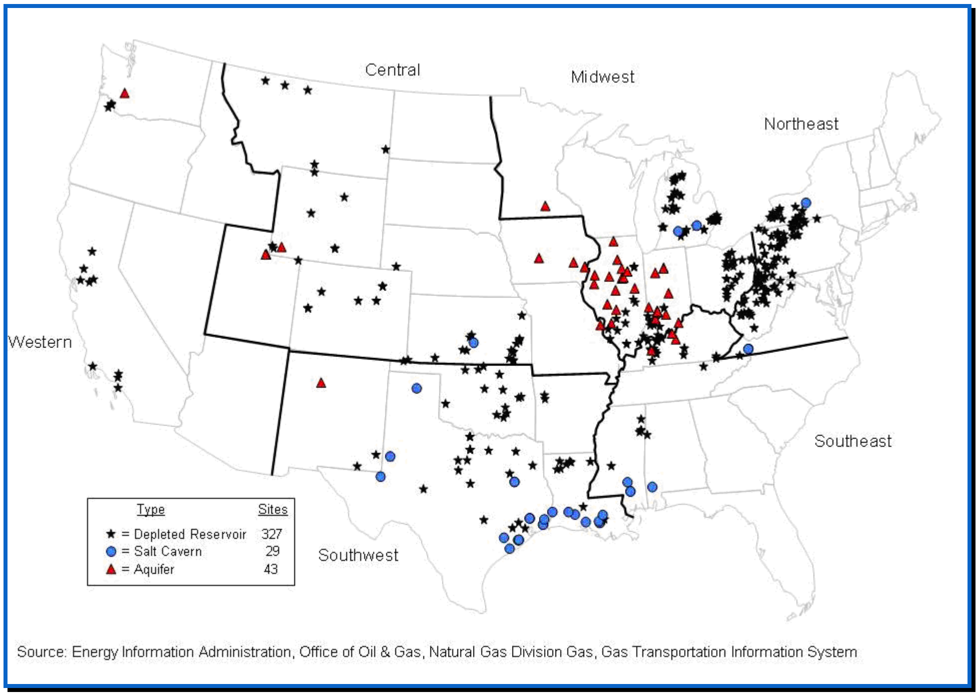
5.3.5 Future Storage and Inventory Management

Natural Gas Storage

As stated in Section 5.2, Near-Term Fuel Management Issues, underground natural gas storage is not available on National Grid's system because the local geology does not support it.

As shown in Exhibit 5-14, underground storage fields in the Northeast are located primarily in and west of the Appalachians. The Northeast underground storage capacity as reported by the EIA is approximately 800 Bcf, with a maximum delivery of 15 Bcf per day. This represents around 30% of total U.S. capacity.

Exhibit 5-14 US Natural Gas Storage Locations[28]



For the most part, storage fields in the Northeast are fully subscribed. New storage is being constructed in the Northeast, but it is remote to National Grid and offers no operational advantages. It may offer pricing advantages if actively managed.

Fuel Oil Storage and Inventory Management

One cause for concern is the ability to maintain barge deliveries to the E.F. Barrett facility. Channel navigability and higher flash specifications remain issues for suppliers and barge transporters. Suppliers are reluctant to make deliveries to this location. Going forward, increasing barge transportation rates will economically impact future marine deliveries. One possible solution is to convert the E.F. Barrett facility to a truck delivery site.

New generating sites coming online in the near future that are primarily gas-fired, such as Caithness, could create pressure on the availability of fuel oil, as well as transportation of fuel oil to the site.

Currently, discrepancies exist between engine manufacturer's fuel oil specifications and the fuel oil commercially available. The current oil supplier does not guarantee that it can deliver fuel oil that will meet engine manufacturer fuel oil specifications. The uncertainty around meeting existing fuel oil specifications is exacerbated as the fuel oil industry introduces other products, such as biofuels; for example, Colonial Grade 55 kerosene may present issues regarding GE engine fuel oil requirements. This may require additional studies to gain support from engine manufacturers to approve new fuel specifications in order not to void machine warranties.

[28] Source: EIA

Recently, each annual bid cycle has had a decreasing number of suppliers interested in supplying residual fuel oil to Northport, Port Jefferson, and E.F. Barrett, due to the irregular and declining volume of residual fuel used, driven by the preference for natural gas. The possibility of a very limited number of interested parties exists, and having only one residual oil supplier would be deemed operationally inadequate.

National Grid is responsible for monitoring the inventory levels and quality of fuel oil suppliers' storage tanks to ensure that an adequate supply of quality fuel oil is available for combustion turbine and FTU sites. The possible decline in availability of dedicated fuel storage tanks, leased or owned, or of the infrastructure to support various fuel types (i.e., barges and trucks) may restrict product availability on Long Island. LIPA has one leased storage agreement with Northville Industries Corp. for the Holtsville/Setauket tank farm, which is ongoing for the present. Moving forward, based on operating experience, there may be an issue of compatibility of biofuels with the existing equipment and storage facilities at generating sites.

5.3.6 Impact of Repowering

Repowering refers to the modernization or replacement of a conventional generating technology resource with a more efficient combined cycle generating resource.

LIPA has taken action to minimize the volatility of fuel costs and its impact on customers by utilizing dual fuel capabilities at specified generation facilities, and investigating the potential for repowering existing plants as compared to other investments. LIPA has completed a detailed investigation of the feasibility of repowering several on-Island boiler units owned by National Grid. The results of these studies contribute to the consideration of resource alternatives as LIPA develops its Electric Resource Plan. LIPA intends to continue investigating the opportunities for fuel diversity at existing facilities through integration of market purchases that provide alternative fuels.

Depending on what, if any, options are chosen for repowering at the boiler sites, some loss in fuel diversity may occur. In a "hybrid" repowering scenario, in which the unit's boiler is eliminated and replaced with combustion turbines, the ability to utilize No. 6 residual oil as a generation price option will be lost on that particular unit, and diminished for the fleet overall. The risk of such diminished fuel diversity includes the possibility of higher energy costs in the event that natural gas prices rise significantly above No. 6 oil and though less likely, the possibility of electric supply curtailment in the event of a major natural gas supply disruption to generating facilities on Long Island.

The risks to fuel diversity will be examined and possible mitigation strategies will be determined. One such strategy could include a preference for "backyard" repowering, in which an entirely new combined cycle unit is built on the site of an existing plant while leaving the old boiler unit in place, rather than replacing the boiler, as in a hybrid repowering. This would allow existing dual-fuel-capable units to be maintained in a ready status for operation with No. 6 oil only as needed during high gas price episodes.

Repowered units can be licensed for dual fuel capability with natural gas and distillate oil. While distillate provides little or no pricing optionality, it does provide for backup firing capability in the event of natural gas supply curtailment or disruption. However, in the recent past, air permits for new and/or repowered combined cycle plants licensed in New York have allowed a maximum of only 30 days per year of firing time on distillate fuel.

5.3.7 Renewable Fuels

LIPA is committed to the advancement of renewable fuel to supply on-Island generation. Diversifying fuel sources is beneficial to customers because it provides the potential for lower cost, reduces risk of over-reliance on any fuel source, and aids in mitigating climate change. As mentioned earlier in this Appendix, as well as in Section 7 of the Draft Electric Resource Plan 2009-2018, LIPA plans to utilize renewable energy resources to diversify its fuel sources, consistent with the goals of the Renewable Energy Task Force. LIPA also plans to utilize the RPS as a means of fuel diversification.

LIPA uses RFPs to contract for renewable energy alternatives. LIPA also supports the goals of the statewide RPS that helps stimulate renewable investments. Another method by which LIPA could support the advancement of renewable fuel is by entering into a long-term purchase contract with renewable project developers. These purchase contracts would help the developers secure the financing often necessary to develop alternative energy projects.

5.3.8 Landfill Gas to Energy Program

LIPA is working with various counties and municipalities in New York State to implement landfill gas-to-electric energy projects. Using internal combustion engines, these projects have the potential to economically recover a total of close to 20 megawatts of electricity from waste gas. They will be owned and operated by the counties, municipalities, or other public entities.

Municipal solid waste landfills are the second largest source of human-related methane emissions in the United States, accounting for nearly 23 percent of these emissions in 2006. At the same time, methane emissions from landfills represent a lost opportunity to capture and use a significant energy resource.

Landfill gas (LFG) is created as solid waste decomposes in a landfill. This gas consists of about 50 percent methane (CH_4), the primary component of natural gas, about 50 percent carbon dioxide (CO_2), and a small amount of non-methane organic compounds. Instead of allowing LFG to escape into the air, it can be captured, converted, and used as an energy source. Using LFG helps to reduce odors and other hazards associated with LFG emissions, and it helps prevent methane from migrating into the atmosphere and contributing to local smog and global climate change. Landfill gas is extracted from landfills using a series of wells and a blower/flare (or vacuum) system. This system directs the collected gas to a central point where it can be processed and treated depending upon the ultimate use for the gas.

LFG can be used to generate electricity on site or it can be injected into the natural gas distribution system. This decision may depend upon the landfill's proximity to the natural gas distribution system The opportunity exists for LIPA to contract for LFG to be used to supply the on-Island generating fleet.

5.3.9 Biofuels

Biofuels are those fuels created from living organisms like photosynthetic plants, or from metabolic by-products like organic or food waste. Biofuels include Biomass and Biodiesel, both described further in the following sections. LIPA committed in the 2004 Draft Energy Plan to assess the viability of biofuels on Long Island. LIPA is currently assessing biofuels as a potential technology for new and existing generating units on its system. LIPA is working to study the economic and environmental impacts of biofuels in the hopes of incorporated biofuels into its fuel portfolio.

Biomass

Technology Behind Biomass

Biomass includes forestry and agricultural residues, wood waste, and eventually dedicated energy crops. The electric power sector can use biomass in two ways, through direct burning of the feedstock (combusted alone or co-fired with coal), or through the use of fuels derived from the biomass (such as gases from gasification or biodiesel). A recent pilot project has demonstrated the potential of biodiesel in boilers for electricity generation.

The Northeast states, particularly Maine, have some "excellent" to "outstanding" biomass resources. Unlike other renewable energy options, biomass-based power is not constrained by location—the biomass can be shipped anywhere. However, the cost and environmental impact of transporting the feedstock must be considered.

Environmental Effects of Biomass

Biomass-based power plants release air pollutants because they combust organic material to generate electricity. However, equipment can be installed on the stack to remove particulates. Furthermore, due to the composition of plant material, no sulfur dioxide is released when this biomass is combusted. Biomass is often considered carbon neutral because as much carbon was taken up by the organic matter that is released during combustion, and sometimes biomass combustion is considered a net carbon sink because the methane that would be released as the organic decomposes would have been greater than that which is released during combustion. Nevertheless, closed loop-biomass, i.e. crops grown in a sustainable manner that ensures a new crop is planted to absorb the carbon released during the previous crop's combustion for energy use, are considered to be more environmentally friendly (and, in some cases, qualify for more financial incentives).

Economics of Biomass

Biomass-based power generation through direct combustion is estimated to cost eight to nine cents per kWh, while generation using gasification is estimated to cost five to six cents per kWh.

Biodiesel

Case Study of Biodiesel

Biodiesel is a legally recognized diesel fuel, adhering to the American Society for Testing & Materials (ASTM) standards and usable as a stand-alone product or as a blend with conventional diesel. It can be produced from several types of feedstock, including vegetable oils (e.g. soybean, palm, mustard, canola and rapeseed), animal fats (fish oils, poultry offal, and tallow), and recycled cooking grease. Soybean oil is the leading feedstock for biodiesel production in the U.S., whereas rapeseed is the preferred feedstock in European biodiesel. While soybean oil costs more than fats and greases, it also requires less processing.

To produce biodiesel, oils and fats are chemically reacted with an alcohol (such as methanol) in a transesterification process. The product of this reaction is a crude biodiesel that is then refined to produce purified biodiesel. According to the National Biodiesel Board (NBB), biodiesel is "a fuel composed of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats, designated B100, and meeting the requirements of ASTM D 6751." A biodiesel blend is "a blend of biodiesel fuel meeting ASTM D 6751 with petroleum-based diesel fuel, designated BXX, where XX represents the volume percentage of biodiesel fuel in the blend." The non-biodiesel portion of the blend could be: No. 1 or No. 2 diesel, heating oil, jet A, kerosene, JP8, or other distillate fuel. Pure biodiesel (B100) has approximately 10 percent less energy content than No. 2 diesel.

Despite a few drawbacks, biodiesel's many positive characteristics make it a very attractive alternative to conventional diesel. Aside from being a replacement fuel, it can also be used as an additive to increase lubricity. Adding one or two percent of biodiesel to ultra low sulfur diesel fuels (ULSD) improves lubricity. Biodiesel is also much more biodegradable, much less toxic, and much safer to handle—due to a higher flashpoint—than conventional diesel. Additionally, biodiesel is a domestic product that promotes U.S. agriculture and lessens our dependence on imported fuel. And, perhaps most importantly, emissions are significantly lower for biodiesel-based energy generation. As Exhibit 5-15 indicates, when biodiesel replaces conventional diesel, all emissions, except for NO_X, decrease (NO_x is discussed in more detail below).

Exhibit 5-15 Change in Emissions with Biodiesel Use[29]

Effluent	Emissions Reduction
Carbon dioxide	-78%
Carbon monoxide	-43%
Nitrogen oxides	+13%
Sulfur dioxide	-100%
Particulate matter (PM10)	-32%
Volatile organic compounds	-63%

Biodiesel supply is miniscule in comparison to diesel consumption. The Department of Energy estimates U.S. diesel demand for on-road applications is 40 billion gallons per year; thus biodiesel met one percent of diesel demand in 2006. According to Hill, J. *et al.*, approximately six percent the total 2005 U.S. diesel demand could have been met if all of the 2005 soybean harvest (3.0 billion bushels or potentially 4.2 billion gallons of biodiesel) had been converted to biodiesel. Another LECG report, this time prepared for the New York State Energy Research and Development Authority, found that if all soybean crops and yellow fat in New York were converted to biodiesel, the state could produce 40 million gallons by 2012.[30] Converting an entire soybean harvest to biodiesel would clearly interfere with food supplies, but these statistics are useful for illustrating the potential supply that biodiesel producers could achieve from the most common feedstock, soybean, and using currently available processing technology.

Power Generation and Biodiesel

LIPA and National Grid implemented testing of biofuels at the East Hampton and Montauk peaking facilities. The three 2 MW diesel engines at each location were fired with a biofuel blend to determine operating and emissions performance. The engines currently use very high quality distillate fuel oil, diesel. The biofuel blend burns at higher temperature than the diesel fuel, though it has a lower heating value. The test results indicate that up to 5% commercially available biofuel can be safely fired in the

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[29] Source: Johnston, M., Evaluating the Potential for Large-Scale Biodiesel Deployments in a Global Context (2006) (available at: http://www.sage.wisc.edu/energy/MSjohnston.pdf).
[30] LECG, *Statewide Feasibility Study for a Potential New York State Biodiesel Industry* (2005).

units with some adjustments to engine settings. Up to 20% biofuel blend may be a future option with upgraded engine components. The current pricing of biofuel is significantly higher than comparative fuels. The environmental and economic aspects of the tests will be evaluated further to determine whether use of biofuels can be demonstrated on a larger scale for existing oil fired units and whether renewable energy economic incentives and or carbon dioxide emission price considerations can make the fuel more competitive.

In an effort to investigate the feasibility of using biofuels for power generation, NYPA undertook a test run using biodiesel at its Charles Poletti Power Project. The 885 MW load-following plant is located in Astoria, Queens and began generating power in 1977. Poletti was originally built as an oil-fueled plant, but was modified in 1980 to also burn natural gas, which is now its primary fuel source.[31]

The focus of the biodiesel test was to determine the technical and economic feasibility of using biofuel blend in a utility-size boiler. The project team, including NYPA, the Electric Power Research Institute (EPRI), Schildwachter Fuel Oil, and Megrant Corporation, monitored several emission and boiler operation parameters during the two-day test run, including:

- Flow rate (No. 6 Fuel oil and biodiesel);
- Furnace exit gas temperature;
- Flame observations;
- Windbox O_2;
- Boiler exit O_2;
- Emissions (CO_2, NO_x, opacity, SO_2 and PM_{10}); and
- Boiler performance data.

Exhibit 5-16 shows the biodiesel flow rates at various blend levels, from 0 percent to 20 percent biodiesel, at partial and full generating capacity levels. For this test run, a total of 100,000 gallons of soybean-based biodiesel was blended on-site with 900,000 gallons of No 6 fuel oil.[32] To put this quantity of biodiesel use in perspective, in 2004, the plant consumed 49.3 million gallons of fuel oil.

Exhibit 5-16 Poletti Biodiesel Test Run Blends and Flow Rates[33]

Fuel	400 MW	750 MW
Baseline Test	0 gal/hr	0 gal/hr
5% Biodiesel	1,330 gal/hr	2,500 gal/hr
10% Biodiesel	2,660 gal/hr	5,000 gal/hr
15% Biodiesel	4,060 gal/hr	7,600 gal/hr
20% Biodiesel	5,450 gal/hr	10,220 gal/hr

[31] A new 500 MW gas-fired combined cycle plant was built next to the Poletti plant and will allow NYPA to shut down some older and less clean plants, including Poletti—slated for retirement prior to 2010. This biodiesel test run was at the old plant.
[32] The large quantities of blended product required for this test were beyond what was available for purchase, so NYPA staff blended the fuels on-site.
[33] Source: Courtesy of NYPA

Poletti Biodiesel Project Results

Over the two-day test run (October 24-25, 2006), the unit generated 1,100 MWh of biodiesel-based electricity with no operational problems. The emissions results were very positive, with SO_2 and CO_2 emissions lower than would be expected with conventional oil, and there was no change in NO_X emissions. The lower SO_2 emissions can be attributed to the naturally lower sulfur levels in the biodiesel feedstock compared to diesel. The reduction in CO_2 is attributable to the renewable nature of the biodiesel. In general, NO_x emission rates tend to increase when biodiesel is used in many engines as the nitrogen in the air reacts with oxygen at high temperatures in the engine (biodiesel itself does not contain nitrogen). Conversely, NO_X tends to decrease when biodiesel is used in boilers and home heating units due to the different way in which they burn fuel. Again, NO_x emissions showed no significant change when tested at the Charles Poletti boiler.

Economics of Biodiesel

Policy support for biodiesel is important since it costs significantly more than conventional diesel. New York has a few initiatives to increase the use of renewables in the state, including biofuels. New York has a Renewable Portfolio Standard (RPS) requiring 25 percent of the state's electricity to come from renewables by 2013. In addition, Governor Pataki signed two executive orders intended to promote renewable and alternative fuels, which Governor Spitzer extended. Executive Order 111 directs the "state agencies to be more energy efficient and more environmentally aware." This order also requires state agencies to acquire alternative-fuel vehicles (AFVs). Executive Order 142 expressly promotes biodiesel by requiring 10 percent of state vehicle diesel and five percent of state building heating oil be replaced with biodiesel by 2012.

NYPA expects price reductions from improvements in delivery costs and added revenue from the NY RPS ($0.25/gallon), and continues work to identify further potential reductions from the biodiesel production process. NYPA is now collaborating with Brookhaven National Laboratory for more Poletti tests, and plans to work with the biodiesel industry to improve the economics of biodiesel. Some of the areas NYPA has targeted for potential cost reductions are different feedstock (soybean is the most popular feedstock now, but less expensive options are available), alternative transportation options (the test run product was delivered by rail and truck, but a full-scale operation would require the product be barged in), and perhaps the development of a "boiler" quality product in addition to the "engine" quality biodiesel currently available.

This year EPRI, with its member companies, will begin to study biodiesel use in gas turbines. This work will investigate the technical challenges related to biodiesel combustion in gas turbines as well as the emission rates. Since liquid fuel for gas turbines is substantially more expensive than heavy oil (gas turbine fuel is jet fuel), biodiesel may represent a favorable economic alternative for liquid fuel firing. The higher efficiencies of gas turbine combined cycle plants will generate more MWh from the same quantities of biodiesel, which would generate more renewable energy credits.

The environmental benefits of biodiesel make it an attractive substitute for diesel and fuel oil. Not only are the emissions rates for most pollutants lower when biodiesel is used, but the renewable nature of biodiesel often makes it eligible for renewable energy credits under an RPS program, and thus an additional revenue stream for power generators.

While the target application has been, and still is, transportation, the test run performed by NYPA proves that biodiesel could also meet some of our electric power generation needs.

Even though biodiesel is more expensive than conventional diesel, this may change as the biodiesel industry makes progress on cost reductions and diesel prices continue to rise (though biodiesel price could rise too if demand for biodiesel feedstock outpaces supply).

It is unlikely that biodiesel could replace more than a few percent of total diesel demand in the upcoming years, but it nevertheless offers an alternative energy option that can be added to portfolio of clean energy technologies.

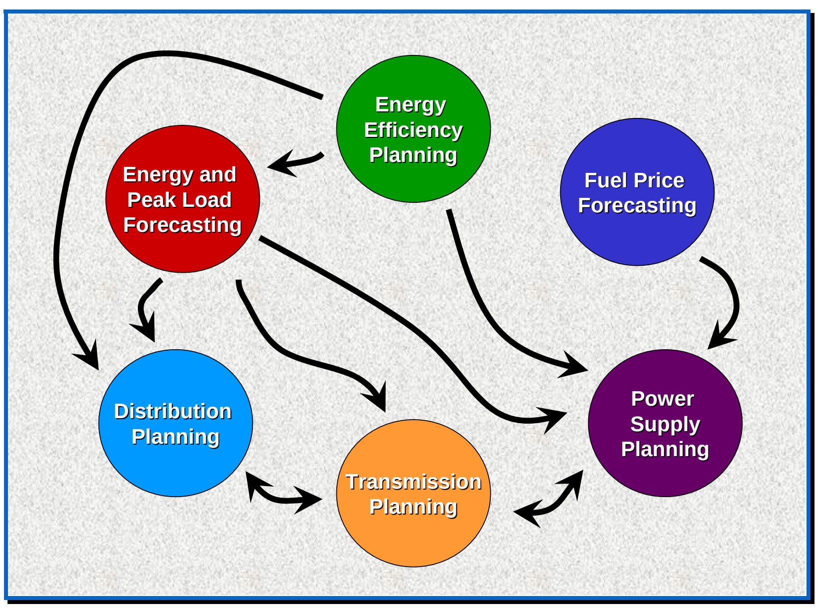
6 Resource Planning Analysis and Assumptions

The following sections of this appendix outline the key observations and conclusions that are driven by LIPA's resource planning process. The results presented herein are based up LIPA's analysis performed during the May 2008 to January 2009 time frame. As such, the conclusions drawn are based on a snapshot of the energy environment as it existed and was forecasted to evolve at that point in time. LIPA's planning data are updated on an ongoing basis. Given the dynamic nature of the energy marketplace, the demands of customers, and system operating conditions, LIPA will continue to monitor all planning inputs and update results as needed to ensure the plan continues to address the electricity needs of Long Island customers in a reliable, safe, environmentally responsible, and cost effective manner.

Exhibit 6-1 depicts the interaction among the major sub-processes, and the data and information flow that occurs during the development of LIPA's comprehensive Electric Resource Plan. The resource planning process is driven by a number of elements or sub-processes, including; environmental planning, energy and peak load forecasting, fuel price forecasting, energy efficiency planning, transmission planning, distribution planning and power supply planning.

Prior sections of this report have addressed the results of environmental planning, energy efficiency planning, transmission and distribution planning, and fuel management planning. The following sections focus on integrating these elements together with the power supply plan to create the recommended Electric Resource Plan.

Exhibit 6-1 Interaction of Planning Processes



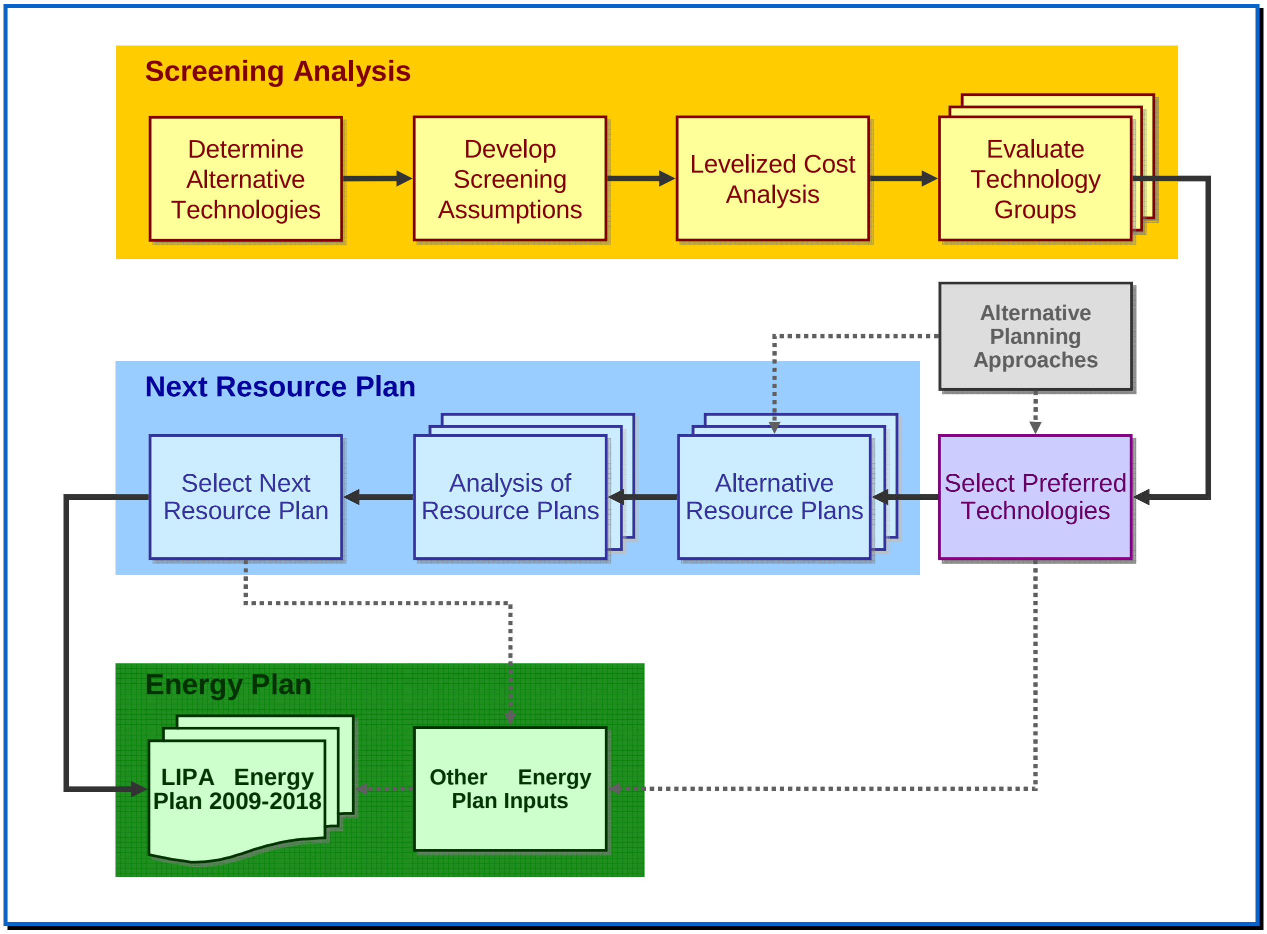
The major elements of LIPA's power supply planning process include:

- A needs analysis that analyzes the need for new resources based on a probabilistic analysis of demand and supply risks
- A screening analysis of various resource options on a stand-alone basis that addresses costs and benefits
- A comparison of alternative power supply plans based on an integrated analysis of selected resource options with the existing system
- A probabilistic assessment of several potential alternative power supply plans
- A representative plan that illustrates one way of pursuing the recommended actions contained in the Electric Resource Plan

The Electric Resource Plan is designed to guide LIPA's decisions over the period 2009 to 2018. However, the need for resources after 2018 can determine actions that LIPA must take prior to 2018. Furthermore, decisions taken prior to 2018 can affect LIPA's power supply future in subsequent years. As a result the resource planning analysis covers the period 2009 to 2028 so that well informed decisions can be made and acted upon in the 2009 to 2018 period.

Exhibit 6-2 depicts the power supply planning process at a high level. Underlying the entire process is a forecast of customer's future energy requirements that is used while evaluating individual technologies and portfolios of technologies. These potential alternative energy futures are compared and contrasted to understand the risks and benefits of each and the implications for customer costs.

Exhibit 6-2 Power Supply Planning Process



The first major element in the power supply planning process is identifying the potential need for new resources during the planning period. In order to frame the potential need, a long term forecast of customer electricity requirements is developed for both energy and peak demand which is then compared with the resources available to LIPA. Several different planning criteria including NYSRC, NYISO reserve and LIPA self directed operational requirements are used to assess the need. This analysis is provided in Section 7 of the report.

Once the forecasted reserve and operational need are established LIPA then identifies how the resource needs could be met through individual technologies and portfolios of technologies. Assembling these potential alternative energy futures requires a significant amount of technical analysis. LIPA utilizes a screening tool to narrow down the technology choices into viable economic groupings and then proceeds to identify alternative portfolios that could address the identified need. Section 8 summarizes the alternative resources considered which are depicted in six groups: supply, efficiency, renewable, repowering, retirement and transmission options. A levelized cost of each alternative is calculated under a variety of operating conditions. These alternatives were evaluated and are presented in Section 8 of this report.

The resources which best fit LIPA's strategic objectives within each group are selected to develop the alternative, or comparison, plans. The alternative plans are developed to evaluate alternative approaches to meeting the projected resource needs. In order to compare the various alternative plans, LIPA develops a reference case against which all others are benchmarked. This Reference Plan does not represent LIPA's preferred plan but is simply a means to measure the relative attractiveness of the alternative plans. Alternative plans are developed to test various strategies such as:

- Relying upon specific types of resources such as energy efficiency, repowering, or renewables;
- Achieving certain objectives such as reducing CO_2 emissions, minimizing rate impacts or reducing the impacts of fuel price volatility; or
- Combining strategies based on the information gained from evaluating other strategies.

A summary of the alternative plans developed is included in Section 9 of this report.

The balance of Section 6 is organized around discussion of key planning assumptions, resource adequacy, uncertainty analysis, and the derivation of the recommended resource plan to meet the required resources.

6.1 Assumptions

As mentioned earlier, the analysis for the electric resource plan was prepared over a nine month period. During this time energy markets were in turmoil. However, a specific forecast needed to be selected in order to perform the analysis. Due to the extensive nature of the analysis, the analysis could not be redone each time there was a change in outlook. The Final Plan will contain an update that incorporates updated forecasts. The following summarizes the vintage of the assumptions used in each of the sections of the report.

- Section 7 – Resource Needs Analysis – This analysis determines how much and when new resources are needed. This analysis was performed using load forecasts prepared in November and December of 2008. As such it reflects the impacts of the current economic downturn. Fuel price forecasts do not enter into this analysis.
- Section 8 – Alternative Technology Assessment – This analysis compares alternative technologies so that the best technologies can be selected for further analysis in the context of alternative plans. The alternative technology analysis was performed using a fuel price forecast that was developed using market information available in December of 2007 and January of 2008. Since then fuel prices have been very volatile reaching record highs in mid 2008 before falling to lower levels by the end of 2008 and early 2009. Load forecasts were not used in this analysis.
- Section 9 – Development of the Electric Resource Plan – This analysis is used to determine the types of resources and sequence of resources to use in the LIPA plan. This analysis was performed over the June 2008 to January 2009 time period using a single consistent set of fuel price and load forecasts. The fuel price forecast was developed in the December 2007 to January 2008 timeframe. The load forecast was developed in the November 2007, time frame.

6.1.1 Fuel Forecast

The first three years of the fuel forecast are based on the a 10 day average for the ten days ending December 27, 2007 of NYMEX natural gas, fuel oil forward curve prices and New York Harbor 1% residual oil swap prices. The first year of the forecast prices is heavily influenced by the run–up in crude oil prices caused by high world demand brought on by the growing economies in Asia.

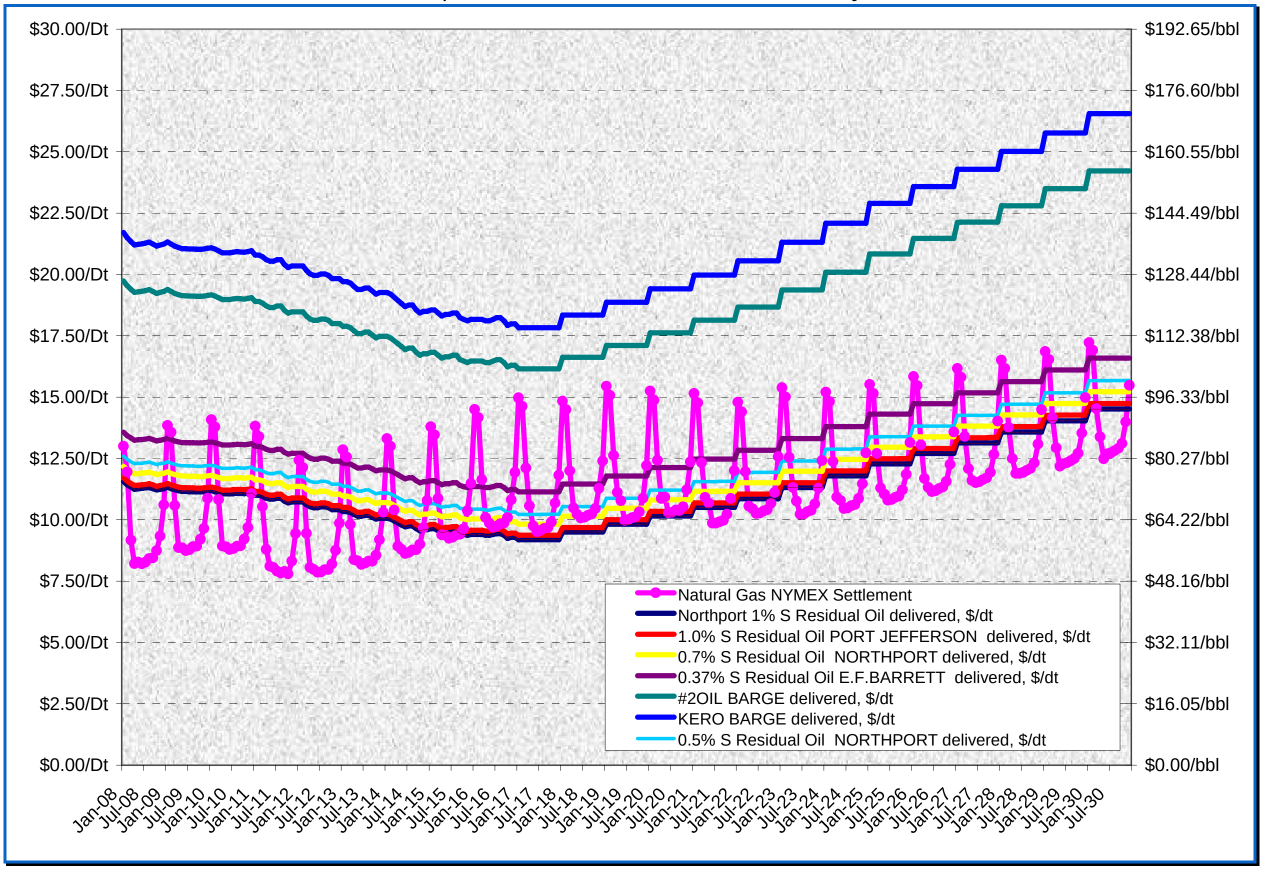
In the near term natural gas prices remain weak in comparison to residual oil. This is result of growing natural gas supply which has been a result of recent finds in shale gas such as the Barnett Shale in Texas. Where a few years earlier natural gas supply was expected to remain level, these new shale gas finds along with Rockies express pipeline moving western gas eastward are expected to produce a short term oversupply. The economy is forecasted to remain weak in the near term causing erosion in industrial demand for natural gas which also causes weak prices.

The mid-term of the forecast is highlighted by economic recovery. When combined with the increased focus on the environment and a slow down in world oil demand natural gas prices rise and remain higher than forecasted residual oil prices. Electric generation demand for natural gas is expected to increase into the future. As demand increases imported LNG becomes a bigger part of the supply pictures helping to offset increasing demand.

In the long term an increase in demand is predicted to force the opening of restricted federal land to gas exploration in the distant future along with the increased probability of finding new gas fields and increased accessibility due to technological innovation. Residual oil prices are projected to remain stable in relation to natural gas prices, reflecting a decrease in demand brought on by the long-term push to cleaner fuels. The long term outlook returns to a more traditional relationship between natural gas and residual oil where natural gas is at a premium in the winter and discounted in the summer.

Exhibit 6-3 NY Citygate Fuel Price Forecast

Natural Gas prices delivered to the NY Citygate and Residual Oil prices delivered to the plant using the NYMEX settlement values and Residual Oil Swap prices for December 27, 2007, the 2007 NG forecast and long term residual oil forecast Residual Oil Prices Revised by LIPA.

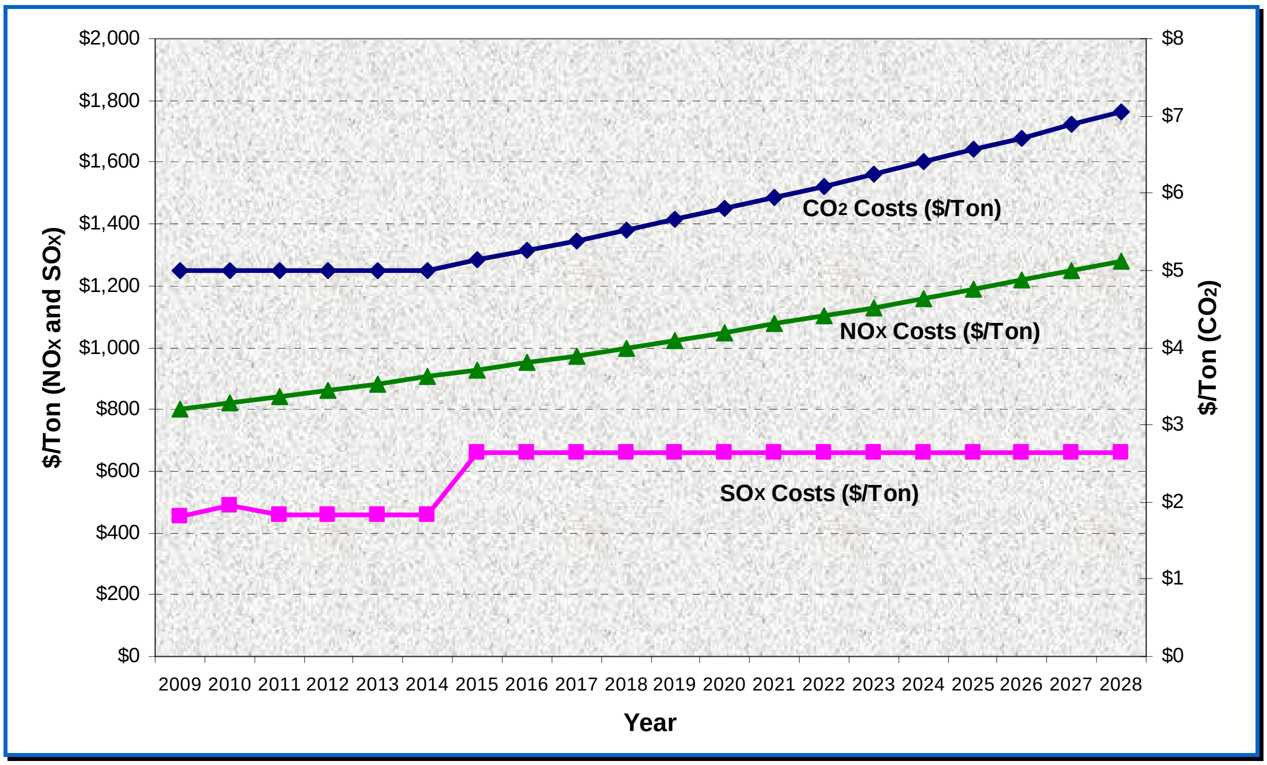


Note: A decatherm is a unit of measurement of heat equivalent to 1 million Btu.

6.1.2 Emissions Cost

As part of the resource planning evaluation of alternative plans, LIPA specifically incorporates the projected costs associated with environmental emissions of sulfur dioxide (SO2), nitrogen oxides (NOX) and carbon dioxide (CO2). Projections of emissions credits costs are highly unpredictable because they are dependent upon the future changes in environmental regulations, the development of new technologies, and the overall performance of the economy. Exhibit 6-4 depicts the 2009 to 2028 annual emission cost projections, in $/ton emitted, used by LIPA for the evaluation of the Draft Electric Resource Plan. The SO2 projection assumes that regulations require 2 allowances for each ton emitted starting in 2010. The CO2 allowance costs are based on the assumption that the RGGI program continues to be implemented as currently structured and that there are no federal CO2 allowance programs implemented. CO2 emissions costs could be much higher if federal regulations are implemented.

Exhibit 6-4 Emission Cost Forecast

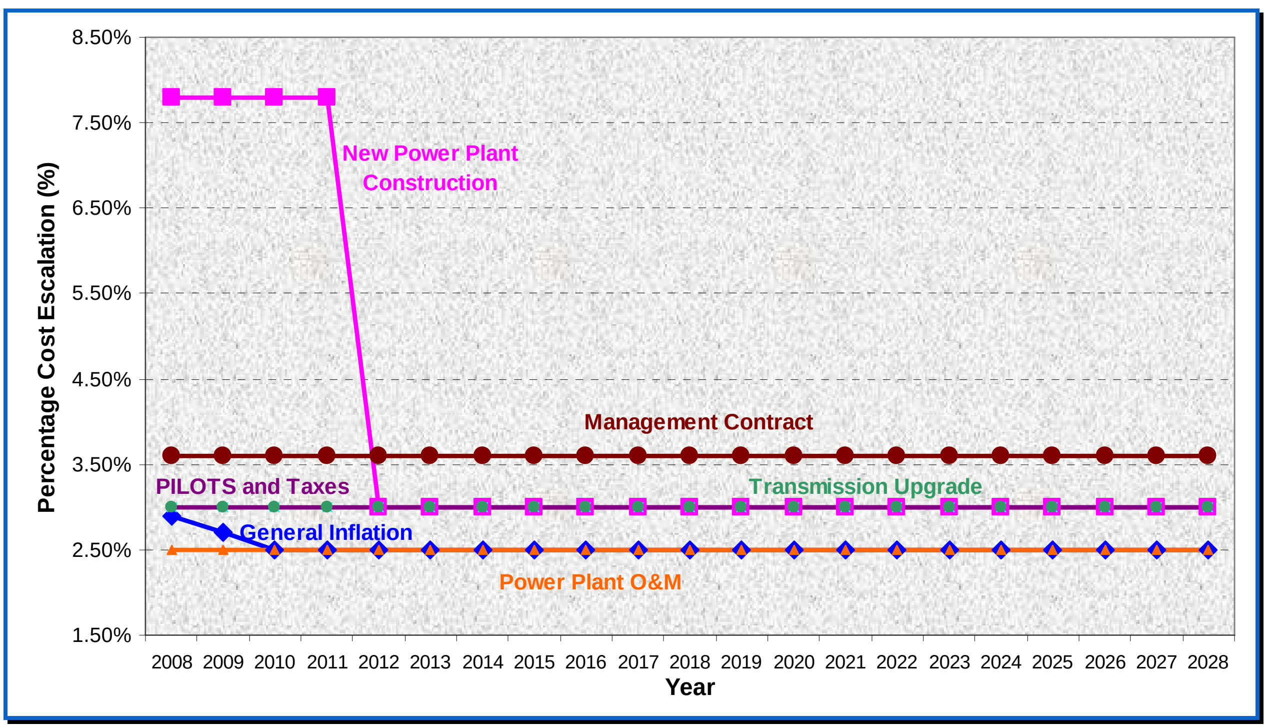


6.1.3 Other Escalation Rates

In addition to the escalation of fuel costs and emissions costs presented above, other costs are also projected to increase over time. Exhibit 6-5 shows the projected annual escalations rates that were used in the development of the Draft Electric Resource Plan. The following rates are depicted:

1. General Inflation Rate – used for costs that do not have other escalation assumptions
2. New Power Plant Construction Costs – used for the cost of building new central station power plants
3. Power Plan O&M Costs – used for the non-fuel operations and maintenance cost of operating a power plant
4. Transmission Upgrade Costs – used for escalating the cost of building new or upgrading existing transmission facilities
5. Pilots and Taxes – used to escalate the assumed payments for Payments in Lieu of Taxes (PILOTS) made by LIPA and taxes paid by builders of privately finance power plants
6. Management Contract Costs – used to escalate the costs of the major contracts used to manage the transmission and distribution system and customers service operations (Management Services Agreement contract or MSA) and Power Plant Operations contracts (Power Supply Agreement contract or PSA) These escalation rates account for increases in both the underlying costs supplying the service, but also the costs of increasing volume due to load growth on the MSA contract and the cost of increasing maintenance and environmental retrofits on power plants as they age in the PSA contract.

Exhibit 6-5 Projected Annual Percentage Cost Escalation Rates



6.1.4 Load Forecast

This report describes LIPA's energy and peak demand load forecasts and the forces influencing them, including various aspects of Long Island's economic outlook. Long Island's economic growth is supported and driven by the availability of energy sources. Long Island Power Authority (LIPA) regularly develops an energy plan for the region to ensure adequate power resources are planned to support continued economic expansion in the area. The load forecast is a critical component in developing the energy plan because the short and long-term power required by residents and businesses located on Long Island is one of the most significant factors in estimating LIPA's energy resource requirements over the planning horizon.

Producing a load forecast is dependent upon estimating a variety of variables, including weather, levels of economic activity, and both changes in population and in consumption patterns. Long Island's residents live in one of the wealthiest areas in the United States with a population of over 2.86 million. Long Island's close proximity to New York City's job market, a diversified local economy, and the availability of skilled labor, are all building blocks for continued growth. The Long Island economy is expected to continue to expand in 2009 (0.5%), slightly slower than in 2008 (0.8%) and much slower than in 2007 (3.0%). Below trend growth (1.0%) is expected over the next four years.

Exhibit 6-6 depicts the historic, 2008, and forecasted, 2009-2028, growth in energy before DSM reductions based on the November 2008 forecast. In the short-term LIPA's system energy requirements for 2009 are projected to grow by 0.1% over 2008 energy consumption.

Exhibit 6-7 depicts historic peaks for the period 1995 to 2008 and the November 2008 forecast of peaks for the 2009 to 2028 period. The forecasted peak demand growth for the LIPA generating system is projected to be -0.4% in 2009 including a 51 MW reduction for the LIPA Edge program. The historic peaks are shown on both an actual value basis and normalized for weather impacts. Normalization is simply a process used to be able to compare peaks on a consistent (or apples to apples) basis by assuming consistent weather profiles. To put these projections in historic perspective, normalized energy consumption in the LIPA system has grown by 1.3% on an average annual basis since 2000 and normalized peak demand has grown at an average annual rate of 2.2%, reflecting the economic growth of the area.

Exhibit 6-6 Historic and Forecasted LIPA Energy Requirements (November 2008 Forecast)

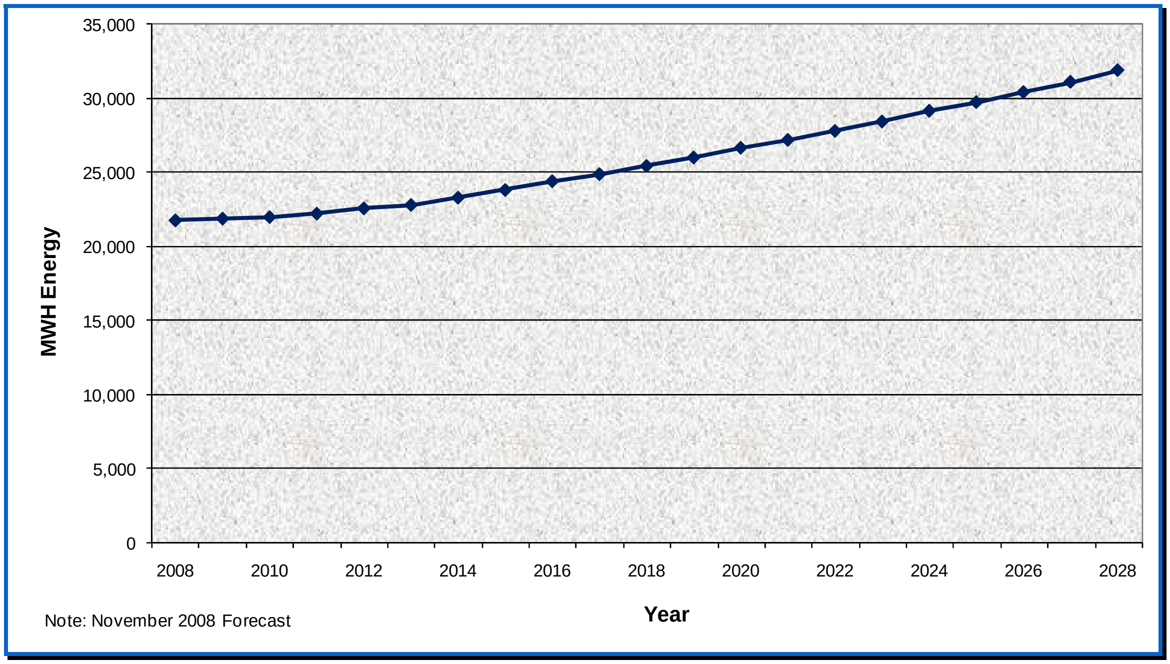
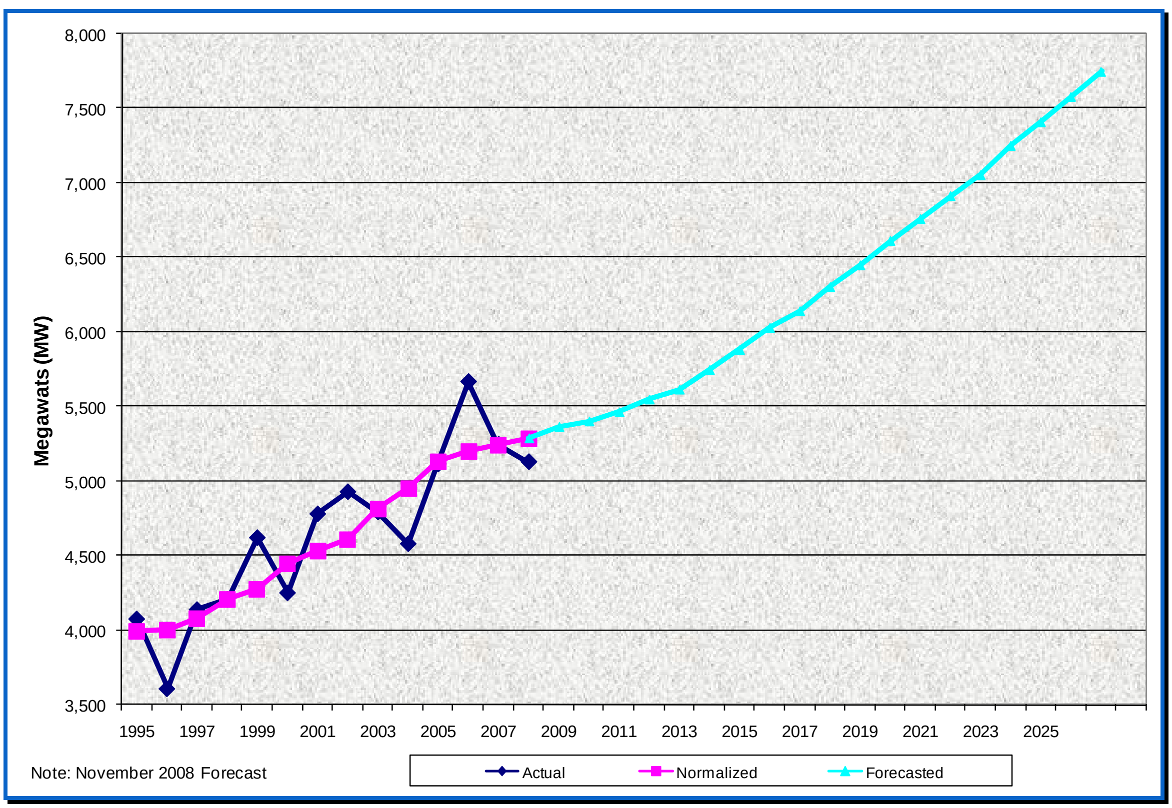


Exhibit 6-7 Historic and Forecasted LIPA System Peak (November 2008 Forecast)



There are two primary projections developed as part of the forecasting process: an energy forecast and a peak demand forecast. The energy forecast is simply the projection of electric energy consumed throughout the year, much the same concept as estimating the number of gallons of gas used to power our automobiles for one year. The peak forecast assesses the annual maximum requirements, on a consolidated basis, that LIPA's customers take from the electric system at any one point in time, which traditionally is during the summer season. For example, a homeowner may normally turn on a few lights in their residence when they get home at night, which draws only a small amount of power. However, on a hot day they may also choose to turn on their air conditioning, which causes more power to be drawn from the electrical system than is the case in cooler weather. On an island-wide basis, if many commercial and residential customers all run their air conditioners simultaneously, then the power requirements ramp up rapidly, which on the very hottest day may create a single peak energy demand for the year. LIPA must be prepared to have sufficient resources available to meet that maximum customer demand.

LIPA's 2009 – 2018 Electric Resource Plan used two forecasts in its development:

- The "Comparison of Alternative Plans" was based on the November 2007 Load Forecast
- The "Assessment of Need" was based on the November 2008 Load Forecast

While the same methodologies were used to develop both forecasts, updated data available in 2008 resulted in a different forecast. This report provides data and information regarding the forecast prepared in November 2008 which is depicted in Exhibit 6-8. Exhibit 6-9 provides the results of the November 2007 forecast.

Further discussion of the peak and energy load forecast process and results is included in the Appendix D-4 Long Range Forecast of Energy Requirements.

Exhibit 6-8 LIPA 2008 Peak Load and Energy Forecast

Table B

FORECAST OF ELECTRIC REQUIREMENTS, SALES, AND PEAK LOADS: 2009 - 2028

LIPA LOAD FORECAST

	DISTRIBUTION SYSTEM LOAD FORECAST BEFORE DSM REDUCTIONS			REDUCTIONS FOR DSM PROGRAMS			DISTRIBUTION SYSTEM LOAD FORECAST AFTER DSM REDUCTIONS			LONG ISLAND CHOICE REDUCTIONS			LIPA BUNDLED CUSTOMER LOAD FORECAST		
YEAR	REQS. (GWH)	SALES (GWH)	PEAKS (MW)	REQS. (GWH)	SALES (GWH)	PEAKS (MW)	REQS. (GWH)	SALES (GWH)	PEAKS (MW)	REQS. (GWH)	SALES (GWH)	PEAKS (MW)	REQS. (GWH)	SALES (GWH)	PEAKS (MW)
2007	21,705	20,182	5,239			29	21,705	20,182	5,210	1,432	1,335	289	20,273	18,847	4,921
2008	21,726	20,202	5,302	72	67	18	21,655	20,135	5,284	1,647	1,535	332	20,008	18,600	4,952
2009	21,844	20,310	5,361	217	203	99	21,626	20,107	5,262	1,983	1,848	331	19,644	18,259	4,931
2010	21,947	20,406	5,398	373	348	133	21,574	20,058	5,265	2,262	2,108	372	19,312	17,950	4,892
2011	22,181	20,624	5,460	552	514	176	21,630	20,110	5,284	2,541	2,368	413	19,089	17,742	4,871
2012	22,533	20,952	5,546	755	703	228	21,778	20,249	5,317	2,820	2,628	454	18,958	17,620	4,863
2013	22,765	21,169	5,612	973	907	289	21,792	20,262	5,323	3,099	2,888	495	18,693	17,373	4,828
2014	23,259	21,629	5,744	1,186	1,105	354	22,073	20,523	5,390	3,099	2,888	495	18,974	17,635	4,895
2015	23,773	22,107	5,879	1,391	1,297	424	22,381	20,811	5,455	3,099	2,888	495	19,282	17,922	4,960
2016	24,366	22,661	6,027	1,551	1,445	495	22,816	21,215	5,532	3,108	2,896	495	19,708	18,319	5,037
2017	24,843	23,104	6,139	1,706	1,590	565	23,136	21,514	5,574	3,099	2,888	495	20,037	18,626	5,079
2018	25,396	23,620	6,301	1,863	1,737	638	23,533	21,884	5,663	3,099	2,888	495	20,434	18,995	5,168
2019	25,966	24,151	6,448	1,993	1,857	706	23,973	22,294	5,743	3,099	2,888	495	20,874	19,406	5,247
2020	26,623	24,763	6,612	2,091	1,949	769	24,532	22,815	5,843	3,108	2,896	495	21,424	19,918	5,348
2021	27,151	25,256	6,759	2,132	1,987	827	25,019	23,269	5,931	3,099	2,888	495	21,920	20,380	5,436
2022	27,764	25,827	6,913	2,199	2,050	884	25,565	23,777	6,030	3,099	2,888	495	22,465	20,889	5,535
2023	28,394	26,414	7,054	2,260	2,106	936	26,134	24,308	6,118	3,099	2,888	495	23,035	21,420	5,623
2024	29,119	27,090	7,251	2,288	2,132	972	26,832	24,958	6,279	3,108	2,896	495	23,724	22,062	5,784
2025	29,705	27,636	7,411	2,343	2,183	1,015	27,362	25,453	6,396	3,099	2,888	495	24,263	22,564	5,901
2026	30,379	28,265	7,580	2,374	2,213	1,050	28,005	26,052	6,530	3,099	2,888	495	24,906	23,163	6,035
2027	31,071	28,909	7,749	2,425	2,260	1,085	28,646	26,649	6,664	3,099	2,888	495	25,547	23,761	6,169
2028	31,863	29,648	7,904	2,474	2,306	1,109	29,389	27,342	6,795	3,108	2,896	495	26,282	24,446	6,300

Base Case Notes:
(1) LIPA includes LIC & PFJ and excludes municipalities, NYPA BNL, EDP & MDA
(2) Normalized experienced results for 2007 & 2008
(3) Budget Sales approved December 11, 2008.
(4) Peak load forecast approved December 4, 2008
(5) LI Choice forecast issued August 2008.

Exhibit 6-9 LIPA 2007 Peak Load and Energy Forecast

Table B

FORECAST OF ELECTRIC REQUIREMENTS, SALES, AND PEAK LOADS: 2008 - 2027

LIPA LOAD FORECAST

	DISTRIBUTION SYSTEM LOAD FORECAST BEFORE DSM REDUCTIONS			REDUCTIONS FOR DSM PROGRAMS			DISTRIBUTION SYSTEM LOAD FORECAST AFTER DSM REDUCTIONS			LONG ISLAND CHOICE REDUCTIONS			LIPA BUNDLED CUSTOMER LOAD FORECAST		
YEAR	REQS. (GWH)	SALES (GWH)	PEAKS (MW)	REQS. (GWH)	SALES (GWH)	PEAKS (MW)	REQS. (GWH)	SALES (GWH)	PEAKS (MW)	REQS. (GWH)	SALES (GWH)	PEAKS (MW)	REQS. (GWH)	SALES (GWH)	PEAKS (MW)
2006	21,330	19,831	5,207			112	21,330	19,831	5,095	1,428	1,331	304	19,902	18,500	4,791
2007	21,762	20,235	5,284	57	53	74	21,705	20,182	5,210	1,432	1,335	289	20,273	18,847	4,921
2008	22,155	20,599	5,336	166	155	88	21,988	20,444	5,248	1,563	1,457	258	20,425	18,987	4,990
2009	22,436	20,862	5,420	262	244	117	22,174	20,617	5,303	1,660	1,548	273	20,514	19,070	5,030
2010	22,798	21,199	5,514	363	339	149	22,434	20,860	5,365	1,758	1,638	289	20,677	19,222	5,076
2011	23,223	21,595	5,620	485	452	189	22,738	21,143	5,431	1,855	1,729	305	20,883	19,414	5,126
2012	23,693	22,033	5,744	623	580	237	23,071	21,453	5,507	1,952	1,820	320	21,119	19,634	5,187
2013	24,125	22,436	5,851	784	731	294	23,341	21,705	5,556	1,947	1,815	320	21,394	19,890	5,236
2014	24,628	22,904	5,980	950	885	353	23,678	22,019	5,627	1,947	1,815	320	21,731	20,205	5,307
2015	25,143	23,384	6,112	1,074	1,001	414	24,069	22,383	5,698	1,947	1,815	320	22,122	20,569	5,378
2016	25,741	23,942	6,256	1,174	1,094	473	24,568	22,848	5,783	1,952	1,820	320	22,615	21,029	5,463
2017	26,212	24,381	6,365	1,320	1,231	536	24,892	23,150	5,829	1,947	1,815	320	22,945	21,336	5,509
2018	26,767	24,898	6,524	1,471	1,371	602	25,296	23,527	5,922	1,947	1,815	320	23,349	21,712	5,602
2019	27,335	25,427	6,666	1,613	1,503	642	25,722	23,924	6,024	1,947	1,815	320	23,775	22,109	5,704
2020	27,994	26,041	6,825	1,772	1,652	709	26,222	24,390	6,116	1,952	1,820	320	24,269	22,570	5,796
2021	28,513	26,525	6,967	1,941	1,809	780	26,573	24,717	6,188	1,947	1,815	320	24,626	22,902	5,867
2022	29,124	27,095	7,117	2,115	1,971	846	27,009	25,124	6,271	1,947	1,815	320	25,062	23,309	5,951
2023	29,749	27,677	7,252	2,279	2,124	906	27,470	25,553	6,347	1,947	1,815	320	25,523	23,739	6,026
2024	30,473	28,352	7,443	2,371	2,210	925	28,102	26,142	6,518	1,952	1,820	320	26,150	24,323	6,198
2025	31,043	28,883	7,597	2,490	2,321	959	28,553	26,562	6,637	1,947	1,815	320	26,606	24,748	6,317
2026	31,709	29,504	7,760	2,600	2,423	989	29,109	27,081	6,771	1,947	1,815	320	27,162	25,266	6,451
2027	32,390	30,138	7,921	2,696	2,513	1,013	29,693	27,625	6,908	1,947	1,815	320	27,746	25,811	6,588

Base Case Notes:
(1) LIPA includes LIC & PFJ and excludes municipalities, NYPA BNL, EDP & MDA
(2) Normalized experienced results for 2006 & 2007
(3) Budget Sales approved September 11, 2007.
(4) Peak load forecast approved October 17, 2007
(5) LI Choice forecast issued August 2007.

7 Resource Needs Analysis

The resource needs analysis is used to determine the timing and magnitude of new resource additions. The analysis in this section is based on load forecasts prepared in the November/December 2008 timeframe.

7.1 Resource Adequacy Assessment

Evaluation of resource adequacy is undertaken to ensure adequate resources are available over the forecast horizon. LIPA's need for new resources is driven primarily by two sets of planning criteria:

- NYISO ICAP Reserve Margin Requirements for LIPA,
- NYISO "Zone K" Locational ICAP Requirements for Long Island, and

Two additional criteria, LIPA ICAP and Long Island OPCAP are important supplemental perspectives used to analyze the minimum capacity reserves necessary to preserve the reliability of Long Island as a whole.

- NYISO "Zone K" Locational ICAP Requirements for LIPA
- LIPA Operational Capacity Requirement (OPCAP) for Long Island

Given the geographic constraints imposed by being an island with limited ability to import power from off-Island supply resources, LIPA has developed the OPCAP planning criteria that accounts for the specific operational conditions and contingencies that impact resource planning overall for Long Island.

7.1.1 NYISO LIPA ICAP Resource Requirements

The analysis in this section is based on the NYSRC and NYISO regional reliability criteria and represents the minimum level of installed reserves that LIPA must have available to meet these requirements. The load and capacity data shown in Exhibit 7-1 identifies the projected resource requirements for LIPA through the year 2028 under reference need case assumptions. Both the Total Statewide and Long Island Locational Capacity Requirements are considered in this evaluation. Statewide Requirements are based on the portion of LIPA's peak load which occurs coincident with the overall NYCA peak load. Long Island Locational Requirements (also referred to as "NYCA Load Zone K Requirements") are based on the portion of LIPA's peak load which occurs coincident with the overall peak load for Long Island. If the Load Zone K peak occurs at the same time the NYCA peak occurs, then both of these requirements will be based on the same load forecast. Historically, however, these two peaks have occurred at slightly different times resulting in two separate load forecast requirements which are used as a basis for establishing LIPA's Statewide and Locational ICAP Requirements. Both of these load forecast values are shown in Exhibit 7-1 for the LIPA Reference Need Case.

Resources are subdivided into on-Island (NYISO "Zone K") and off-Island categories. On-Island resources include existing power supply contracts with National Grid, NYPA, and various merchant generators and Independent Power Producers located on Long Island. Off-Island resources include LIPA's share of the Nine Mile 2 Generating Facility, NYPA contracts, and existing firm LIPA purchases imported over transmission interconnections with the NYISO, PJM and ISO-NE systems. Reserve levels are shown as the differential between 1) total requirements and total resources and 2) on-Island requirements and on-Island resources.

Included in the Reference Need Case assumptions is the projected level of Demand-Side Resources (DSM) that LIPA expects to achieve excluding any potential ELI impacts. The load forecast for both the Total Statewide and On-Island Locational Requirements shown in Exhibit 7-1. Both of the forecast loads are reduced by the expected embedded DSM contribution and factored into the required resource calculation to arrive at the minimum required resources to meet the NYISO ICAP criteria. These required resources are compared to the appropriate existing resource levels to determine the amount of additional resources needed to meet the specific requirement.

Exhibit 7-1 shows LIPA's minimum on-Island and total resources needed to maintain reliability under NYISO ICAP criteria under LIPA Reference Need Case assumptions. This table assumes there is perfect knowledge about the future. Later in this section the treatment of uncertainty is addressed and shows the projection used by LIPA to determine the need for resources. The reserves shown for each requirement are driven by a set of reliability criteria developed by the NYSRC which include historical generator performance factors, system operating conditions, transmission and interconnection capabilities, and loss of load criteria that apply to all members of the NYISO.

Exhibit 7-1 LIPA ICAP Load and Capacity Position (MW) – Reference Need Case

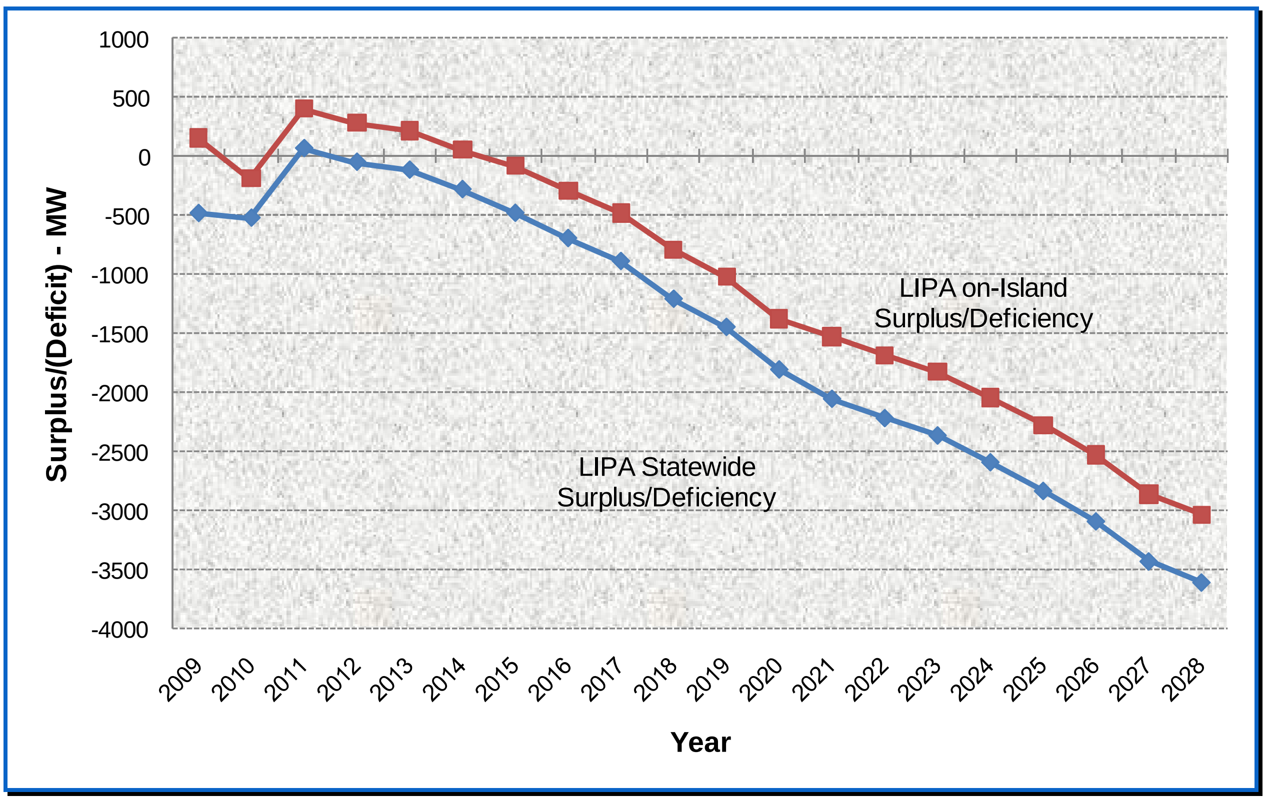
	Load[1]		Resource Requirements		Resources Available			Reserves	
Year	NYCA Coincident LIPA Load	Zone K Coincident LIPA	Statewide Requirement	On-Island Requirement	On-Island Resource	Off-Island Resource	Total Resource	Statewide Sur./(Def.)	On-Island Sur./(Def.)
2009	4943	5000	5758	4875	5021	255	5276	(483)	146
2010	4883	4939	5689	5108	4913	255	5168	(522)	(194)
2011	4900	4956	5709	5129	5522	255	5777	68	393
2012	4941	4997	5757	5177	5454	255	5709	(48)	277
2013	4962	5018	5781	5204	5412	255	5667	(115)	208
2014	5090	5147	5930	5345	5395	255	5650	(280)	50
2015	5219	5278	6080	5487	5395	205	5600	(481)	(93)
2016	5361	5421	6245	5644	5946	205	5551	(695)	(298)
2017	5462	5524	6364	5757	5269	205	5474	(890)	(488)
2018	5613	5676	6539	5924	5124	205	5329	(1210)	(799)
2019	5751	5815	6700	6077	5046	205	5251	(1449)	(1031)
2020	5902	5968	6875	6244	4861	205	5066	(1810)	(1383)
2021	6035	6103	7031	6303	4767	205	4972	(2059)	(1536)
2022	6175	6245	7194	6459	4767	205	4972	(2223)	(1693)
2023	6300	6372	7340	6600	4766	205	4971	(2370)	(1834)
2024	6495	6568	7566	6814	4765	205	4970	(2597)	(2049)
2025	6638	6713	7733	6974	4688	205	4893	(2841)	(2286)
2026	6792	6869	7913	7146	4609	205	4814	(3099)	(2537)
2027	6947	7026	8093	7319	4450	205	4655	(3439)	(2869)
2028	7100	7181	8272	7489	4449	205	4654	(3618)	(3040)

[1] Load forecast prepared in November/December 2008.

Exhibit 7-2 graphically depicts LIPA's statewide and on-Island ICAP resource requirement positions, excluding ELI impacts. On a statewide basis, after accounting for the available existing resources including DSM impacts and the NYSRC mandated minimum required resources, LIPA has a projected resource deficiency of 483 MW in 2009. Thereafter, the deficiency briefly increases through May 2010 prior to the expected commencement of a long term capacity purchase agreement in June 2010 which will bring an additional 660 MW from the PJM Control Area across the Neptune Cable to Long Island. This results in a short term surplus through 2011. In 2012 LIPA's statewide resources are again deficient and steadily become more deficient through 2028 as load continues to grow and existing contracts for resources begin to expire. This results in an overall forecasted statewide resource deficiency level of 3,618 MW by 2028.

LIPA's on-Island requirement is also depicted in Exhibit 7-2. There is a short term on-Island deficiency in the month of May 2010 of 194 MW which occurs prior to the expected June 2010 contract for 660 MW of additional capacity resources across the Neptune Cable. This 1 month deficiency will be met with existing Long Island market resources which are not currently under contract to LIPA. The next forecast resource deficiency for LIPA does not occur until 2015, when an on-Island resource deficiency of 93 MW is forecast under Reference Need Case assumptions. Thereafter, the deficiency increases as load continues to grow and contracts for Long Island based resources begin to expire, resulting in a forecast on-Island resource deficiency level for LIPA of 3,040 MW by 2028.

Exhibit 7-2 LIPA ICAP Resource Requirement Position (MW) – Reference Need Case



Resource levels shown in capability year 2010 do not include the Marcus Hook Contract which begins June 1, 2010, as the NYISO capability year begins May 1 and this contract is beginning one month later so it cannot be included for that year.

Taken in combination under the Reference Need Case assumptions the ICAP Resource adequacy analysis indicates that action needs to be taken by 2015 to avoid resource deficiencies on Long Island. While the statewide requirements can generally be met with purchases from the NYISO Capacity Market, Long

Island requirements must be met with local resources that qualify for the more limited Long Island Market.

7.1.2 Long Island Resource Requirements

The previous discussion focused on LIPA's statewide and on-Island ICAP resource requirements. This section focuses on Long Island's ICAP resources requirements in its entirety (i.e. including municipalities, retail access etc.). Exhibit 7-3 outlines LIPA's estimates of the ICAP Resource Adequacy position for Long Island as a whole. As the largest electric energy provider on Long Island, LIPA considers the overall system reliability of Long Island a critical part of its resource planning. The Long Island assessment provides an indication of the robustness of the Long Island Capacity Market. Furthermore, it provides LIPA with an indication as to whether the reliability of the Long Island system will be adequate to serve future needs. If LIPA maintains its own NYISO capacity requirements but the Long Island assessment shows an overall deficiency the reliability of everyone on Long Island, including LIPA, may be adversely affected.

Exhibit 7-3 Long Island ICAP Load and Capacity Position (MW) – Reference Need Case

	Load[1]	Resource Requirements	Resources Available	Reserves
Year	**Zone K Coincident Long Island Load**	**On-Island Requirement**	**On-Island Resources**	**On-Island Sur./(Def.)**
2009	5437	5363	5595	232
2010	5420	5670	5651	(19)
2011	5479	5737	6311	574
2012	5564	5831	6311	480
2013	5627	5903	6311	408
2014	5758	6049	6311	262
2015	5890	6195	6311	116
2016	6034	6356	6287	(69)
2017	6138	6472	6287	(186)
2018	6292	6644	6287	(357)
2019	6433	6801	6287	(514)
2020	6588	6973	6287	(686)
2021	6724	7026	6187	(839)
2022	6867	7186	6187	(1000)
2023	6996	7331	6187	(1144)
2024	7194	7551	6187	(1364)
2025	7341	7716	6187	(1529)
2026	7499	7892	6187	(1705)
2027	7657	8070	6187	(1883)
2028	7813	8245	6187	(2058)

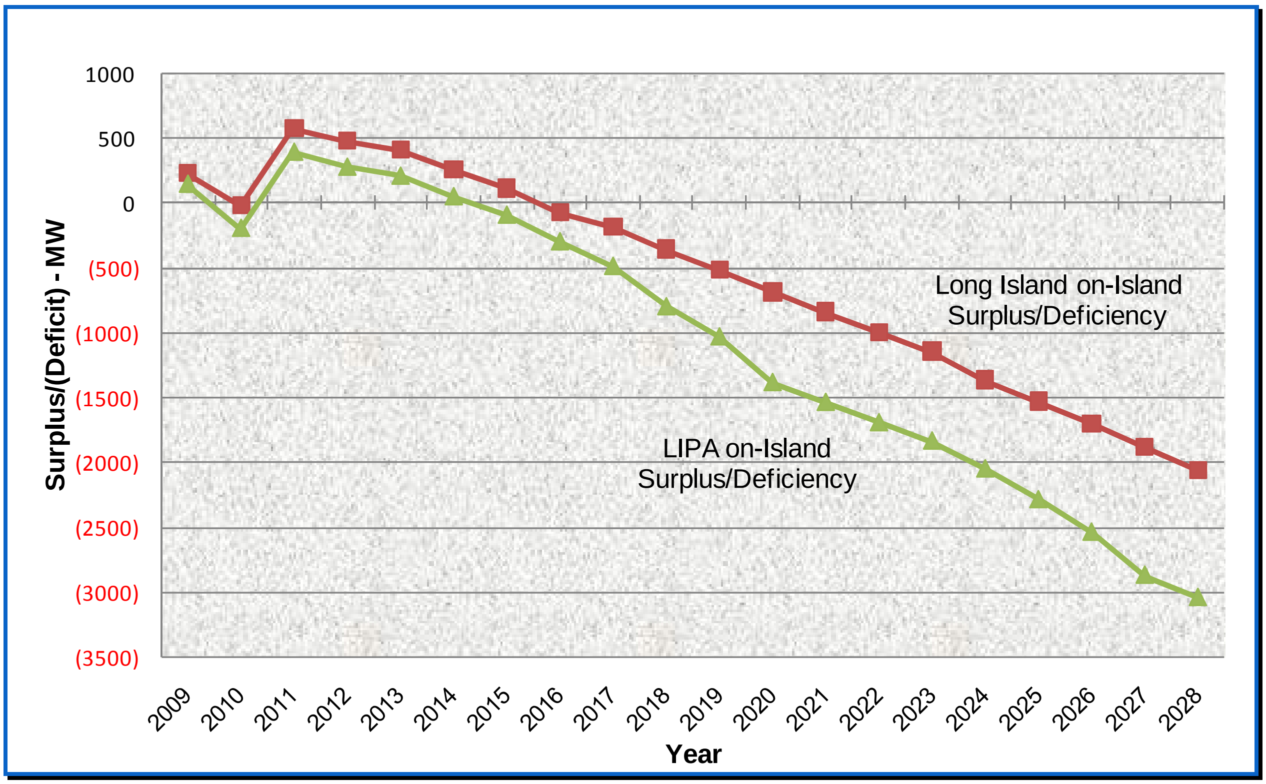
[1] Load forecast prepared in November/December 2008.

Long Island's ICAP resource adequacy position tracks that of LIPA, with a need to develop resources that qualify for the Long Island Market by 2016 in order to avoid resource deficiencies.

Exhibit 7-4 graphically depicts Long Island on-Island ICAP resource requirement position. For comparison purposes the LIPA on-Island ICAP resource requirement position is also shown.

Although the two lines follow the same general trend, the Long Island resource position is somewhat better than that of LIPA in the long term. This is because certain LIPA contracts for on-Island resources terminate or are reduced during the forecast period, which negatively impacts the LIPA position. However, since these resources physically remain on Long Island and are expected to continue commercial operation, the Long Island resource requirements are unaffected.

Exhibit 7-4 Long Island ICAP Resource Requirement Position – Reference Need Case



***Resource levels shown in capability year 2010 do not include the Marcus Hook Contract which begins June 1, 2010, as the NYISO capability year begins May 1 and this contract is beginning one month later so it cannot be included for that year.**

7.1.3 Operational Planning Resource Requirements (OPCAP)

OPCAP is a criterion that looks at Long Island resource requirements from a contingency planning perspective. As such, resources levels and load requirements are assessed differently and do not match those previously identified in the ICAP analyses.

Exhibit 7-5 outlines the Long Island OPCAP resource adequacy position. Historically, the OPCAP methodology developed by LIPA has been a more stable indicator of the need for resources than the NYISO locational requirements. At times the OPCAP methodology has been a more stringent criterion than the minimum NYISO standards. At other times, the NYISO standards have been more stringent. Currently, Long term forecasting using the NYISO standard is slightly more stringent than the OPCAP criterion. Under OPCAP, sufficient resources on Long Island must be available to address the simultaneous occurrence of the following conditions:

- The unavailability of 10% of on-Island generating resources,
- A Long Island peak load representing the 80th percentile of historic weather conditions in the past thirty years,
- The simultaneous loss of the largest generating unit and transmission intertie on Long Island.

The OPCAP available resources for Long Island include on-Island generating resources, DSM programs, transmission tie-line capability, and emergency measures. Please refer to notes 2, 3 & 4 in Exhibit 7-5 for further explanation.

Exhibit 7-5 Long Island OPCAP Load and Capacity Position (MW) – Reference Need Case

	Load	Resource Requirements		Resources Available					Reserves
Year	Long Island Load	Contingencies(1)	On-Island Requirement	On-Island Resource (2)	DSM	Inter-ties(3)	Emergency Measures(4)	Total Resource	On-Island Sur./(Def.)
2009	5625	1,299	6924	5034	135	2,144	186	7499	575
2010	5663	1,304	6967	5034	139	2,144	187	7504	537
2011	5729	1,310	7038	5034	153	2,144	188	7519	481
2012	5819	1,317	7136	5034	148	2,144	189	7515	379
2013	5890	1,323	7213	5034	154	2,144	190	7522	309
2014	6027	1,330	7357	5034	158	2,144	191	7526	169
2015	6167	1,337	7505	5034	163	2,144	192	7533	28
2016	6321	1,346	7666	5034	169	2,144	193	7518	(148
2017	6438	1,352	7789	5012	180	2,144	194	7530	(259)
2018	6605	1,361	7966	5012	191	2,144	195	7542	(424)
2019	6759	1,369	8127	5012	200	2,144	196	7552	(575)
2020	6928	1,377	8305	5012	212	2,144	197	7565	(740)
2021	7080	1,385	8465	5012	225	2,144	198	7579	(886)
2022	7240	1,394	8634	5012	239	2,144	199	7594	(1040)
2023	7386	1,401	8787	5012	254	2,144	200	7610	(1177)
2024	7591	1,412	9003	5012	258	2,144	201	7615	(1389)
2025	7756	1,421	9177	5012	273	2,144	202	7631	(1546)
2026	7931	1,430	9361	5012	288	2,144	203	7647	(1714)
2027	8106	1,439	9544	5012	301	2,144	204	7660	(1884)
2028	8269	1,447	9716	5012	305	2,144	205	7666	(2050)

(1) Reflects the simultaneous occurrence of 3 events: a. peak load representing the 80th percentile of historic weather conditions in the past thirty years and b. the loss of the largest and second largest energy resources on Long Island

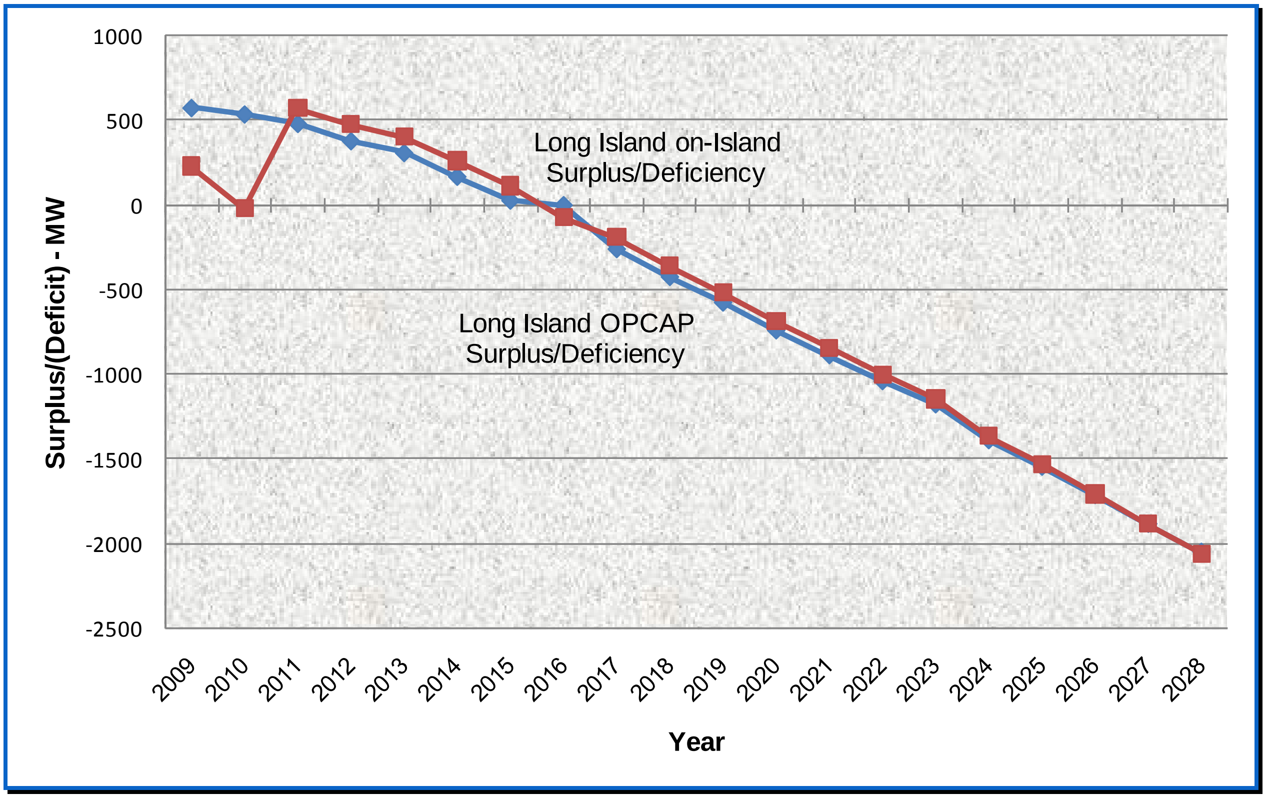
(2) Reflects the capacity reduction due to unavailability of 10% of Long Island generation at the time of peak demand due to forced or scheduled outages

(3) Represents five Long Island interconnection resources: a) 637 MW NYPA-Consolidated Edison (ConEd) inter-tie at Shore Road b) 653 MW ConEd inter-tie at E. Garden City c) 330 MW Cross-Sound Cable at Shoreham, d) 200 MW Northeast Utilities cable at Northport, and e) 660 MW Neptune Cable at Newbridge Road, Levittown. Net from these resources is power wheeled to ConEd (286 MW) and a phase shifter dead-band (50 MW)

(4) Reflects combined effects of voltage reductions and public appeal load relief. Levels are based on past experience observed during peak load conditions.

Exhibit 7-6 graphically displays the OPCAP resource requirement position. For comparison purposes, the Long Island ICAP on-Island requirements are also shown.

Exhibit 7-6 Long Island OPCAP Resource Requirement Position (MW) – Reference Need Case



Resource levels shown in capability year 2010 do not include the Marcus Hook Contract which begins June 1, 2010, as the NYISO capability year begins May 1 and this contract is beginning one month later so it cannot be included for that year.

Exhibit 7-6 shows a brief decrease in the Long Island on-Island requirement in 2010. This decrease occurs briefly in May 2010 prior to the expected June 2010 contract for 660 MW of additional capacity resources across the Neptune Cable. The OPCAP planning criteria results in the need for additional on-Island resources in 2016 as is also the case when planning to the ICAP standard. By 2028, the OPCAP analysis indicates a projected on-Island deficiency of 2,050 MW while the ICAP analysis indicates a very similar Long Island on-Island need of 2,058 MW.

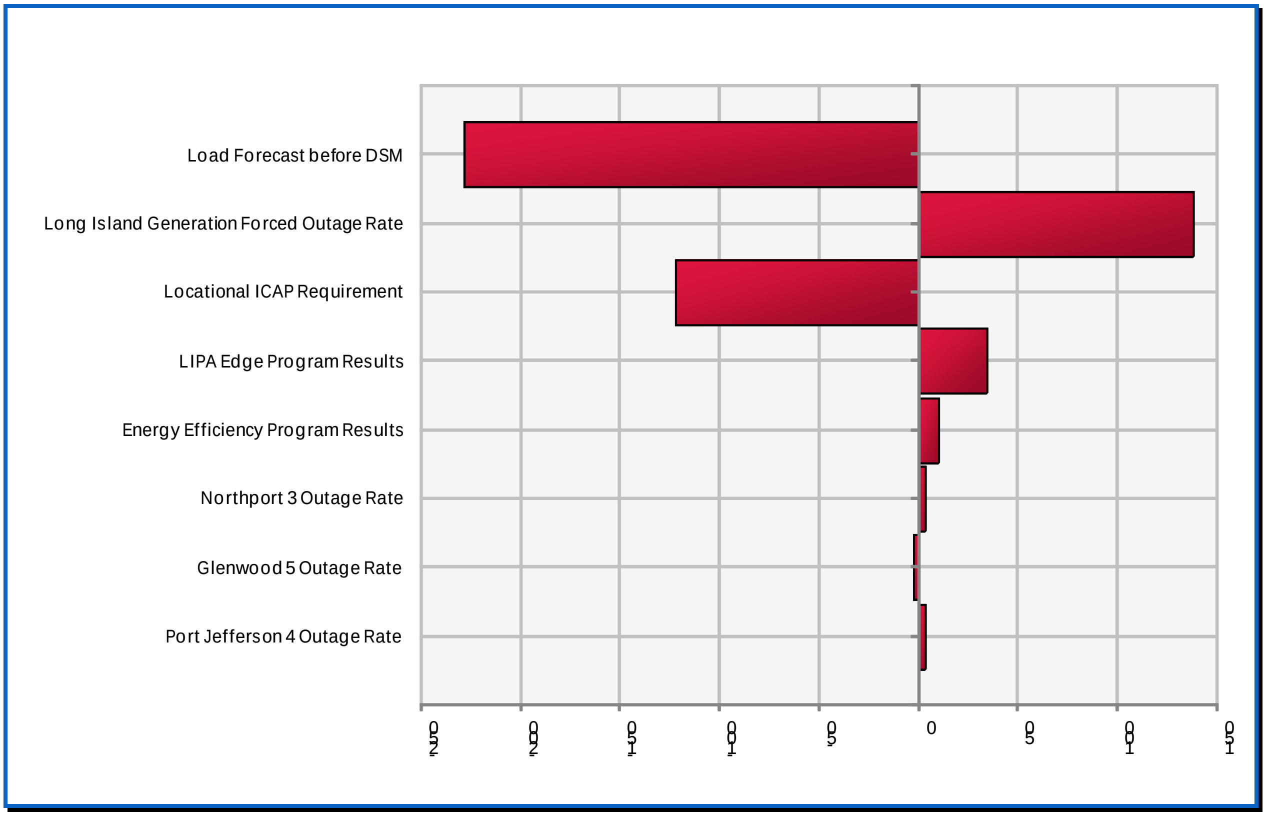
The overall the analysis of OPCAP and ICAP reliability criterion results in the LIPA On-Island ICAP criteria as driving the most immediate and greatest need for additional resources. The initial need occurs in 2015 with a 93 MW forecasted deficiency if no additional resources are added. Please refer to Exhibits 7-1, 7-3 and 7-5 for the detailed annual analysis and resulting surplus/deficiency forecasts.

7.2 Probabilistic Needs Assessment – Reference Need Case

Resource planning and energy planning in general is not an exact science. Weather variations and major system component failures are just two of the many factors that have significant implications for resource adequacy. While significant efforts go into the development of criteria and analysis to minimize risk, the unavoidable uncertainty that surrounds the many underlying assumptions make it desirable to go well beyond minimum criteria to ensure reliable and cost effective service. This process, however, is not risk-free and LIPA must plan now to adjust for changes that may occur over the next decade and beyond. To better manage this risk, LIPA first assesses its overall needs based on known variable assumptions, and then further analyzes both the variability associated with planning assumptions and operational considerations that focus on the near term comparison of planned to actual performance of the electric system. The uncertainty analysis results identified below incorporate probabilistic forecast assumptions to create a probabilistic view of capacity resources required to meet varying levels of confidence.

Figure 7-7 illustrates the relative significance of the various variables affecting the need for resources. While many inputs influence the resource plan, the load forecast is the most significant variable followed by the forced outage rates of the Long Island generators and the locational requirements as established by the NYISO on an annual basis. Load requirements, specifically peak MW capacity needs, are by far the single most important factor in forecasting LIPA's resource adequacy position over the planning horizon.

Exhibit 7-7 Tornado Diagram – Reference Need Case



7.2.1 Load Forecast Uncertainty

The load forecast developed by LIPA for its resource needs, as well as the overall needs of Long Island is comprised of several key components. These components represent expectations associated with customer demand, retail access program participation, municipal requirements and demand side management programs. The alternative load forecast scenarios analyzed by LIPA are derived by varying the assumptions associated with these forecast components from those incorporated into the Reference Need Case projection. Fluctuations associated with changes in the economic environment and modeling errors can create uncertainty in the load forecast over the planning horizon. Economic uncertainty accounts for changes in load consumption associated with varying assumptions in economic growth. Forecasting uncertainty accounts for modeling errors, which result from the peak demand forecasting process. In order to account for some of these deviations and errors in the forecast process, LIPA conducts a probabilistic assessment of its load forecast and resource analysis using statistical software to capture the range of uncertainty inherent in its forecast models.

Historical data is used to determine how much variability exists between actual load components and the forecast of peak load in a given year. Probabilistic distributions of occurrence are then constructed for each of the major variable components of the load forecast for each year of a particular case study. A probabilistic assessment is then conducted by running simulations through a decision model. This model combines the key load determinants with their various predicted outcomes in order to produce a load forecast range within a banded confidence interval.

7.2.2 Resource Adequacy Uncertainty

The probabilistic assessment of LIPA's resources takes into consideration the variability inherent in the drivers used to estimate LIPA's resource levels. LIPA's resource estimates include assumptions for generation in key areas such as unit availability and performance ratings. Historic data is used to construct probabilistic distributions for each LIPA resource in order to study the overall impact of resource variability in the planning process. Statistical sampling is then performed during the probabilistic assessment process to determine the contribution each resource will make to LIPA's overall resource totals.

Identifying the Reference Need Case does not explicitly account for the risks that actual outcomes may vary from the planned or expected. By accounting for these uncertainties in the probabilistic assessment the Reference Need Case can be viewed in the context of the range of all possible resource requirement outcomes. Resource planning decisions can then be made based on the level of perceived risk inherent within this range of possible outcomes.

7.2.3 Probabilistic Modeling and Results

LIPA's Probabilistic Needs Assessment studied the variability associated with forecast load and resource levels for the Reference Need Case which excludes the impacts of LIPA's ELI program. The following exhibits show the results of the probabilistic assessment of LIPA's resource requirements.

A stochastic model is used to combine the key variables with their respective uncertainty distributions into the many possible scenarios or energy futures. These thousands of possible energy futures are combined to create a probabilistic view of the amount of additional resources required to meet varying levels of confidence. For example if the goal were to be absolutely certain (worst case for all key variables) that the required resources never exceed the resources available the goal would translate to planning to the 100 percent confidence level.

LIPA Statewide IRM Requirement

Exhibit 7-8 shows the probabilistic resource requirement results for the LIPA statewide ICAP criteria. Results are shown in a Confidence Level Table format. The far left column lists increasing confidence levels from 5% to 95% in 5% intervals. The annual megawatts of required resources, deficiencies are depicted in red, increases with increasing levels of confidence.

Exhibit 7-8 shows the range of possible resource requirements on a statewide, probability weighted basis. For this criteria, LIPA plans to the 50% confidence level which represents the midpoint in the range possible outcomes. At this confidence level there is an equal probability that resources available will exceed LIPA's minimum resource requirements or be deficient in meeting those same requirements.

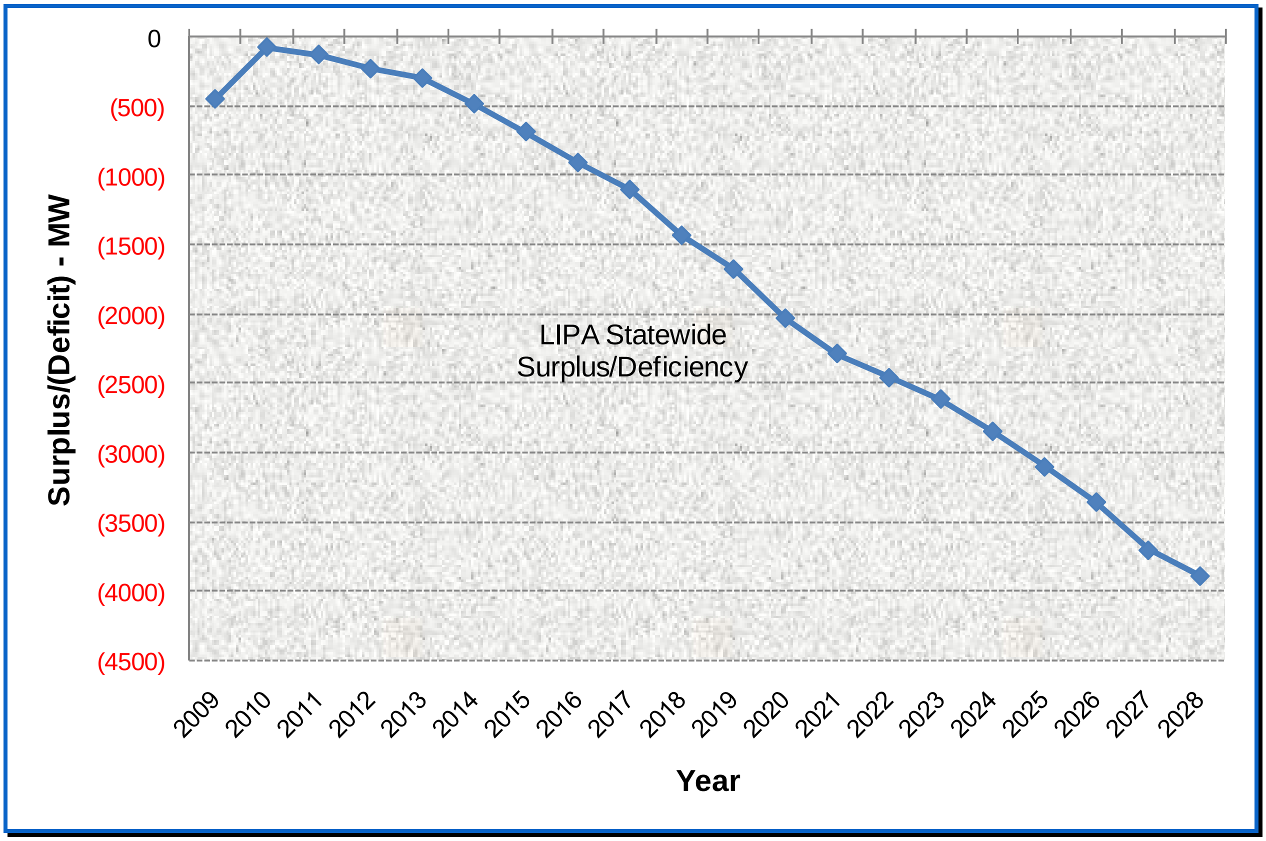
Exhibit 7-8 Probability Table – LIPA Statewide ICAP Resource Requirements (MW)

Year>	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
95%	(833)	(506)	(557)	(638)	(732)	(909)	(1108)	(1314)	(1557)	(1892)	(2150)	(2576)	(2799)	(2997)	(3134)	(3389)	(3649)	(3895)	(4264)	(4499)
90%	(756)	(421)	(455)	(559)	(628)	(827)	(1031)	(1235)	(1467)	(1793)	(2041)	(2417)	(2674)	(2884)	(3019)	(3278)	(3536)	(3807)	(4145)	(4353)
85%	(706)	(362)	(381)	(508)	(571)	(738)	(958)	(1174)	(1389)	(1725)	(1989)	(2359)	(2596)	(2776)	(2945)	(3196)	(3440)	(3713)	(4048)	(4260)
80%	(650)	(308)	(313)	(451)	(530)	(691)	(920)	(1128)	(1334)	(1668)	(1917)	(2293)	(2540)	(2727)	(2891)	(3121)	(3375)	(3644)	(4006)	(4195)
75%	(609)	(247)	(286)	(408)	(484)	(640)	(870)	(1095)	(1286)	(1615)	(1875)	(2237)	(2510)	(2672)	(2833)	(3075)	(3321)	(3584)	(3949)	(4122)
70%	(575)	(198)	(243)	(372)	(450)	(612)	(834)	(1035)	(1250)	(1573)	(1826)	(2201)	(2446)	(2619)	(2791)	(3003)	(3274)	(3540)	(3900)	(4074)
65%	(535)	(161)	(205)	(320)	(403)	(575)	(783)	(1011)	(1210)	(1535)	(1783)	(2160)	(2396)	(2571)	(2747)	(2976)	(3234)	(3482)	(3859)	(4028)
60%	(508)	(140)	(177)	(296)	(367)	(533)	(752)	(982)	(1169)	(1493)	(1757)	(2113)	(2366)	(2532)	(2691)	(2936)	(3189)	(3437)	(3796)	(3976)
55%	(476)	(107)	(151)	(263)	(339)	(510)	(710)	(933)	(1138)	(1461)	(1722)	(2089)	(2325)	(2501)	(2650)	(2886)	(3141)	(3400)	(3759)	(3933)
50%	(448)	(75)	(128)	(230)	(298)	(483)	(684)	(907)	(1102)	(1432)	(1677)	(2030)	(2285)	(2460)	(2614)	(2847)	(3104)	(3357)	(3705)	(3891)
45%	(412)	(35)	(87)	(203)	(262)	(445)	(644)	(882)	(1071)	(1389)	(1646)	(1998)	(2248)	(2429)	(2557)	(2803)	(3059)	(3321)	(3653)	(3847)
40%	(369)	0	(51)	(173)	(240)	(410)	(610)	(848)	(1029)	(1356)	(1604)	(1958)	(2215)	(2393)	(2519)	(2763)	(3002)	(3297)	(3611)	(3797)
35%	(341)	30	(23)	(141)	(210)	(371)	(578)	(808)	(992)	(1315)	(1552)	(1915)	(2172)	(2343)	(2483)	(2722)	(2967)	(3249)	(3579)	(3761)
30%	(290)	69	0	(106)	(173)	(340)	(536)	(766)	(956)	(1281)	(1516)	(1875)	(2119)	(2298)	(2445)	(2687)	(2931)	(3180)	(3528)	(3707)
25%	(254)	109	43	(73)	(132)	(304)	(503)	(720)	(895)	(1235)	(1463)	(1824)	(2077)	(2241)	(2401)	(2635)	(2870)	(3112)	(3453)	(3651)
20%	(213)	145	82	(26)	(89)	(263)	(447)	(672)	(865)	(1170)	(1424)	(1768)	(2025)	(2177)	(2346)	(2553)	(2792)	(3061)	(3387)	(3588)
15%	(157)	219	134	24	(37)	(214)	(383)	(621)	(797)	(1128)	(1354)	(1710)	(1981)	(2105)	(2267)	(2494)	(2723)	(3003)	(3323)	(3513)
10%	(77)	271	193	97	26	(146)	(336)	(544)	(724)	(1057)	(1257)	(1641)	(1922)	(2033)	(2193)	(2418)	(2642)	(2910)	(3255)	(3420)
5%	1	333	282	166	134	(19)	(216)	(429)	(639)	(967)	(1165)	(1535)	(1786)	(1944)	(2061)	(2270)	(2532)	(2770)	(3120)	(3284)

Exhibit 7-9 shows that on a 50% confidence level basis LIPA currently does not have sufficient contracted resources to meet its statewide requirements in any year of the study period. In 2009 there is a need for 448 MW of additional resources which grows to 3891 MW by 2028.

LIPA's statewide IRM requirements have historically been met on an annual basis with short term purchases from the NYISO Capacity Market. Going forward, LIPA will continue to assess the condition of the statewide market to determine whether it is appropriate to continue to rely on the market or more beneficial to LIPA to invest in new off-Island resources.

Exhibit 7-9 LIPA Statewide ICAP Resource Requirements (MW) - 50% Confidence



Long Island Locational Requirement

Exhibit 7-10 shows the probabilistic resource requirement results for the Long Island on-Island ICAP criteria. For this criterion, LIPA plans to an 80% confidence level in order to ensure an adequate level of resources are available to meet Long Island's requirements. At this confidence level there is only a 20% probability that resources available will be inadequate. LIPA believes it is prudent to plan to a higher level of confidence when dealing with on-Island resources due its improved but still limited ability to import energy from off-Island sources in the event of an emergency or other extreme set of circumstances.

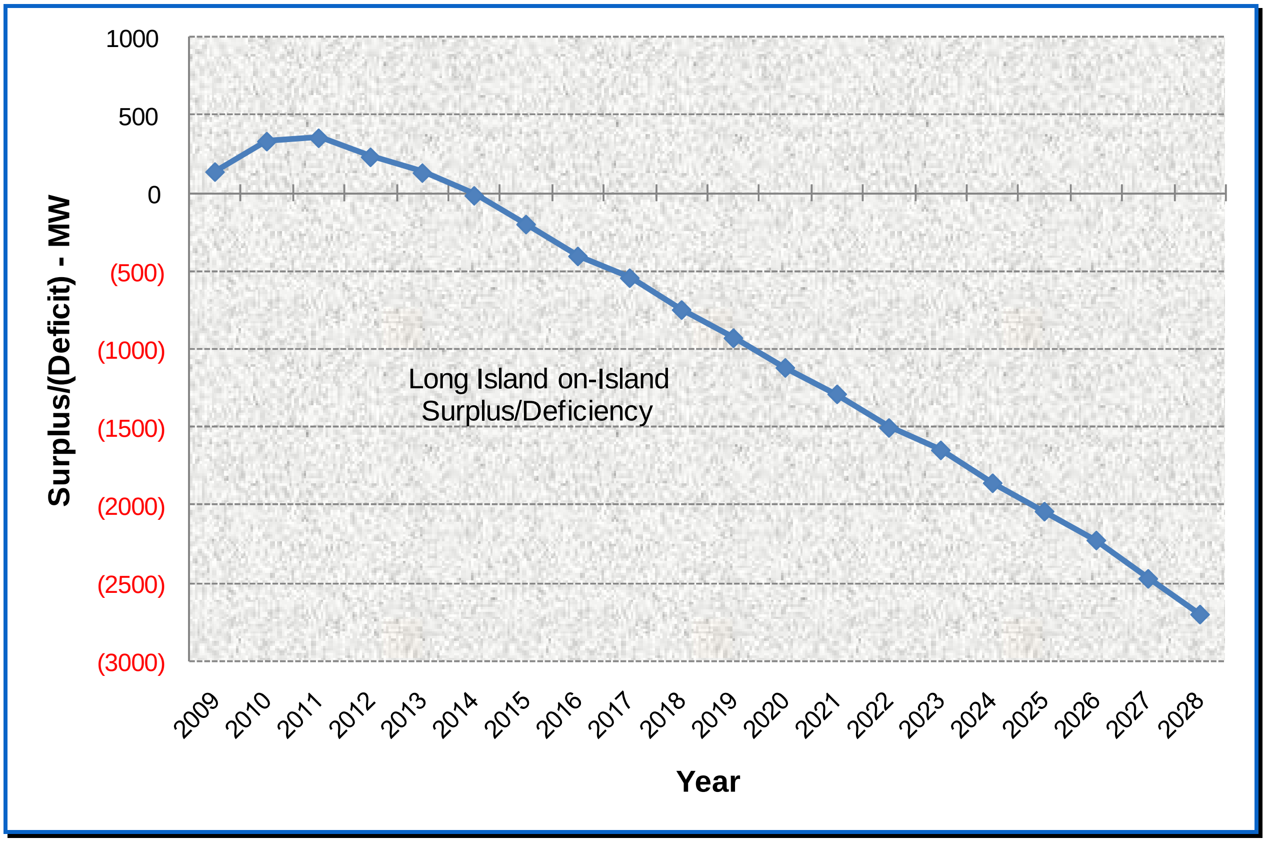
Exhibit 7-10 Probability Table – Long Island On-Island ICAP Resource Requirements (MW)

Year>>	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
95%	(28)	71	89	(12)	(158)	(309)	(464)	(763)	(879)	(1075)	(1341)	(1531)	(1823)	(1939)	(2066)	(2352)	(2617)	(2785)	(3049)	(3376)
90%	41	194	207	99	0	(166)	(356)	(585)	(734)	(943)	(1163)	(1337)	(1547)	(1709)	(1849)	(2149)	(2347)	(2548)	(2812)	(3063)
85%	101	281	280	172	67	(83)	(251)	(471)	(612)	(841)	(1042)	(1203)	(1366)	(1609)	(1730)	(1978)	(2196)	(2387)	(2654)	(2870)
80%	139	334	356	234	132	(14)	(198)	(403)	(543)	(747)	(928)	(1119)	(1289)	(1505)	(1648)	(1859)	(2042)	(2227)	(2474)	(2703)
75%	179	377	397	296	189	38	(126)	(350)	(482)	(693)	(849)	(1005)	(1171)	(1409)	(1552)	(1761)	(1950)	(2150)	(2319)	(2519)
70%	209	432	437	340	240	71	(80)	(272)	(403)	(606)	(776)	(952)	(1093)	(1294)	(1458)	(1640)	(1826)	(2035)	(2162)	(2399)
65%	241	460	472	379	287	100	(17)	(221)	(313)	(535)	(697)	(880)	(1031)	(1190)	(1377)	(1580)	(1746)	(1946)	(2072)	(2290)
60%	269	495	505	412	336	156	23	(159)	(253)	(449)	(619)	(818)	(965)	(1102)	(1285)	(1515)	(1646)	(1865)	(1998)	(2201)
55%	301	524	542	448	375	201	64	(103)	(209)	(388)	(564)	(757)	(890)	(1041)	(1217)	(1437)	(1581)	(1775)	(1907)	(2102)
50%	331	553	579	491	414	255	110	(56)	(151)	(334)	(491)	(683)	(841)	(967)	(1123)	(1357)	(1493)	(1704)	(1840)	(2017)
45%	362	577	613	533	448	311	169	(10)	(115)	(289)	(428)	(609)	(767)	(878)	(1047)	(1301)	(1433)	(1622)	(1764)	(1956)
40%	387	623	643	572	481	354	213	33	(77)	(209)	(371)	(548)	(702)	(816)	(989)	(1193)	(1363)	(1552)	(1682)	(1855)
35%	420	656	677	606	544	410	266	87	(40)	(146)	(304)	(476)	(639)	(768)	(908)	(1119)	(1285)	(1456)	(1616)	(1774)
30%	451	704	721	645	601	456	307	153	28	(99)	(232)	(415)	(562)	(689)	(822)	(1057)	(1185)	(1387)	(1523)	(1645)
25%	500	751	762	673	637	506	362	197	88	(32)	(179)	(335)	(474)	(615)	(738)	(973)	(1099)	(1250)	(1456)	(1545)
20%	538	804	806	710	692	559	420	243	155	32	(117)	(229)	(406)	(541)	(661)	(882)	(997)	(1144)	(1338)	(1421)
15%	585	858	852	753	749	623	517	316	246	103	(33)	(102)	(263)	(444)	(544)	(712)	(879)	(1012)	(1232)	(1290)
10%	645	907	919	820	837	705	590	483	355	210	105	(19)	(151)	(305)	(377)	(581)	(748)	(817)	(1044)	(1095)
5%	747	966	1020	961	947	815	714	606	511	359	291	95	59	(93)	(177)	(366)	(507)	(635)	(851)	(917)

Exhibit 7-11 shows the probability weighted NYISO Long Island Locational requirement which evaluates the ability of all Long Island qualified resources[1] to meet the Long Island locational requirements[2]. This graph shows that at the 80% confidence level Long Island will exceed the minimum requirement in all years through 2013. The margin above the minimum requirement can be used to meet the statewide requirement. New resources located on Long Island are needed starting in 2014.

In the past, LIPA's assessment of the Long Island market indicated that investors were unlikely to invest on a speculative basis to supply the Long Island electric capacity market without long term power supply contracts. As a result, LIPA has negotiated long term contracts to assure adequate supply for its customers. LIPA expects that long term contracts will continue to be needed in the future.

Exhibit 7-11 Long Island On-Island ICAP Resource Requirements (MW) - 80% Confidence



LIPA Locational Requirement

Exhibit 7-12 shows the probability weighted NYISO LIPA Locational requirement which evaluates the ability of Long Island qualified resources under contract to LIPA to meet the LIPA locational requirements.

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1 Off-Island resources delivered over a dedicated merchant transmission line can be qualified as Long Island resources.

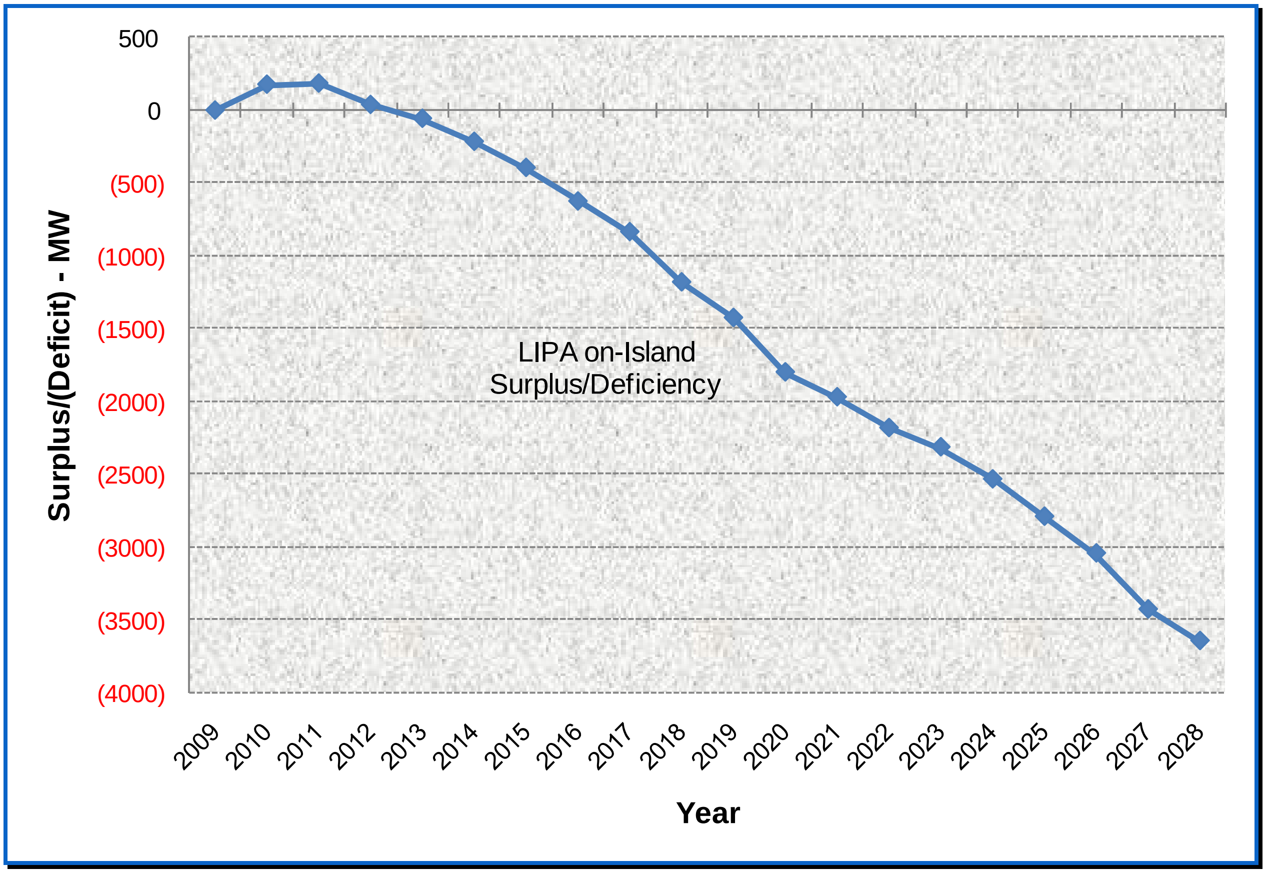
2 The Long Island requirement includes municipal utility loads (Freeport, Greenport, and Rockville Centre) as well as LIPA's direct resources. All resources available to the Long Island capacity market are included in the analysis.

Exhibit 7-12 Probability Table – LIPA On-Island ICAP Resource Requirements (MW)

Year>>	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
95%	(181)	(73)	(86)	(211)	(353)	(514)	(665)	(981)	(1173)	(1498)	(1841)	(2209)	(2503)	(2603)	(2719)	(3015)	(3344)	(3600)	(4002)	(4312)
90%	(104)	35	24	(105)	(194)	(375)	(555)	(807)	(1026)	(1377)	(1671)	(2022)	(2225)	(2397)	(2517)	(2805)	(3085)	(3364)	(3788)	(4029)
85%	(46)	123	104	(24)	(127)	(297)	(450)	(691)	(906)	(1271)	(1547)	(1896)	(2052)	(2287)	(2408)	(2634)	(2933)	(3201)	(3625)	(3835)
80%	(5)	173	181	34	(61)	(220)	(399)	(630)	(840)	(1185)	(1430)	(1804)	(1975)	(2187)	(2319)	(2539)	(2796)	(3048)	(3433)	(3650)
75%	27	223	220	95	(1)	(171)	(331)	(577)	(776)	(1131)	(1360)	(1701)	(1864)	(2098)	(2232)	(2449)	(2696)	(2966)	(3288)	(3495)
70%	61	263	259	141	43	(141)	(283)	(496)	(698)	(1043)	(1291)	(1640)	(1780)	(1981)	(2139)	(2335)	(2570)	(2872)	(3142)	(3364)
65%	100	302	295	178	92	(108)	(221)	(445)	(617)	(972)	(1206)	(1574)	(1722)	(1879)	(2071)	(2260)	(2500)	(2760)	(3050)	(3262)
60%	127	326	325	207	135	(53)	(189)	(388)	(555)	(890)	(1134)	(1509)	(1661)	(1794)	(1972)	(2202)	(2394)	(2693)	(2988)	(3180)
55%	149	358	364	242	181	(3)	(145)	(335)	(517)	(831)	(1073)	(1447)	(1590)	(1734)	(1900)	(2120)	(2332)	(2613)	(2892)	(3086)
50%	183	382	397	291	215	41	(92)	(287)	(454)	(773)	(1015)	(1383)	(1542)	(1667)	(1819)	(2042)	(2255)	(2531)	(2824)	(2993)
45%	203	407	430	327	251	103	(40)	(242)	(421)	(734)	(940)	(1308)	(1475)	(1575)	(1737)	(1990)	(2182)	(2458)	(2744)	(2936)
40%	240	452	461	367	281	138	6	(195)	(382)	(657)	(892)	(1243)	(1400)	(1520)	(1686)	(1881)	(2122)	(2386)	(2670)	(2841)
35%	273	488	496	395	339	198	55	(140)	(352)	(600)	(829)	(1184)	(1339)	(1463)	(1603)	(1811)	(2047)	(2295)	(2615)	(2760)
30%	305	530	533	440	404	246	96	(76)	(275)	(547)	(752)	(1116)	(1272)	(1389)	(1521)	(1752)	(1951)	(2220)	(2515)	(2633)
25%	347	585	574	469	434	292	148	(38)	(223)	(471)	(705)	(1047)	(1177)	(1319)	(1436)	(1673)	(1872)	(2089)	(2449)	(2542)
20%	378	629	623	501	485	343	203	10	(149)	(418)	(652)	(927)	(1109)	(1240)	(1358)	(1575)	(1771)	(1984)	(2341)	(2422)
15%	427	679	667	552	546	404	304	81	(68)	(351)	(555)	(815)	(977)	(1148)	(1252)	(1421)	(1647)	(1865)	(2230)	(2285)
10%	496	730	732	616	631	490	374	238	41	(244)	(429)	(723)	(865)	(1016)	(1082)	(1281)	(1522)	(1667)	(2033)	(2100)
5%	583	800	832	756	738	591	500	369	188	(102)	(249)	(631)	(640)	(817)	(885)	(1060)	(1278)	(1496)	(1853)	(1933)

Exhibit 7-13 shows that at the 80% confidence level LIPA will exceed the minimum requirement in 2011 and 2012. The margin above the minimum requirement can be used to meet the statewide requirement. LIPA needs to contract for new resources located on Long Island starting in 2013.

Exhibit 7-13 LIPA On-Island ICAP Resource Requirements (MW) - 80% Confidence



Long Island OPCAP Requirement

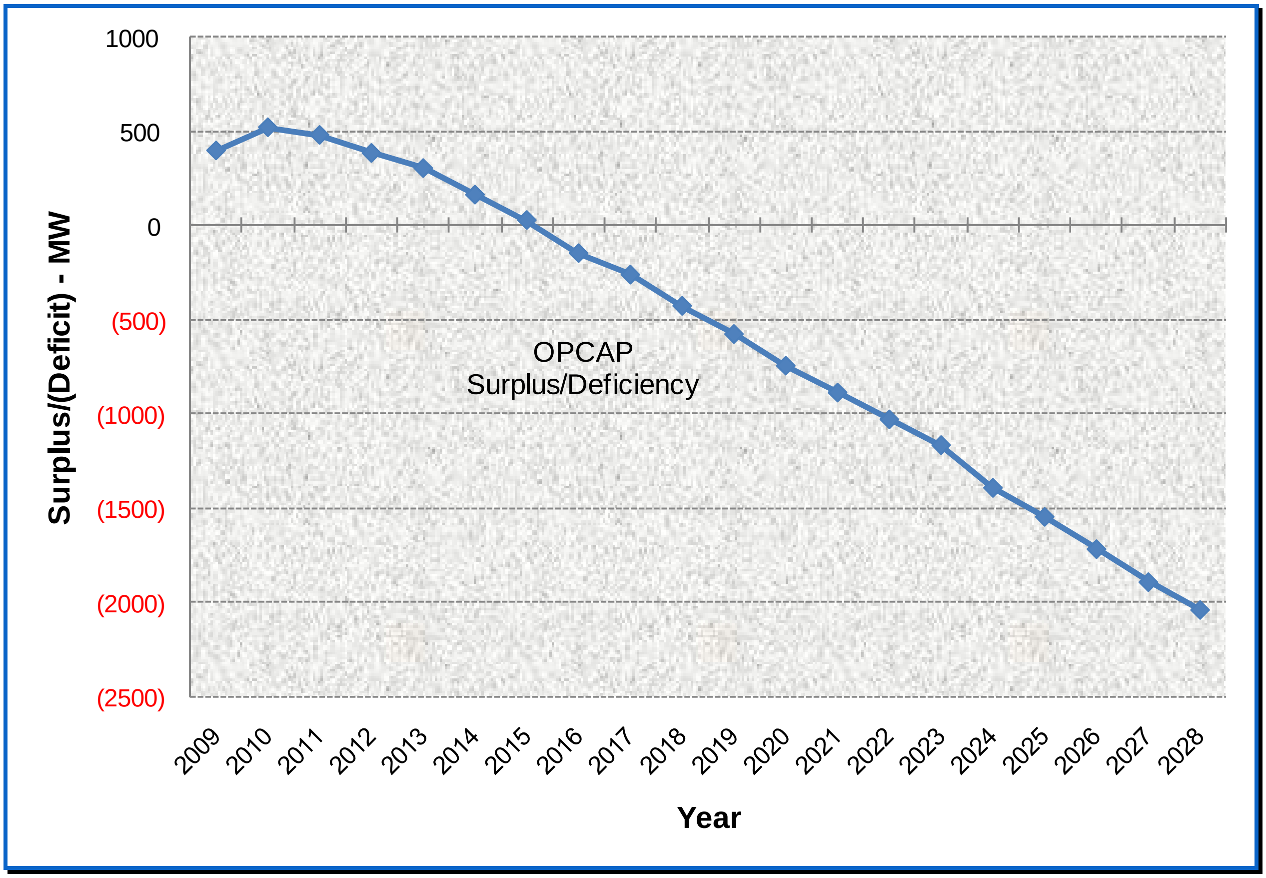
Exhibit 7-14 shows the probability weighted OPCAP requirement which evaluates the ability of Long Island to guard against the potentially severe consequences of a major contingency such as the loss of a large generator or transmission intertie, occurring over a long period of time.

Exhibit 7-14 Probability Table – OPCAP Resource Requirements (MW)

Year>>	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
95%	23	133	120	14	(41)	(197)	(339)	(523)	(638)	(834)	(984)	(1165)	(1311)	(1482)	(1629)	(1847)	(2007)	(2168)	(2361)	(2547)
90%	88	219	223	108	43	(113)	(259)	(416)	(559)	(732)	(887)	(1063)	(1211)	(1382)	(1521)	(1741)	(1898)	(2086)	(2270)	(2422)
85%	149	277	278	153	88	(51)	(212)	(380)	(501)	(680)	(833)	(1001)	(1145)	(1305)	(1456)	(1682)	(1826)	(2005)	(2191)	(2361)
80%	196	338	306	191	126	(6)	(164)	(340)	(449)	(627)	(781)	(953)	(1101)	(1266)	(1416)	(1630)	(1772)	(1957)	(2126)	(2313)
75%	227	377	345	234	158	32	(128)	(300)	(424)	(588)	(733)	(911)	(1055)	(1213)	(1358)	(1580)	(1734)	(1911)	(2089)	(2254)
70%	267	405	373	272	196	57	(96)	(258)	(385)	(545)	(714)	(869)	(1019)	(1172)	(1315)	(1524)	(1696)	(1862)	(2043)	(2196)
65%	296	429	392	299	228	85	(52)	(236)	(356)	(514)	(670)	(832)	(974)	(1141)	(1275)	(1493)	(1657)	(1813)	(1989)	(2163)
60%	330	460	427	329	252	114	(32)	(216)	(317)	(487)	(636)	(801)	(951)	(1098)	(1242)	(1463)	(1609)	(1787)	(1950)	(2119)
55%	368	489	452	350	275	136	(3)	(184)	(294)	(460)	(610)	(776)	(927)	(1065)	(1203)	(1431)	(1579)	(1752)	(1926)	(2081)
50%	395	518	477	382	301	161	26	(150)	(264)	(429)	(578)	(746)	(889)	(1031)	(1168)	(1394)	(1548)	(1720)	(1895)	(2042)
45%	440	543	502	409	342	191	54	(122)	(235)	(392)	(555)	(709)	(850)	(1012)	(1137)	(1361)	(1514)	(1688)	(1845)	(2015)
40%	463	572	533	435	365	211	83	(98)	(209)	(362)	(519)	(682)	(822)	(974)	(1112)	(1320)	(1486)	(1658)	(1812)	(1984)
35%	499	602	563	463	387	248	116	(69)	(169)	(325)	(478)	(646)	(793)	(941)	(1068)	(1279)	(1442)	(1616)	(1775)	(1935)
30%	537	632	592	487	423	281	153	(29)	(140)	(299)	(448)	(607)	(756)	(907)	(1039)	(1242)	(1403)	(1570)	(1725)	(1894)
25%	583	668	621	518	457	318	177	2	(102)	(258)	(419)	(572)	(719)	(871)	(990)	(1205)	(1361)	(1521)	(1685)	(1855)
20%	613	707	659	554	486	351	216	33	(68)	(228)	(366)	(535)	(664)	(829)	(959)	(1163)	(1313)	(1464)	(1626)	(1803)
15%	677	747	691	599	536	398	269	75	(18)	(179)	(322)	(478)	(623)	(758)	(905)	(1105)	(1259)	(1420)	(1579)	(1740)
10%	729	788	733	645	581	440	321	154	59	(124)	(248)	(420)	(566)	(694)	(832)	(1037)	(1182)	(1346)	(1516)	(1688)
5%	812	865	812	729	650	542	387	246	127	(48)	(156)	(321)	(466)	(624)	(759)	(931)	(1080)	(1244)	(1440)	(1579)

Exhibit 7-15 graph shows that at the 50% confidence level LIPA will exceed the minimum requirement in all years through 2015. Starting in 2016 LIPA will need to obtain additional resources to meet this requirement.

Exhibit 7-15 OPCAP Resource Requirements (MW) - 50% Confidence



Summary of Need Dates

Exhibit 7-16 summarizes the initial year of need and the megawatt magnitude of that need under the alternative planning criteria studied.

Exhibit 7-16 Probabilistic Resource Requirements Comparison (MW) – Reference Need Case

Planning Criteria	Initial Year of Need	Megawatts Needed
LIPA Statewide	2009	248
Long Island on-Island	2014	14
LIPA on-Island	2013	61
OPCAP	2016	150

The next section of this report takes a look at the implications of ELI on the magnitude and timing of LIPA's resource needs.

7.3 Resource Sensitivity Analysis – ELI Sensitivity Need Analysis

The resource sensitivity analysis discussed in section 7.1 and 7.2 assumes that no new resources are added to the system. However, LIPA's trustees authorized development of the Efficiency Long Island (ELI) program and the trustees have funded the first year of this program. This section addresses the sensitivity of the foregoing need analysis assuming the ELI program is implemented.

7.3.1 Probabilistic Modeling and Results Including ELI Impacts

For the 2009 to 2018 Electric Resource Plan, two criteria drive LIPA's resource planning decisions.

- NYISO ICAP Reserve Margin Requirements for LIPA,
- NYISO "Zone K" Locational ICAP Requirements for Long Island, and

Results of the probabilistic analysis are presented only for these two criteria.

LIPA Statewide IRM Requirement – ELI Sensitivity

Exhibit 7-17 shows the probabilistic resource requirement results for the LIPA statewide ICAP criteria including ELI impacts.

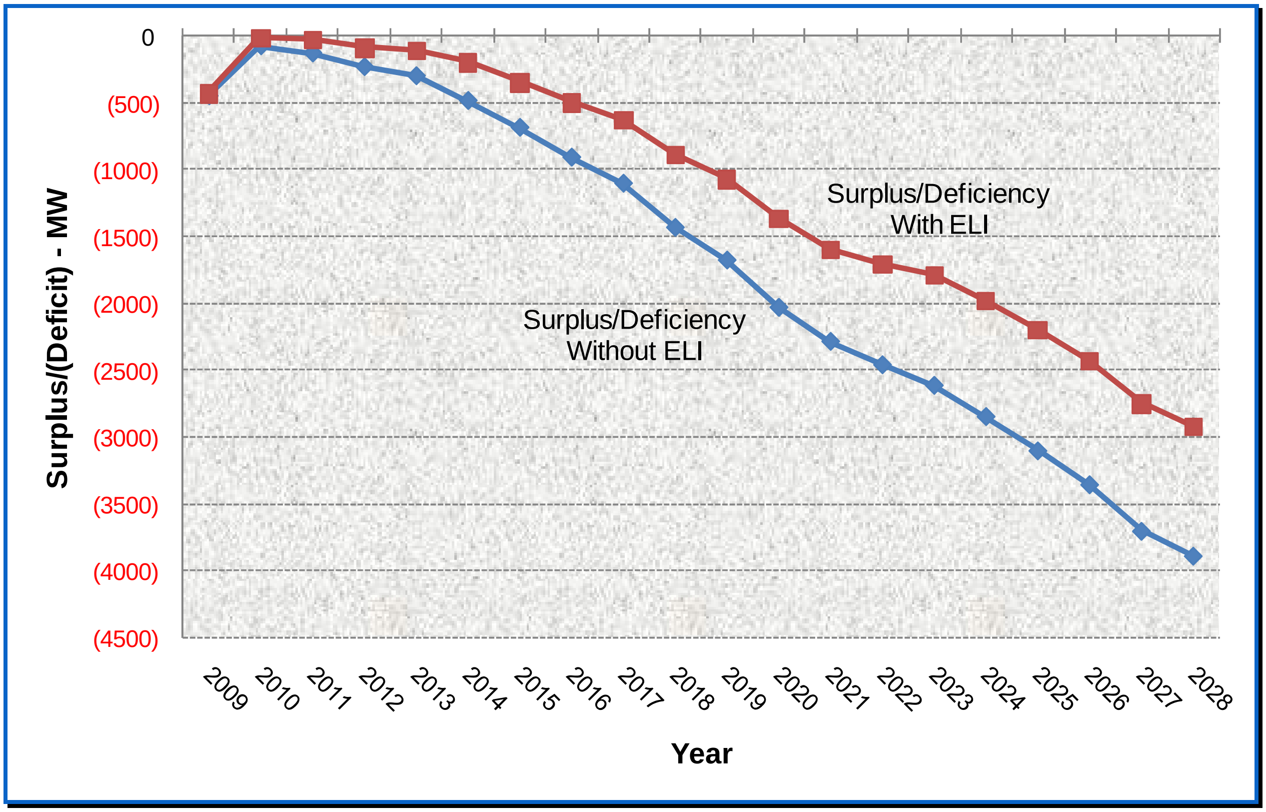
Exhibit 7-17 Probability Table – LIPA Statewide ICAP Resource Requirements

Year>>	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
95%	(815)	(496)	(416)	(526)	(526)	(641)	(805)	(964)	(1132)	(1418)	(1627)	(1906)	(2158)	(2341)	(2412)	(2576)	(2804)	(3087)	(3421)	(3546)
90%	(721)	(387)	(332)	(422)	(446)	(547)	(699)	(880)	(1000)	(1295)	(1494)	(1811)	(2035)	(2187)	(2269)	(2481)	(2659)	(2925)	(3283)	(3426)
85%	(673)	(316)	(281)	(373)	(385)	(498)	(639)	(795)	(928)	(1232)	(1390)	(1748)	(1960)	(2092)	(2161)	(2385)	(2591)	(2839)	(3197)	(3355)
80%	(624)	(255)	(247)	(329)	(331)	(440)	(590)	(739)	(889)	(1159)	(1338)	(1666)	(1852)	(1998)	(2095)	(2317)	(2533)	(2762)	(3093)	(3246)
75%	(591)	(221)	(207)	(276)	(288)	(412)	(536)	(688)	(847)	(1105)	(1287)	(1584)	(1799)	(1941)	(2035)	(2241)	(2450)	(2691)	(3028)	(3207)
70%	(549)	(170)	(168)	(235)	(243)	(355)	(500)	(639)	(797)	(1051)	(1241)	(1528)	(1759)	(1885)	(1973)	(2165)	(2398)	(2631)	(2962)	(3147)
65%	(515)	(130)	(137)	(207)	(205)	(323)	(465)	(611)	(749)	(1009)	(1200)	(1483)	(1712)	(1847)	(1928)	(2120)	(2348)	(2583)	(2916)	(3086)
60%	(486)	(93)	(97)	(174)	(177)	(280)	(426)	(587)	(713)	(971)	(1153)	(1446)	(1675)	(1789)	(1885)	(2073)	(2295)	(2535)	(2859)	(3027)
55%	(460)	(51)	(66)	(135)	(143)	(246)	(384)	(548)	(666)	(927)	(1114)	(1409)	(1642)	(1746)	(1843)	(2023)	(2252)	(2481)	(2806)	(2979)
50%	(432)	(18)	(34)	(89)	(113)	(202)	(349)	(501)	(633)	(888)	(1074)	(1368)	(1601)	(1705)	(1787)	(1985)	(2197)	(2432)	(2752)	(2922)
45%	(394)	15	(12)	(64)	(84)	(176)	(320)	(460)	(595)	(855)	(1030)	(1335)	(1548)	(1670)	(1747)	(1928)	(2158)	(2389)	(2717)	(2884)
40%	(369)	52	21	(40)	(45)	(136)	(278)	(412)	(553)	(811)	(980)	(1300)	(1510)	(1622)	(1708)	(1893)	(2114)	(2344)	(2663)	(2828)
35%	(332)	76	67	1	1	(103)	(246)	(383)	(518)	(769)	(930)	(1260)	(1451)	(1579)	(1670)	(1850)	(2057)	(2309)	(2625)	(2768)
30%	(298)	112	103	38	40	(69)	(214)	(340)	(485)	(736)	(894)	(1219)	(1418)	(1537)	(1625)	(1785)	(2013)	(2270)	(2570)	(2707)
25%	(253)	154	141	83	87	(41)	(177)	(304)	(437)	(687)	(838)	(1186)	(1368)	(1486)	(1572)	(1740)	(1958)	(2197)	(2508)	(2664)
20%	(210)	194	180	131	123	(3)	(127)	(253)	(370)	(645)	(808)	(1131)	(1305)	(1412)	(1535)	(1692)	(1910)	(2160)	(2455)	(2584)
15%	(156)	241	226	172	175	73	(52)	(186)	(307)	(569)	(746)	(1074)	(1231)	(1346)	(1480)	(1637)	(1827)	(2078)	(2381)	(2523)
10%	(82)	336	290	245	221	133	13	(111)	(240)	(490)	(679)	(997)	(1145)	(1247)	(1372)	(1534)	(1730)	(1963)	(2270)	(2386)
5%	(7)	416	383	349	330	218	113	7	(149)	(380)	(556)	(837)	(1045)	(1110)	(1226)	(1375)	(1609)	(1839)	(2131)	(2294)

Exhibit 7-18 compares LIPA resource requirements on a statewide, 50% confidence level basis. The blue line represents resource requirements without ELI just as in the previous section of this report and the red line presents the requirements after ELI is added.

Including ELI, LIPA still does not currently have sufficient contracted resources to meet its requirements in any year of the study period. However, the need for additional resources in 2009 has been reduced by 17 MW to 432 MW and the 2028 need has been reduced by a significant 969 MW to 2922 MW.

Exhibit 7-18 LIPA Statewide ICAP Resource Requirements - 50% Confidence



Long Island Locational Criteria – ELI Sensitivity

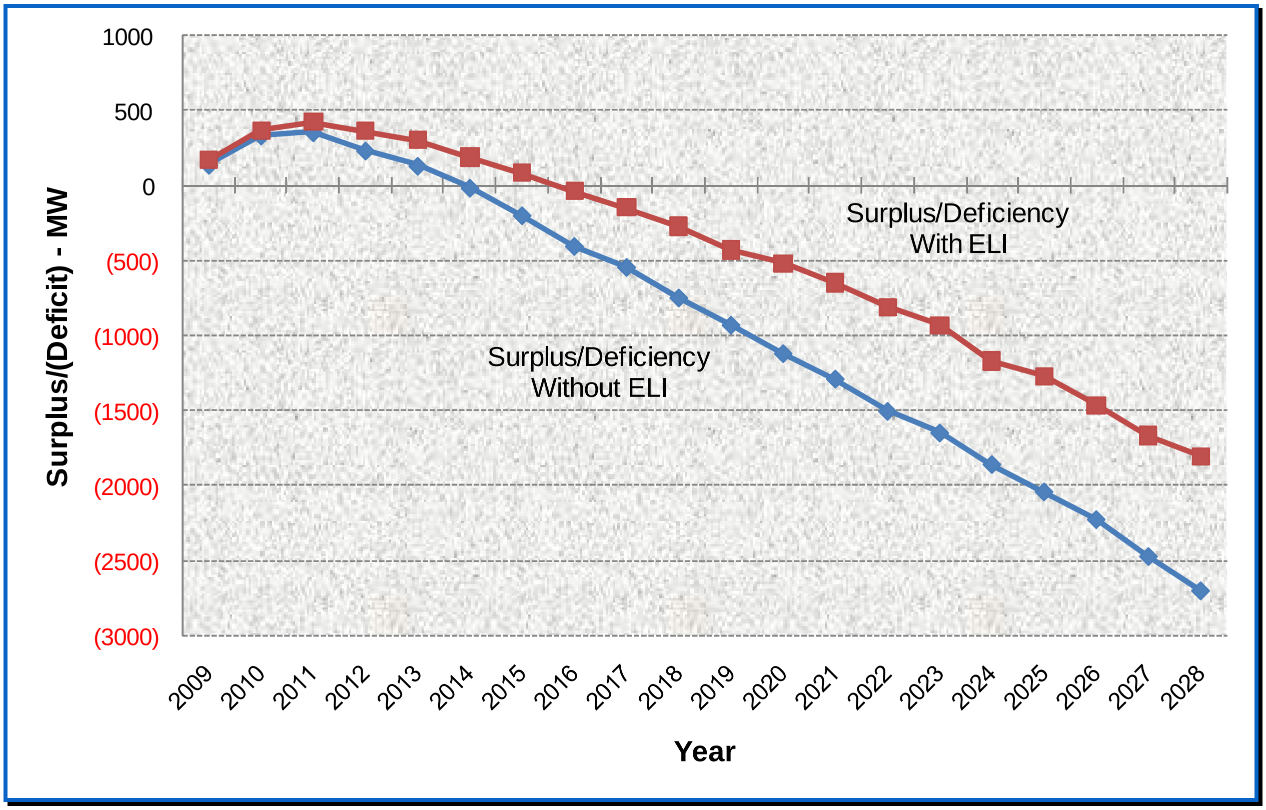
Exhibit 7-19 shows the probabilistic resource requirement results for the Long Island on-Island ICAP criteria. As previously discussed, for this criterion LIPA plans to an 80% confidence level in order to ensure an adequate level of resources are available to meet Long Island's requirements.

Exhibit 7-19 Probability Table – Long Island On-Island ICAP Resource Requirements

Year>>	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
95%	8	118	220	95	75	(86)	(222)	(382)	(449)	(645)	(822)	(1025)	(1067)	(1287)	(1411)	(1603)	(1778)	(2001)	(2162)	(2428)
90%	71	262	293	231	173	41	(73)	(247)	(309)	(456)	(633)	(781)	(881)	(1044)	(1147)	(1445)	(1511)	(1752)	(1924)	(2099)
85%	136	326	362	300	232	99	12	(127)	(206)	(365)	(512)	(622)	(722)	(934)	(1031)	(1299)	(1417)	(1569)	(1777)	(1963)
80%	170	369	424	363	307	191	88	(38)	(143)	(269)	(429)	(518)	(646)	(811)	(929)	(1171)	(1274)	(1466)	(1666)	(1804)
75%	201	393	461	399	360	245	140	20	(77)	(196)	(336)	(430)	(565)	(704)	(811)	(1054)	(1132)	(1358)	(1541)	(1698)
70%	227	436	511	447	415	315	202	80	(25)	(132)	(251)	(354)	(494)	(625)	(750)	(953)	(1046)	(1254)	(1432)	(1585)
65%	248	483	549	480	467	366	265	134	26	(78)	(151)	(293)	(438)	(554)	(663)	(851)	(974)	(1145)	(1335)	(1483)
60%	290	525	586	523	498	419	316	170	75	(4)	(104)	(241)	(370)	(459)	(601)	(792)	(889)	(1026)	(1237)	(1392)
55%	315	576	622	561	523	468	371	237	136	71	(52)	(167)	(292)	(387)	(514)	(689)	(815)	(965)	(1118)	(1288)
50%	341	604	656	600	570	512	405	275	221	127	14	(66)	(248)	(315)	(455)	(610)	(747)	(880)	(1021)	(1195)
45%	371	645	687	634	604	540	458	329	273	186	92	(17)	(176)	(243)	(370)	(524)	(679)	(806)	(953)	(1114)
40%	402	682	722	666	639	574	494	386	342	216	140	29	(115)	(180)	(292)	(422)	(601)	(718)	(875)	(1030)
35%	424	715	750	696	696	625	541	430	400	278	212	75	(53)	(117)	(235)	(337)	(522)	(652)	(773)	(897)
30%	450	746	788	742	745	682	604	492	464	354	281	120	8	(39)	(138)	(255)	(437)	(547)	(670)	(808)
25%	487	784	826	797	782	734	657	551	514	414	344	179	116	27	(48)	(183)	(341)	(441)	(596)	(714)
20%	529	820	876	839	836	798	730	612	581	500	412	274	196	111	17	(77)	(240)	(362)	(504)	(602)
15%	588	878	921	918	913	840	805	679	676	576	504	414	295	191	166	24	(96)	(216)	(391)	(471)
10%	639	940	988	991	986	920	872	806	793	687	671	554	433	339	297	120	26	(89)	(198)	(328)
5%	729	1032	1088	1129	1164	1066	1000	974	928	909	804	691	658	531	517	357	225	138	40	(98)

Exhibit 7-20 compares Long Island on-Island resource requirements on an 80% confidence level basis. Including ELI, Long Island's initial need for additional resources is deferred for two years from 2014 to 2016. The overall need in 2028 is reduced by a significant 899 MW to 1804 MW.

Exhibit 7-20 Long Island On-Island ICAP Resource Requirements - 80% Confidence



In summary, ELI significantly reduces the need for additional resources on Long Island. The initial year of need is deferred by two years to 2016 and the overall need for additional resources is reduced by nearly 900 MW by the year 2028.

7.4 Conclusions

As described earlier, the probabilistic assessment was developed by identifying key variables that drive the need for future resources, capturing the range of possible outcomes for those variables within defined distributions, and analyzing the impact they can have on the final results.

A very high confidence level indicates the resource requirements that must be met in order to be very certain all worst case contingencies are satisfied. Conversely, a very low confidence level identifies the minimum planning requirements necessary to meet just a few of the possible outcomes. Achieving the lower confidence level would be far easier and less costly to achieve, but would also result in a much higher risk profile for LIPA's customers since a significant number of possible outcomes would not be accounted for in the resource plan.

The appropriate planning level is dependent upon the cost of achieving the higher level of confidence vs. the cost of failing to meet the requirement. As a result, LIPA has selected the 80% confidence level for