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# New York Power Authority

## High Efficiency Lighting Program

### Profile #17, 1992

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# Executive Summary

As "the Chairman's baby," the New York Power Authority's (NYPA) High Efficiency Lighting Program (HELP) is one of the most aggressive programs of its kind. NYPA began the program in June 1990 for its retail customers in Southeast New York (SENY). Now the program has been expanded to government facilities statewide, and to schools on Long Island, New York.

To date, in the SENY region alone, over one hundred million dollars have been committed to the program and annual energy savings achieved to date with gross expenditures of \$15.7 million are 40.5 GWh and 8.7 MW. When all SENY projects in various stages of completion are considered, the total cost (NYPA's share plus the customer's share) of more than \$55 million, will result in annual energy savings of 151 GWh and 30.9 MW.

NYPA's HELP is a turnkey program that is offered to NYPA customers, to government facilities, and to schools on Long Island at no risk and with no cash outlay. In addition to providing consulting services for customers to analyze lighting loads and potentials for energy efficiency, NYPA will guarantee a three-year payback on its retrofits and will finance entire retrofits through its Conservation Loan Bank. Loan payments are recouped through customers' monthly bills. NYPA oversees the whole job from start to finish, from audit to installation and inspection, providing the customer with a high degree of service.

To date, the Power Authority has burst beyond its initial projections for the program for both savings and expenditures. Sixteen months into the program, over 50% of the five-year SENY budget was committed and over 50% of the five-year projected savings were identified through about 140 facility audits. By June 1990, SENY audits had identified 32 MW and associated energy savings of 157 GWh annually with an associated project cost of \$53 million. These installations will be complete by the end of 1993. To date over \$25 million has been formally committed to the project representing 85 retrofits that will save 17 MW and 80 GWh annually. [R#10]

The statewide HELP program, which began in earnest in June 1991, has also logged impressive results. As of September 1992 audits had been performed at 45 facilities and 14 MW of peak demand and 60 GWh of annual savings potential had been identified at a total project cost (including investor-owned utilities' rebates) of \$20 million. The Long Island School program is also on track, having begun in January 1992, with 70 facilities audited revealing savings of 6 MWp and 14 GWh at a cost of more than \$9 million.

## High Efficiency Lighting Program (HELP)

Utility: New York Power Authority  
Sector: Commercial  
Measures: Comprehensive lighting retrofits: fixtures, lamps, ballasts, occupancy sensors, etc, some HVAC.  
Mechanism: Guaranteed three-year payback; costs financed in full internally  
History: Started in 1990, expanded statewide in 1991, and to school districts on Long Island in 1992.

### Completed Projects Data

Annual energy savings: 40,492 MWh  
Lifecycle energy savings: 809,840 MWh  
Peak capacity savings: 8.7 MW  
Cost: \$15.742 million

### Active Projects Data

Cumulative energy savings: 151 GWh  
Lifecycle energy savings: 3,032 GWh  
Capacity savings: 30.9 MW  
Cost: \$55.342 million

## Conventions

For the entire 1992 profile series all dollar values have been adjusted to 1990 U.S. dollar levels unless otherwise specified. Inflation and exchange rates were derived from the U.S. Department of Labor's Consumer Price Index and the International Monetary Fund's International Financial Statistics Yearbook: 1991.

The Results Center uses three conventions for presenting program savings. **Annual savings** refer to the annualized value of increments of energy and capacity installed in a given year, or what might be best described as the first full-year effect of the measures installed in a given year. **Cumulative savings** represent the savings in a given year for all measures installed to date. **Lifecycle savings** are calculated by multiplying the annual savings by the assumed average measure lifetime. **Caution:** cumulative and lifecycle savings are theoretical values that usually represent only the technical measure lifetimes and are not adjusted for attrition unless specifically stated.

# Utility Overview

The New York Power Authority (referred to as NYPA and "the Power Authority") was created by Governor Franklin D. Roosevelt 60 years ago and has carried out its early mission, "to give back to the people the waterpower which is theirs". Now NYPA is the largest non-federal, public power organization in the nation, supplying almost a quarter of all of New York State's electricity, fully 36.2 billion kilowatt-hours in 1991! [R#1]

**"We've been a maverick since day one. We're one of the few utilities in the nation without a designated franchise area. Yet more people get public power in New York than in any other state in the union."**  
Chairman Richard M. Flynn [R#1]

The New York Power Authority's mission is to furnish the people of New York State with lower-cost electricity. It sells this energy to designated companies and State facilities, to investor-owned utilities for resale without profit to their customers, and to authorized public agencies and publicly-owned utilities. Thousands of government facilities in the State receive NYPA's low cost power – from subways and commuter trains to schools, government offices, and hospitals. More than 100,000 jobs in the state depend on NYPA's "preference" power. A nonprofit, public-benefit energy corporation, the Power Authority does not use tax revenues or state funds or credit. It finances construction of its projects through bond sales to private investors and repays the bonds with proceeds from operations. [R#1]

NYPA is the largest state-owned electric utility and was formed by an act of the New York legislature in 1931. While NYPA is primarily a wholesaler of electric power, it operates about 6,850 MW of generating capability, primarily hydroelectricity, but also two nuclear plants, a pumped storage hydroelectricity facility, and one fossil-fueled power plant in Astoria-Queens, New York. NYPA also has five small hydro generating facilities with a combined output of just under 30 MW. NYPA currently operates more than 1,400 circuit miles of bulk transmissions lines throughout the state, making NYPA the dominant transmission company in the state. This has facilitated power exchanges with both Ontario and Quebec, Canada. NYPA's primary wholesale customers include the State's seven investor-owned utilities, and 51 municipal and cooperatively-owned electricity utilities for which NYPA services as both a power supplier and regulator. Retail sales are limited to direct service industrial customer (many of in the Niagara region) and public institutions in the metropolitan area of New York City. In no instances does the Power Authority sell directly to residential customers.

## NYPA 1991 STATISTICS

Number of Customers	166
Energy Sales	36,200 GWh
Energy Sales Revenue	\$872 million
Net Rated Output	6,875 MW
<b>Price Ranges for Power and Energy *</b>	
Niagara/St. Lawrence	0.30 - 0.33 ¢/kWh
St. Lawrence-FDR	0.30 - 1.0 ¢/kWh
Blenheim-Gilboa	1.0 ¢/kWh
Fitzpatrick Plant	1.70 - 2.12 ¢/kWh
Poletti/Indian Point 3	2.64 - 6.44 ¢/kWh

\* Rates vary by customer type, season, and time of production; energy charges are in addition to demand charges which range from \$1.00/kWh/month to \$13.40/kWh/month

Despite the fact that NYPA is the largest utility in New York in terms of power sales, it has the lowest fossil-fuel dependency and relies on fossil fuels for only 8% of its energy. In 1991, NYPA sold 36.2 billion kWh of electricity, supplying 24% of the State's needs. Of the total sales, 34.4 billion kWh was generated by Power Authority facilities and the remainder was purchased from other sources. Hydroelectricity accounts for 21.1 billion kWh, or 61% of the output, 10.7 billion kWh or 31% is generated at NYPA's two nuclear reactors, and natural gas and oil-fired generation provides 2.6 billion kWh or 8% of total generation. In addition to providing a variety of in-state users with low cost power, NYPA sold 2.2 billion kWh in 1991 to Canada (Ontario and Quebec) and to neighboring states.

## NYPA'S RATES/PREFERENCE POWER

Each power plant has its own set of customers (which of course can overlap) and its own rates. NYPA's rate structure thus is very complex. The most desired power, or the highest order of "preference power", is the system's least cost and comes from NYPA's hydro facilities, at Niagara Falls and further east on the St. Lawrence. A few years ago NYPA celebrated the 30th anniversary of the Niagara project, a project which required massive construction, became an engineering marvel, and which had massive economic implications for the entire region.

# Utility DSM Overview

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Phil Pellegrino, Vice President for Power Sales and Rates, noted in a presentation in 1991 that "about five years ago we began smelling the cheese." What Pellegrino was referring to was a remark made by the Chairman of the New England Electric System, John Rowe, when he noted that utilities will invest in demand-side management when it is their most profitable course of action. Like a rat smelling the cheese, NYPA "woke up" to the profitability of DSM. For NYPA, providing DSM, or energy services, is the least cost, most beneficial way of providing reliable electricity for the benefit of the people of New York State.[R#3]

To help assure that Empire State citizens save money the Power Authority unveiled an energy efficiency program "like no other" in June 1990. By the year 2001, it expects to trim 170 MW from electricity needs for about \$350 million, less money than building a plant with comparable capacity.[R#10]

**"Conservation is a major priority at the Power Authority. Improved conservation benefits not only our customers, but our environment as well. It's the most economical way to meet our energy needs."**  
Richard M. Flynn, Chairman.

Like many utilities NYPA is working on refining their DSM efforts. In the HELP program NYPA is providing a direct installation approach, but at the same time it requires customers to pay an amount comparable to a three year payback. HELP and lighting have been particularly integral to the entire NYPA DSM effort. From the World Trade Center at the tip of Manhattan to northern Westchester County, the Power Authority is helping its customers install new, more efficient lighting equipment, because, as NYPA is fond of saying, "one light does make a difference." [R#2] In 1991 NYPA won an American Public Power Energy Innovator Award for SENY HELP.

## NYPA PROMOTES ENERGY CONSERVATION IN FOUR MARKETS:

1. Southeast New York area public customers get the full scale HELP program. These are retail customers that include the New York City subway system and commuter rail lines, the New York City Housing Authority, airports, bridges,

tunnels, all New York City public buildings, the World Trade Center, and various towns, villages, and school districts located in Westchester County. These loads aggregate to a peak demand of about 1,600 MW, roughly 15% of Consolidated Edison's service area load.

2. NYPA runs the "Watt Busters" program for full scale residential weatherization for municipal and cooperative customers.

3. There are some 8,000 buildings throughout the state operated by various agencies of the State of New York to which NYPA has extended its HELP initiatives. For these state facilities NYPA serves in a role akin to an energy service company (ESCO). These facilities are customers of local investor-owned utilities. NYPA provides them with a means for turnkey energy efficiency with no upfront costs.

4. School districts in the Long Island Lighting Company's service territory are eligible for HELP. NYPA assists the school districts on a first come, first serve basis, and recoups LILCO rebates where possible to lessen its financial commitment to the projects.

## OTHER DSM PROGRAMS AT NYPA

- The Watt Buster Program is a residential home energy audit and weatherization program designed for municipal electric systems in upstate New York. The Watt Buster Program is unique in its provision for free installation of recommended weatherization measures that are cost effective. The Power Authority is currently in the process of extending this program to the commercial and industrial sectors.
- The Steam Air Conditioning Rebate Program is primarily intended to discourage existing NYPA customers (who are steam customers of Consolidated Edison) from moving to the NYPA electric system for cooling requirements, upon retirement of antiquated steam absorption equipment. In July 1991, NYPA committed a rebate of \$92,000 to the City of New York based upon the anticipated installation of 400 tons of steam absorption chillers at the American Museum of Natural History.

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- The JAF Industrial Conservation Program targets the J.A. Fitzpatrick power plant's industrial customers and encourages them to install energy-efficient lighting, heating and air conditioning, and process loads. The lighting and HVAC measures are then implemented through a turnkey, direct installation process. A technical analysis will be performed for the process loads to determine efficiency improvements with either NYPA or customer implementation. Upfront financing with a 7-year recovery is then provided. Fitzpatrick power equal to the amount saved will then be relinquished for reallocation.

- The NYPA Facilities Program is designed to provide energy conservation measures at NYPA's own facilities: plants and corporate offices. Construction has been completed at the Charles Poletti power plant in 1991, with St. Lawrence, Blenheim Gilboa, and the White Plains Headquarters planned for 1992.

- The Metropolitan Transit Authority Programs will provide energy-efficient lighting for stations, tunnels, and subway cars as part of the MTA's overall capital improvements plan. These programs are currently in the pilot stages.

- The SENY New Construction Program is designed to offer energy conservation opportunities and incentives to SENY customers who are planning new construction or renovations. The program involves identifying conservation measures which can be employed in the design of electrical, HVAC, and building components of new construction and providing incentives to induce customers to include these energy-efficient measures. An agreed upon amount of program costs are to be recovered directly from participants after the related construction is complete. The remaining costs are to be recovered from the SENY rate base.

- Several programs are currently in pilot stages of evaluation to evaluate the feasibility and cost-effectiveness of various end-use conservation measures including a cool storage demonstration program, high efficiency motor demonstration, high efficiency refrigeration program, and SENY audit reports intended to facilitate the effectiveness for future DSM program designs.

**"Harnessing the potential for energy efficiency could get society off the present treadmill of ever higher financial and environmental risks and could make affordable the electric services that are vital to global development"** Phil Pellegrino, Vice President Power Sales and Rates

- Tree Power is an initiative to conserve energy and enhance the environment that was announced in September of 1991 when \$250,000 was designated to buy trees for the state's 51 municipal and rural cooperative systems over the next five years. For every tree a system purchases, the Power Authority provides a free tree. Tree purchases in 1991 resulted in 4,500 tree plantings in 32 communities.

To support the DSM programs stated above NYPA has set up a Conservation Loan Bank to assist its customers with the finance of energy efficiency retrofits. NYPA borrows short term master notes, only for public customers, using a financing vehicle set up with the Morgan Bank. The utility borrows quarterly against a preestablished maximum credit line.

#### PROJECTED EXPENDITURES AND SAVINGS

Current DSM programs have been approved for funding for \$110 million. NYPA's 10-year capital plan through the year 2000 includes a total DSM expenditure of \$320 million (unlevelized) though some of this money may originate from revolving investments in customers' retrofits and may not thus need to be reauthorized. This represents a doubling of the financial commitments made to date. [R#3] NYPA plans DSM programs for: high efficiency air conditioning, an expanded Watt Buster effort to address commercial and industrial customers, an initiative targeting "traction" customers (mass transit), and an industrial and economic development conservation program.

Through the year 2000 NYPA expects to reduce summer peak demands by about 210 MW and annual energy consumption by nearly 950 GWh. [R#3]

# Program Overview

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HELP has grown with its success, from a program focused only on NYPA's SENY customers, to government facilities in upstate New York and to schools on Long Island. This profile will present all three conceptually, and then focus specifically on SENY HELP, the most advanced of the three markets, for the remainder of the profile.

## HELP'S THREE CUSTOMER CLASSES

### 1. The Southeast New York (SENY) High Efficiency Lighting Program

The HELP program began serving New York City area public customers with an initial budget of \$41 million over a five-year period. NYPA's first installations began in the fall of 1990. By October 1, 1992 NYPA had completed 58 installations saving customers over \$3.3 million per year at a total upfront cost to NYPA of \$15.7 million. [R#7] "On average, NYPA's incentives amounts to about 61% of the total installed cost, with the remaining 39% financed upfront and then recovered from participants' bill savings. [R#10]

Within 16 months of its inception the program was well ahead of its original schedule. HELP had identified 14 megawatts of demand reduction and the program had already committed \$22 million to project costs. This was more than 50% of the five year HELP design target of 23 megawatts and the total program budget of \$41 million. Phil Pellegrino noted that, "On the basis of this experience we plan to greatly accelerate the pace of the program to maximize penetration levels." [R#3]

### 2. Statewide High Efficiency Lighting Program

Statewide HELP is a full scale program designed to fund turnkey conservation services, including lighting, HVAC, and drivepower technologies in state-owned buildings, Sites which are being evaluated include hospitals, office buildings, prisons, and universities. The Authority coordinates its program with local investor-owned utilities to take advantage of utility rebate programs, and has identified over 8,000 potential sites which would qualify for Statewide HELP. When fully implemented, expected savings from the program could reach 250 million kWh annually. [R#10]

New York State operates more than 8,000 buildings which consume 2.8 billion kWh annually at a total cost of \$140 million. These buildings house 17 different state agencies. Given the State's record budget deficits, there is renewed emphasis on reducing operating facility costs. This culminated in Executive Order #132 which requires that energy consumption in state buildings be reduced by 20% by the year 2000. In February 1991 NYPA's Trustees approved funding for the Statewide HELP for \$61 million.

Statewide HELP is expected to be complete in 1996 and will reduce annual electricity consumption in state facilities by an estimated 250 million kilowatt hours (just under ten percent overall) saving about \$12.5 million in annual electricity costs. Through fiscal year 2000, it is expected that the State will save \$40 million in operating costs after all the Authority's costs have been repaid.

### 3. HELP for Public School Districts on Long Island

For years school districts on Long Island have sought NYPA's help particularly in the form of "preference" hydro-electricity. In early 1992 HELP expanded again to be offered to school districts on Long Island. The five-year program was approved by the Authority's Trustees in February 1992. The targeted market is comprised of 127 Long Island school districts, with over 500 site buildings. When fully implemented, energy consumption would be reduced by approximately 20 percent and is expected to save about \$9 million annually in electric costs. The Authority's funds are used for the installation of state-of-the-art high efficiency lighting retrofits, and motor and HVAC DSM measures. Customers will pay for their share of the costs through monthly bill surcharges. The balance of the program costs will be recovered through LILCO's Dollars and Sense Rebate Program.

## SENY HELP IS BASED ON TWO POWERFUL MECHANISMS

- First, HELP offers cash incentives by underwriting the cost of energy-efficient lighting installation, guaranteeing a three-year payback based on lower energy consumption. For instance, if a customer replaces 100 standard fluorescent fixtures with T-8 lamps and electronic ballasts, it may cost \$8,000. In the next three years the customer saves \$6,000. The Power Authority will then pay an incentive of \$2,000 to guarantee the three-year payback for the customer.
- Second, customers may borrow the upfront costs of the retrofits from the Power Authority's Conservation Loan Bank, and then repay the money through bill savings. Thus the program guarantees a 33% return on investment and requires no upfront capital from customers. If a customer uses the Conservation Bank, NYPA levies a bill surcharge to recover the loan payments. After the two year repayments period, bill savings from the lighting conversions flow entirely to the benefit of the customer. Thus the program effectively addresses the basic aversion, or barrier, to energy efficiency retrofits: "overcoming the customer's economic inhibitions." All the NYPA customer has to do is say "yes."

# Implementation

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## MARKETING

There is no more powerful means of soliciting participation than the bold assertion made by NYPA that the utility can facilitate savings of 50-75%. Furthermore, NYPA promotes HELP by asserting that even customers who have already invested in the "first generation" of advanced lighting technologies, such as replacing incandescents with compact fluorescents, can benefit from new state-of-the-art, "third generation" lighting technologies.

NYPA has spared no expense in its marketing materials. At The Results Center we have been very impressed by the program's brochure, the interactive computer disk, and the video which together as a package promote the program.

NYPA's graphics department has done a first-rate job of developing a glossy, powerful brochure for HELP. The brochure explains the potentials for energy-efficient lighting, explains how the program works, and how an interested customer can sign up and get going on a retrofit.

The interactive disk is a novel and useful means for promoting the program. The 5.25" diskette, now available in a 3.5" format as well, neatly packaged in a diskette cover made especially for the program, has simple directions on the back on how to install and run the program. The Interad diskette gives an interested customer a dazzling display of interactive computer technology, and the ability to calculate potential gross savings with ease. The program includes spreadsheet software whereby a customer can insert basic building data (type of offices, warehouses, etc.) square footage, electricity rates, and get an estimate of bill savings.

NYPA has prepared a 15-minute video that explains the rationale for the program, discusses eligibility, potential savings, and how to get involved. The video also services to teach customers about advanced lighting technologies, and lets them see how a retrofit, such as troffer replacement, actually takes place.

In addition to the techniques described above the program has greatly benefitted from the direct work of the Chairman. Chairman Flynn has met face-to-face with key customers, such as the Port Authority, to promote the program. Additionally, Phil Pellegrino has met with all major SENY customers such as the City of New York, the Metropolitan Transportation Authority, the State Office of General Services, and the State University of New York.

## DELIVERY

The Power Authority's HELP program, headed by "point man" Angelo Esposito, handles all aspects of the retrofit from energy use analyses and renovation design to performing and supervising the actual installation. The delivery of program follows a step by step procedure:

- Customer contacts NYPA: A customer simply calls or writes to NYPA and indicates interest in sitting down with NYPA official and discussing how to participate. (NYPA's interactive diskette generates a form letter for the customer to use as well.)

Prior to any meeting NYPA explains the cost sharing aspect of the program to the customer and gets the customer to sign a CSA, or Cost Sharing Agreement. This document serves to define the financial roles of each party and can serve as an umbrella document for customers, such as New York City, with more than one facility. (Sometimes the CSA is signed at the initial meeting.)

- The Initial meeting: At an initial meeting, where NYPA notes "we come to you", a senior staffer explains the program procedure and answers questions.

- The Facility Review: NYPA then conducts a facility review of a customer's eligible facilities and identifies those with the greatest potential for cost savings.

- Auditing: Experts then perform a walk-through energy use analysis (audit) of priority facilities and provide an estimate of potential energy savings and conversion costs. NYPA retains final approval of recommended savings packages for state facilities.

- Action Plan: NYPA officials then present an action plan to the customer for review and approval, and then proceed with detailed lighting studies for customized retrofits.

- Financing: NYPA calculates the cash incentives that the customer will receive for participating in the program, and discusses loan arrangements with the customer available through NYPA's Conservation Loan Bank.

Prior to the construction phase of the retrofit, the customer must sign a CIC, Customer Implementation Contract, with NYPA. This is the last step before construction begins.

# Implementation (continued)

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- **Implementation:** Then the conversion begins. NYPA serves as the general contractor to expedite the procurement and installation of the equipment. NYPA negotiates the contracts, handles all the paperwork, and hires the contractors. Contractors in turn subcontract installation services to local firms.
- **Project Management:** NYPA supervises the construction, both materials and workmanship, and assures that the project is completed quickly and with minimum disruption. Invoices are approved by systems operations personnel, and checks are cut via the energy conservation department.
- **Savings:** If a customer chooses to finance the retrofit using the Conservation Loan Bank, the costs of the conversion are covered by NYPA and repaid out of energy savings. When the project is paid, the benefits of substantially reduced lighting costs and improved illumination all flow to the customer.

In addition to the schedule stated above, for some of the largest participants, key city and state agencies, monthly meetings are held to go over jobs at multiple facilities. These major customers, The City of New York in particular, have already signed CSAs and have several projects in the works at all times.

## MEASURES INSTALLED

Since HELP is a program which is based on design, there is no list of measures installed just as there is no cookie-cutter aspect of the program. A host of measures are implemented to suit the needs of the various clients. The following are illustrative of the classes of technologies employed. These include: fluorescent lamps, electronic ballasts, specular reflectors, compact fluorescent lamps, high efficiency discharge lamps (HIDs), photocells, and occupancy sensors. NYPA also converts exit sign lighting from incandescent to compact fluorescent. HVAC upgrade measures have been eligible for the program since March 1992, but to date no installations have incorporated HVAC technologies.

## STAFFING REQUIREMENTS

There are approximately 100 staff at the New York Power Authority involved with all facets of HELP. There are nearly forty in the Energy Conservation division alone, that work on the HELP program as well as other programs. In addition, NYPA's System Planning Division, given its history of project management, is involved in a project management capacity and oversees construction (retrofit) activities. Although a rough approximation at best, some 20 full time equivalent NYPA staff are involved to run all aspects of the SENY HELP program.

In addition to NYPA's staff, of course, there are a series of contractors who competitively bid the right to be assigned retrofits by NYPA staff. There are three implementation contractors (ICs) for the SENY program. (NYPA has two program managers for each IC, to oversee and facilitate the retrofits assigned to the IC.) The ICs are engineering and design firms that specialize in project management. They perform the audits, then design and oversee the retrofits. The contractors hire subcontractors to perform the installations.

In addition to the projects completed by the ICs, NYPA's staff has served as the contractor for jobs that it has found to be too small for the ICs. These "internal" jobs are less than \$100,000, and are often not cost effective when carried out by ICs, who are paid a percentage of the job. NYPA has found that any job requires a certain amount of diligence in client relations that takes time and leaves the relatively small projects hard to capture. By eliminating the 15% of total project costs that would be paid to the ICs, these jobs become more cost effective. [R#4,10]

# Monitoring and Evaluation

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## MONITORING

NYPA's Project Management group, part of System Planning, monitors the construction activities. Each Implementation Contractor (IC) has a project manager for each facility. NYPA has a parallel function. Each IC is responsible for monitoring subcontractors. Final inspections are done by NYPA's System Planning Division.

Monthly reports are prepared, called "timelines", which track the progress of each project. In addition, "trustee reports" are prepared which outline the status of all the DSM efforts to the Chairman and senior management.

## EVALUATION

NYPA's primary tool for evaluating the success of HELP has been through bill impact analyses carried out by staff, but this is changing quite fast. Although the Power Authority is not regulated by the state public service commission and is therefore not required to do rigorous evaluations of its DSM efforts, a recommendation in the State Energy Plan prepared by the State Energy Office was for NYPA to complete similar evaluations to those required of the investor-owned utilities. Specifically, the SEO wants NYPA to spend a specific dollar amount on evaluation and NYPA has consented to the SEO to comply with the state's DSM accounting, recognizing the value of both process and impact evaluations.

To date a process evaluation has been completed by an outside consulting firm and the same firm has a detailed impact evaluation of HELP underway.

## DATA QUALITY

- The data for this program is based on the SENY HELP program in particular with anecdotes from the Statewide and Long Island School District efforts. SENY, however, clearly represents the bulk of the work complete and underway and commands the greatest degree of confidence in data.

- That said, NYPA's HELP the program is quite young and thus not a significant amount of data is available compared to the gross size of program expenditures committed. A large fraction of the money committed to the project is wrapped up in projects in construction, scheduled for construction, or in design and marketing phases. Only 28% of the total funds committed have been spent on projects that are now complete. (NYPA has spent about \$15.7 million of \$55.3 committed to date.)[R#7] For example, for projects conducted for the City of New York, a total of \$19,283,737 has been allocated/committed, but only \$5,034,241 or a quarter of the total has been spent on projects now complete.[R#6]

- Furthermore, this profile assumes an average three-year payback threshold requirement for participating customers. Some customers at the onset of the program were entitled to a two-year payback ceiling. In the Cost of Program section, a three-year payback is used to determine NYPA's net contribution.

- Engineering estimates are used and have been modified since the onset of the program. Two midcourse determinations: Across the board, NYPA feels that it had overestimated operating hours. NYPA plans to use light loggers, temporarily installed at the time of the initial audit, to verify operating hours. Second, NYPA takes credit that its retrofits provide 90% of their estimated savings during peak periods. NYPA takes a 95% credit for energy savings. However, for schools, which have a low summer use factor, NYPA takes credit for only 70% of the energy savings.[R#4,10]

- The cost of saved energy and the lifecycle savings for the program are based on an average measure lifetime of 20 years. This assumes savings, or credits for savings, when a measure -- such as a compact fluorescent - burns out and is replaced with another compact fluorescent. Although NYPA uses specific lifetimes for each measure, such as 15 years for ballasts, the aggregate lifetime of 20 may be a bit optimistic.

- The Results Center uses a convention for all of its profiles of converting all dollars to 1990 U.S. dollars. Since none of the dollars presented in this profile are assigned to a particular year and since the program has been running since 1989, nominal dollars are used throughout.

# Program Savings

As of October 1, 1992, 58 SENY HELP projects were complete and will result in annual savings of 40,492 MWh and lifecycle energy savings (based on an average measure lifetime of 20 years) of 809,840 MWh. In terms of capacity, the complete projects provide 8.7 MW of savings.[R#7]

Approximately three times the savings are represented in savings for projects still in the various stages prior to installation of energy-efficient technologies. When accounting for all the projects "in the pipeline", including the complete projects presented above, SENY's HELP installation will provide 151 GWh in annual energy savings and 3,032 GWh in lifecycle energy savings. In terms of capacity all active projects will provide 30.9 MW.[R#7]

NYPA also presents savings in economic terms for its customers. For example, over a thirty year time horizon, NYPA expects to save its customers \$240 million in avoided electricity costs.[R#1] Projects complete in the SENY HELP already result in customer bill savings of \$3.3 million, and when all projects in the various stages of implementation are considered, the annual customer bill savings are on the order of \$12 million.[R#7]

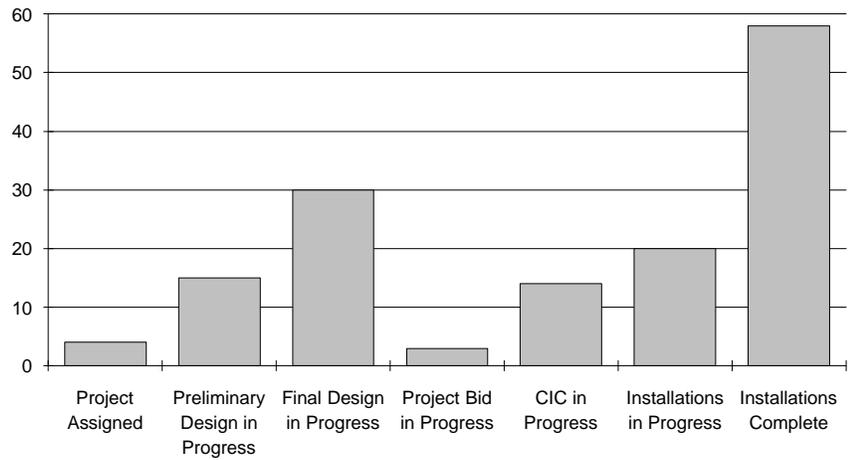
## MEASURE LIFETIME

NYPA uses a 20-year assumed average lifetime for the program that is used to calculate the cost of saved energy and the program's, as well as each retrofits', savings.

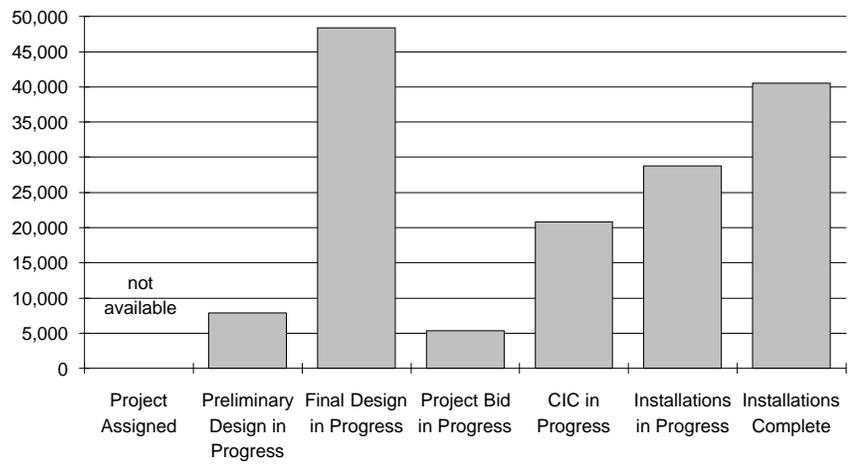
<b>Savings Overview Table</b>	<b># Projects in Phase</b>	<b>Annual Energy Savings (MWh)</b>	<b>Lifecycle Energy Savings (MWh)</b>	<b>Annual Capacity Savings (MW)</b>
Project Assigned	4	n/a	n/a	n/a
Preliminary Design in Progress	15	7,923	158,460	1.50
Final Design in Progress	30	48,374	967,480	9.90
Project Bid in Progress	3	5,351	107,020	1.20
CIC in Progress	14	20,775	415,500	4.10
Installations in Progress	20	28,732	574,640	5.50
Installations Complete	58	40,492	809,840	8.70
<b>Total</b>	<b>144</b>	<b>151,647</b>	<b>3,032,940</b>	<b>30.90</b>

[R#7]

**NUMBER OF PROJECTS**



**TOTAL SAVINGS BY PROJECT (MWH)**



# Cost of the Program

To date, projects complete have cost NYPA a gross amount of \$15.742 million. When the customer's contribution is considered, NYPA's exposure will be far less, likely on the order of a third of the cost, or approximately \$5 million. (See the Cost Table) The total cost of all the projects in the pipeline as of October 1, 1992 is \$55.342 million. Assuming an average project payback of 4.75 years, and thus a net cost to NYPA of 1.75 years of bill savings, the exposure to NYPA is on the order of \$18.8 million. [R#7]

## COST PER PARTICIPANT

The actual cost per customer for this program varies widely, from less than \$100,000 per installation to the \$2.6 million retrofit of Brooklyn College in Queens, New York. Staff estimate that the average job, however, meaning average building, bears an average cost somewhere between \$100,000-200,000. [R#10] The simple average cost of the 58 complete projects is over a quarter of a million dollars, and for all projects in the pipeline the average cost is nearly \$400,000. [R#7]

## COST EFFECTIVENESS

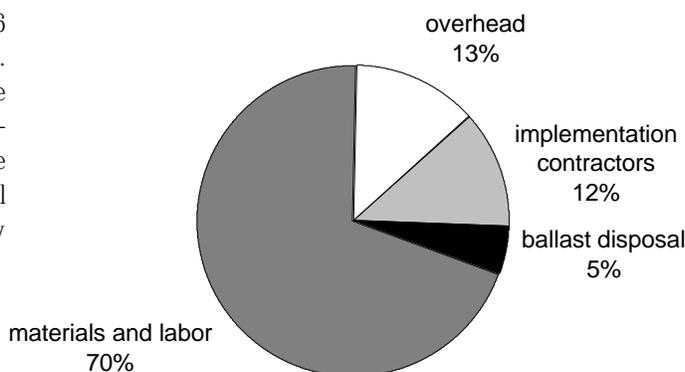
NYPA screens each project for cost effectiveness. This is done in-house, measure by measure. Rarely are measures bundled. At the onset of the HELP program NYPA used the Rate Impact Measure test (RIM) to determine which measures were cost effective and thus implemented. Now the Total Resource Cost (TRC) test is used as the primary screening tool to determine cost effective measures. [R#10]

Incidentally, NYPA has customized its Lotus-driven software for cost effectiveness so that it is highly user friendly and accessible. It is, admittedly, a bit harder for the Statewide

HELP as it then entails other utilities' rate structures and rebate schedules. [R#10]

## COST COMPONENTS

Of the total cost of the program fully 70% is paid for the materials and labor for the retrofits. The remaining 30% is split in the following way: NYPA's direct overhead is approximately 12.5%; the ICs are paid another 12.5% (although this varies depending on bonuses); and about 5% goes for ballast removal and disposal. [R#10]



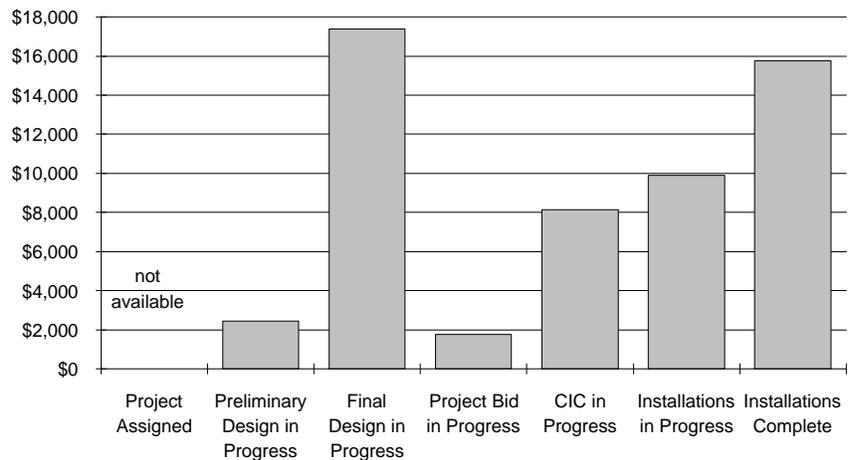
## FREE RIDERSHIP

NYPA assumes no free ridership. Its customers are large institutional type customers whose current budgetary situations will not permit participation without the benefits of the NYPA program.

Cost of Saved Energy (¢/kWh)	Discount Rates						
	3%	4%	5%	6%	7%	8%	9%
NYPA share	0.96	1.05	1.15	1.25	1.35	1.46	1.57
Total Cost	2.61	2.86	3.12	3.39	3.67	3.96	4.26

<b>Cost Overview Table</b>	Number of Projects	Total Project Cost (000)	Customer Annual Bill Savings (000)	Average Payback (years)	Customer Contribution (3 years)	Net Utility Cost (000)
Project Assigned	4	n/a	n/a	n/a		
Preliminary Design in Progress	15	\$2,431	\$583	4.17	\$1,749	\$682
Final Design in Progress	30	\$17,389	\$3,857	4.51	\$11,571	\$5,818
Project Bid in Progress	3	\$1,744	\$475	3.67	\$1,425	\$319
CIC in Progress	14	\$8,151	\$1,736	4.70	\$5,208	\$2,943
Installations in Progress	20	\$9,885	\$2,196	4.50	\$6,588	\$3,297
Installations Complete	58	\$15,742	\$3,316	4.75	\$9,948	\$5,794
<b>Total</b>	<b>144</b>	<b>\$55,342</b>	<b>\$12,163</b>	<b>4.55</b>	<b>\$36,489</b>	<b>\$18,853</b>

**TOTAL COST OF PROJECTS (X1000)**



# Environmental Benefit Statement

Marginal Power Plant	Heat Rate BTU/kWh	% Sulfur in Fuel	CO2 (lbs)	SO2 (lbs)	NOx (lbs)	TSP* (lbs)
<b>Coal</b>						
<b>Uncontrolled Emissions</b>						
A	9,400	2.50%	87,301,000	2,071,000	419,000	42,000
B	10,000	1.20%	93,091,000	802,000	270,000	200,000
<b>Controlled Emissions</b>						
A	9,400	2.50%	87,301,000	207,000	419,000	3,000
B	10,000	1.20%	93,091,000	80,000	270,000	13,000
C	10,000		93,091,000	534,000	267,000	13,000
<b>Atmospheric Fluidized Bed Combustion</b>						
A	10,000	1.10%	93,091,000	245,000	134,000	67,000
B	9,400	2.50%	87,301,000	207,000	167,000	13,000
<b>Integrated Gasification Combined Cycle</b>						
A	10,000	0.45%	93,091,000	165,000	27,000	67,000
B	9,010		83,737,000	60,000	20,000	4,000
<b>Gas</b>						
<b>Steam</b>						
A	10,400		50,777,000	0	116,000	0
B	9,224		44,096,000	0	276,000	13,000
<b>Combined Cycle</b>						
1. Existing	9,000		44,096,000	0	169,000	0
2. NSPS*	9,000		44,096,000	0	80,000	0
3. BACT*	9,000		44,096,000	0	11,000	0
<b>Oil</b>						
<b>Steam--#6 Oil</b>						
A	9,840	2.00%	73,493,000	1,114,000	131,000	125,000
B	10,400	2.20%	77,947,000	1,105,000	165,000	80,000
C	10,400	1.00%	77,947,000	158,000	133,000	42,000
D	10,400	0.50%	77,947,000	463,000	165,000	25,000
<b>Combustion Turbine</b>						
#2 Diesel	13,600	0.30%	97,545,000	194,000	302,000	16,000
<b>Refuse Derived Fuel</b>						
Conventional	15,000	0.20%	115,807,000	298,000	393,000	87,000

**Avoided Emissions Based on 40,492,000 kWh Saved (First Year Only)**

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In addition to the traditional costs and benefits there are several hidden environmental costs of electricity use that are incurred when one considers the whole system of electrical generation from the mine-mouth to the wall outlet. These costs, which to date have been considered externalities, are real and have profound long term effects and are borne by society as a whole. Some environmental costs are beginning to be factored into utility resource planning. Because energy efficiency programs present the opportunity for utilities to avoid environmental damages, environmental considerations can be considered a benefit in addition to the direct dollar savings to customers from reduced electricity use.

The environmental benefits of energy efficiency programs can include avoided pollution of the air, the land, and the water. Because of immediate concerns about urban air quality, acid deposition, and global warming, the first step in calculating the environmental benefit of a particular DSM program focuses on avoided air pollution. Within this domain we have limited our presentation to the emission of carbon dioxide, sulfur dioxide, nitrous oxides, and particulates. (Dollar values for environmental benefits are not presented given the variety of values currently being used in various states.)

## HOW TO USE THE TABLE

1. The purpose of the previous page is to allow any user of this profile to apply the NYPA's level of avoided emissions saved through its High Efficiency Lighting Program to a particular situation. Simply move down the left-hand column to your marginal power plant type, and then read across the page to determine the values for avoided emissions that you will accrue should you implement this DSM program. Note that several generic power plants (labelled A, B, C,...) are presented which reflect differences in heat rate and fuel sulfur content.

2. All of the values for avoided emissions presented in both tables includes a 10% credit for DSM savings to reflect the avoided transmission and distribution losses associated with supply-side resources.

3. Various forms of power generation create specific pollutants. Coal-fired generation, for example, creates bottom ash (a solid waste issue) and methane, while garbage-burning plants release toxic airborne emissions including dioxin and furans and solid wastes which contain an array of heavy metals. We recommend that when calculating the environmental benefit for a particular program that credit is taken for the air pollutants listed below, plus air pollutants unique to a form of marginal generation, plus key land and water pollutants for a particular form of marginal power generation.

4. All the values presented represent approximations and were drawn largely from "The Environmental Costs of Electricity" (Ottinger et al, Oceana Publications, 1990). The coefficients used in the formulas that determine the values in the tables presented are drawn from a variety of government and independent sources.

## NYPA AVOIDED EMISSIONS

The New York Power Authority works in conjunction with the State's investor-owned utilities through the New York Power Pool to assure that the State's electricity requirements are met. For several years NYPA has been the lead utility in the State in regard to power purchases of hydroelectricity from Quebec. NYPA had planned to purchase a 1,000 MW additional block of power from the James Bay hydroelectric development in northern Quebec. In recent years public concern about the development in the James Bay region, coupled with demonstrated savings potentials for energy efficiency, has led the Power Authority change its course dramatically. In August of 1991 Governor Cuomo announced that New York State and the Government of Quebec had decided to suspend contracts for the sale of what was to be \$17 billion of electricity, a 1,000 MW "schedule" of power, over the 20-year life of the planned contract. [R#8] Energy efficiency, coupled with independent power production, are slated to replace the James Bay power.

### \* Acronyms used in the table

TSP = Total Suspended Particulates

NSPS = New Source Performance Standards

BACT = Best Available Control Technology

# Lessons Learned / Transferability

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## LESSONS LEARNED

- First and foremost, NYPA's staff and contractors have proved that it is possible for a utility to very quickly "ramp" up an aggressive DSM program. HELP has had its challenges but leapt out of the starting gates! Remember the program only began in June of 1990.

- The program started with a two-year payback guarantee for customers. This was changed to three years in an unusual tradeoff. Though NYPA had hired a consulting firm which told the utility that companies are not willing to go beyond a two-year payback, as costs went up -- and the actual paybacks stretched from the initially estimated four years, to five and even six years, NYPA opted for the three-year payback, still highly attractive when coupled with the Conservation Loan Bank.

Ironically, NYPA's largest "DSM customer", the City of New York, encouraged NYPA to extend the payback but at the same time to offer a series of rebates for energy-efficient equipment. Indeed NYPA plans to offer rebates, both basic equipment rebates and customized rebates for new construction. [R#4,10]

- NYPA had anticipated that the installed cost per kilowatt of capacity would be \$1,500. Instead, the first wave of projects resulted in costs on the order of \$2,000/kW. Staff are now working on means to bring the costs down to the \$1,600 to 1,800 kW range. [R#4,10]

- Competition with energy service companies has become an issue as costs have exceeded projected costs. On Long Island, energy service companies have been able to offer more attractive bids, leaving NYPA's schools program based on the utility's reputation. In some ways NYPA has "transformed" the energy services market on Long Island, setting standards for lighting designs, etc. [R#4,10]

- A key lesson learned in the process of putting HELP "on the street" is that suggesting routine savings of 75% is highly problematic... and sets up the customers for disappointment. NYPA has backed off this claim, now favoring an estimate of 50%. In reality, the program has achieved energy savings of 60-75%, but this has resulted in bill savings more typically on the order of 25-35%, largely due to capacity payments. [R#10]

- As for the number and frequency of meetings with contractors, NYPA found that at first group implementation contractor meetings were effective sharing opportunities, but in time became overly burdensome and less productive. Staff simply changed the frequency and focused on a particular contractor for a meeting, rather than the group together.

- NYPA learned the hard way about shortages of ballasts in particular, and thus project delays. To overcome this problem, NYPA now estimates how many ballasts and other pieces of equipment that it will need, and then orders these supplies in bulk. NYPA can thus get better pricing than if the contractors went to buy the supplies themselves. [R#4,10]

The scarcity of ballasts early in the project caused NYPA to have to push back the start date for several projects by one or two months, longer than the normal two week start time from the time the customer signs the CIC to the time the subcontractors get to work. Within a week of the signing of the CIC, the facility manager meets with the contractor that NYPA assigns, what it called the "preconstruction" meeting.

- NYPA has also changed the incentive payments for the ICs. Originally ICs were paid based on hourly wages. Now the ICs are paid based on a percentage of materials and labor, plus they get bonus payments if their total costs are less than estimated on a cost/kW-saved basis. Furthermore, they are paid this percentage based on their successful completion of predetermined milestones.

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## TRANSFERABILITY

- The High Efficiency Lighting Program is a formula for savings that overcomes many barriers common to building owners throughout North America and around the world. Let's face it, energy efficiency costs money, and upfront capital at that. HELP addresses this most basic concern.

- The delivery mechanism that HELP uses is quite basic. Any utility can develop a brochure and can project manage lighting installations,... provided ample resources are put forth. NYPA is obviously committed to the project and has put substantial sums of money behind it to save big and fast! The fundamental delivery mechanisms, however, can be used for facilities all over.

Performing HELP for school districts within another utility's service territory was not without challenge! NYPA had to work with Long Island Lighting and now has shown the utility that it can actually help by taking the responsibility for retrofits.

- Naturally, as a government agency, NYPA does have the advantage of getting low cost financing, unavailable to other utilities.

- Finally, NYPA is a highly unusual utility and highly unusual agency. Its role as the State's energy service company for state buildings, working with government customers, seems unusual, but we believe ought to be transferable. NYPA is in the midst of a major and powerful transition, one that other utilities must heed and will, we believe, ultimately replicate.

NYPA staff expect that a similar program will be offered by Public Service Electric and Gas in New Jersey. In addition, the Department of Energy has considered HELP as a model program.

# References

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1. New York Power Authority, 1991 Annual Report.
2. New York Power Authority, High Efficiency Lighting Program brochure.
3. Phil Pellegrino, Vice President, Power Sales and Rates, Paper presented to the Pace University Center for Environmental Legal Studies, 1991.
4. Amy Gaimaro, Associate Power Analyst, personal communication, June - October 1992.
5. Angelo Esposito, Manager, Demand-Side Management Programs, personal communication, June - October 1992.
6. "Status of Active Projects," New York Power Authority High Efficiency Lighting Program, June 29, 1992.
7. Activity Timeline, New York Power Authority, High Efficiency Lighting Program, October 1, 1992.
8. The Energy Newsbrief, Volume 6, Issue #42, "New York Cancels Huge Hydro-Quebec Power Purchase," The Energy Newsbrief, Volume 6, Issue#20, "Canadian Electricity in Dynamic Times," IRT Environment, Aspen, Colorado.
9. New York Power Authority, Statewide HELP brochure.
10. Helen Eisenfeld, Economist, New York Power Authority, personal communication, September - October 1992.

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