Energy Services & Technology

Program Update

As of May 2011, the New York Power Authority has completed $1.4 billion in Energy Service projects at over 3,800 customer facilities statewide, representing an annual recurring savings to program participants of $133 million or $1.3 billion over the life of the programs at current energy costs. Electricity use was reduced by over 1,100 gigawatt-hours (GWH) annually, which in turn reduces greenhouse gases by 816,000 tons per year.

In 2010, we set a one-year record for Energy Service projects with $175 million worth of initiatives completed, which constituted a 20 percent increase over 2009 initiatives.

For 2011, some $180 million worth of initiatives are on track to be completed.

In addition, there are $1.8 billion in new projects either identified or already in construction that will result in annual savings of $73 million by reducing electricity use by 429,000 MWH, fossil fuel use by an equivalent of 14 million Therms of natural gas, which in turn will reduce greenhouse gases by an estimated 355,000 tons annually.

In addition to the typical measures implemented via NYPA's ESP projects there are a variety of new measures being incorporated into projects over the past two years. These include: LED Lighting for Bridge Necklace Lighting, Ice Storage for Air Conditioning, Rail Road Track Third Rail Heating Controls, Micro Hydro turbines, Rail Road Signal Compressed Air Systems, Swimming Pool Lighting, College Dormitory Room Heating Controls, Lighting and Heating Controls in Public Housing Apartments, Solar Thermal Systems, T5 Wide Area Bay Lighting, Escalator Motor Controls, Co-generation Systems, Micro Steam Turbines, Biomass Boilers, Rapid Roll Up Doors, Laundry Facility Upgrades, Water Conservation and Data Center Upgrades.

Other NYPA initiatives, such as the Business Customer and Renewable Energy programs, have also been enhanced over the past two years either as a result of actions taken by the Board of Trustees or state legislative initiatives supported by NYPA. They have also increased the Authority's effectiveness in highlighting energy efficiency across the state while helping to meet the State Energy Policy goals of increasing the efficient use of New York's energy resources and reducing the dependency on fossil fuels.

NYPA's Research and Development endeavors have also been increased, again as a way to meet the state's goal of reducing New York's use of fossil fuels by 45 percent by 2015 either through

energy efficiency, increased use of renewable energy resources, and more efficient operation of our power generating assets and transmission facilities.

Program Results Highlights

100 MW Statewide Solar Photovoltaic

NYPA issued a Request For Proposals (RFP) in January, 2010 based on the overwhelming responses from the solar Photovoltaic industry to the Authority's Request For Expressions of Interest (RFEI) to install 100 megawatts of PV systems on municipal, school and university and other buildings around the state. A prospective bidders conference was convened that attracted over 400 attendees. By the April 22 deadline, 44 proposals were received representing most of the national and international solar development corporations. An extensive evaluation process was put in place which resulted in the preparation of a list of potential recommended awards. Installing 100 MWs of solar power systems around the state will triple the amount of solar power generated in New York.

NYC – Board Of Education

Energy Services & Technology Staff is working with NYC Schools to implement lighting and comprehensive energy efficiency projects at various locations throughout the 5 Boroughs of NYC. Many of these schools are a subset of the ones mentioned in the media recently that were said to contain PCBs within the lighting ballasts. Due to the age of these ballasts, significant energy savings can be obtained by their replacement with new energy efficient electronic ballasts. In partnership with NYC, the Board of Education and the SCA (School Construction Authority), NYPA is retrofitting 11 schools to determine the cost benefit of these projects and to develop standard operating procedures for the removal of the hazmat ballasts from the sites. The outcome of this evaluation will determine if additional projects can be implemented in this manner.

NYC Department of Environmental Protection Program

In 2008, the first direct energy services program agreement with the Department of Environmental Protection (DEP) was executed to support a $300M multi-year program. Since the execution of this agreement, there has been major growth in this program, two significant projects have been completed, including North River Wastewater Treatment and Owl's Head totaling $42M. An additional 14 projects are in various stages of development or construction. Owl's Head WWTP and ADG I projects will start construction this year and will re-use digester gas to fuel engines, boilers, and fuel cells thereby reducing greenhouse gas emissions and fossil fuel consumption.

City University of New York

In 2008, an energy services program agreement with the City University of New York (CUNY) was executed to support a multi-year program. Since the execution of this agreement, 24 projects have been completed, are currently in construction or have been identified. This includes

ES&T's two largest projects, Bronx Community College Infrastructure Upgrade and New York City College of Technology Central Plant.

New York City Housing Authority

Over the past few years, this program has averaged $25 million per year, which includes 23 projects either completed, in progress, or identified. Notable projects include NYCHA Castle Hill Houses Heating Plant, Lighting, and Climate Controls Upgrade and NYCHA Rutgers Houses Heating System Installation. In addition, we are in the 11th phase of the NYCHA Hot Water Storage Tank Replacement Program, installing approximately 800 instantaneous hot water heaters.

MTA

Our partnership with the MTA in project and program activities has increased significantly with the MTA and its Agencies over the past several years. We have made significant progress with program participation from Metro North and LIRR, which had very little involvement / participation in the past. We also increased project activity with Bridges and Tunnels and greatly expanded our program offerings to NYCT to include larger and more comprehensive and complex projects. Overall, we expanded and grew MTA's Program activities from about $2 to $4 million per year to $15 million in 2011 and looking to grow this even further to over $20 million by year 2015 (over a 500% increase).

Energy Services Program Statewide

This program was expanded by $400 million (via Trustee action) in response to an increased volume of work bringing total authorized funding to $833 million. In addition, new implementation services contracts with six contractors were issued, which doubled the number of contractors implementing statewide Energy Services programs.

NYPA LEED Initiatives at Authority Visitors Centers & Facilities

NYPA initiated a project that will pursue a minimum of LEED Certification at the Blenheim Gilboa, Hawkins Point, and Niagara Visitors Centers. Site visits were completed at St. Lawrence, Blenheim-Gilboa, and Niagara visitor centers to compete Task 1, the production of the LEED checklist. Task 2, the energy star analysis have been completed at St. Lawrence and Blenheim-Gilboa visitor centers. In addition, NYPA initiated energy audits at other NYPA facilities located at the Niagara, Blenheim-Gilboa, Saint Lawrence, and Flynn power projects, Clark Energy Center, and the Poletti 500 megawatt and Flynn power plants. The design for energy conservation measures that were recommended at St. Lawrence has been initiated. Construction has begun on Blenheim-Gilboa upgrades.

Fuel Cells

Over the past two years, NYPA has completed and commissioned two fuel cells that include installations at the Bronx Zoo and NYPA's White Plains Office. Three 400kw fuels cells have also been delivered to Tower 1 at the World Trade Center. Six more fuel cells are scheduled to be delivered to Towers 3 and 4 later this month. Three fuel cells for Tower 2 will be delivered when construction of that tower proceeds. The fuel cells will eventually supplement the electricity supplied to the Trade Center when construction is completed and the fuel cells are placed into service.

Energy Efficiency Weatherization Program

NYPA focused on low income assistance through the distribution of energy savings kits to over 38,000 lower income residents who reside in areas served by the 51 Municipal Electric Systems and Cooperatives around the state that receive NYPA power, and also in Westchester County Housing Authority units and utility paying residents of NYCHA. It is projected that the energy saving kits could help save these consumers some $200 in energy costs annually.

Municipal and Cooperative Village Insulation Program

Nineteen Municipal and Cooperative Systems elected to participate in insulating attic and crawl spaces in close to 1,300 residential homes to be completed through April of 2011. Total annual kWh savings translates close to 4.7Mkwh, saving each home approximately $185 and 3,600kwh annually. Total NYPA expenditure in 2010 amounted to $1.5M to be supplemented with an additional $1.5M in 2011.

Business Customers

Legislative authorization enhancing NYPA's energy efficiency programs in 2008 allowed the Authority to expand its energy efficiency program, which resulted in the completion of energy audits for 54 business customers. Combined, the audits identified energy efficiency strategies that could save these businesses some $6.3M in energy costs, which in turn can help save numerous jobs. NYPA will be offering training courses to its Business Customers in the Fall of 2011 focusing on improvements in technologies with high electric consumption. These will be regional trainings open to all of our customers.

ARRA – Funded Energy Efficiency Projects

NYPA assisted in bringing ARRA-related funds to New York State resulting in 43 projects receiving $54 million in Federal Stimulus funding that are being implemented statewide.

NYPA Renewable Energy Program

In 2008, the Board of Trustees approved $21 million in funding to expand the Power Authority's statewide Renewable Energy Program for introducing new clean and sustainable energy technologies, particularly in upstate regions. The funding, to be provided over five years, was approved in support of New York State's Renewable Energy Task Force. Over the last two

years numerous renewable energy projects have been initiated throughout New York State including over 2.5 megawatts of solar PV projects, distributed wind projects, energy storage projects focused on better renewable energy integration into the grid, fuel cells fueled by renewable energy sources, and biomass projects.

Municipal/Cooperative Solar PV Incentive Program

As part of the Trustee approved 2008 Renewable Energy Plan above, NYPA implemented a pilot solar photovoltaic (PV) incentive program for its Municipal and Cooperative Electric System customers who are generally not eligible to receive a solar incentive through the New York State Energy Research Development Authority. The program provided a NYPA incentive of $4 per Watt of installed PV system capacity (approximately 50% of system costs), for systems up to 10 kW. The Muni/Coop passed this incentive along to their residential, commercial or municipal electricity customers who elected to install a PV system. NYPA pays the incentive in two installments, 20% upon system design and 80% upon system commissioning. The deadline for new applications was April 29, 2011 and the deadline for all incentive payments is December 30, 2011. The budget for this pilot program was initially set at $2,000,000. The program was offered to all 51 of NYPA's Municipal or Rural Electric Cooperative customers. Ultimately, twelve utilities signed on to participate in the program: Skaneateles, Solvay, Delaware County Electric Cooperative, Tupper Lake, Otsego Electric Cooperative, Lake Placid, Massena, Steuben, Boonville, Freeport, Ilion and Sherburne.

Electric Transportation

Solar Carport Project

NYPA has launched a program to design, build and test proof of concept electric vehicle charging stations that utilize renewable energy. The Village of Tarrytown and the Village of Skaneateles will participate in the first phase of the project. EPRI is a program partner. NYPA will issue an RFP for design/construction third quarter 2011. Once completed, the solar carports will be owned, operated and maintained by the Villages of Tarrytown and Skaneateles.

Hybrid School Bus Evaluation Program

In 2010 NYPA was awarded DOE Clean Cities "Stimulus" funding for the second phase of this program, the evaluation of a new charge-sustaining (no plug) hybrid school bus manufactured by Thomas Built Corporation. The bus will be placed in service with Gates Chili Central School District this fall. NYPA continues to evaluate the performance of a plug-in hybrid and charge-sustaining (no plug) hybrid manufactured by IC Bus Corporation. Those buses are currently in service with the Greater Amsterdam Central School. The evaluation has spurred the bus manufacturer to improve hybrid drive system efficiency.

Hybrid and Plug-in Hybrid Yard Tractor Demonstration

NYPA has put together a project to demonstrate and evaluate prototype hybrid and plug-in hybrid yard tractors with the New York Container Terminal. Other project partners include EPRI and the Port Authority of New York and New Jersey. The tractors, which were built by Kalmar,

a leading yard tractor manufacturer, and equipped with hybrid drive systems by US Hybrid, were placed in service in January 2011.

Trucks and Buses Plug-Hybrid Vehicle Demonstration & Evaluation Program
NYPA continues to work with EPRI on a national USDOE ARRA funded program to accelerate the development and commercialization of medium-duty plug-in hybrid trucks and buses. NYPA enlisted customers from around the state to participate in the program – NYPA and its customers make up 10 of the 50 participating fleets. Vehicle deliveries will start fall 2011.

Light Duty Plug-in Vehicle Demonstration
NYPA is supporting the demonstration of new light-duty plug-in all-electric vehicles and extended range electric vehicles in New York City and other customer fleets. NYPA will work with customers to evaluate the performance of the Ford Transit Connect electric van and the GM Volt extended range electric vehicle in a wide range of fleet applications. Fourteen fleets are participating in the program in 2011.

NYPA Green Fleet Study
As part of the Sustainability Plan, NYPA is conducting a study to evaluate fleet procurement and maintenance practices and is developing recommendations for the "greening" of the fleet. NYPA will identify opportunities to introduce electric-drive vehicles and other more efficient vehicles into the fleet.

RESEARCH AND TECHNOLOGY DEVELOPMENT

Niagara Acoustic Doppler Flow Measurement and Plant Optimization (ongoing)
NYPA has installed a new flow measurement technique to more accurately and frequently measure the water flow into the forebay area which enables the Niagara Power Project to optimize power generation and water usage. The technology utilized is Acoustic Doppler flow measurement system. Currently, all diversion-based calculations at the Niagara project rely on hourly measurements by elevation gauges. In practice, there could be significant volume errors depending on captured elevations for beginning / ending of the hour. These inaccuracies result in large tolerances for diversion of water that may generate control action in a wrong direction. This project helps alleviate this problem and improve the overall performance of the Niagara operations. Plant optimization projects include finding the best operation and ancillary service requirements, installation of proper water level management system for LPGP, developing real-time performance indicators, and quantifying and maximizing the benefits provided by conventional and pumped-storage hydroelectric projects to transmission grids.

Y49 Cathodic Protection System for Long Island Sound Cable
The Self Contained Fluid Filled (SCFF) Y-49 power cables represent a $300 million NYPA investment (today a $2 billion asset) and are very important to NYPA's operations and transmission of power to Long Island. A Cathodic Protection system is required to prevent damage to the cable due to stray DC currents due to trains, etc. Without the Cathodic Protection system, it is anticipated that the life expectancy of the power cables would be reduced by at least

15 years. NYPA R&TD successfully installed this automatic Cathodic Protection System on the power cables in Long Island Sound. This system automatically adjusts itself to mitigate the effects of the stray DC currents, which could corrode the return conductor and ultimately cause the cables to fail.

Network-based Automated Transmission Line Fault Analysis System
This computer network-based system provides system fault data quickly to authorized personnel for analysis and decision making and restoration of service. In the event of a permanent transmission line fault, speedy restoration of service is imperative to maintain transmission availability as high as possible and to avoid having dispatch of energy in a less economic mode. This system automatically collects the fault data from the digital fault recorders located in the substations and generating stations using secure protocols. The data is then processed and converted to a standard format on a central computer. The fault analysis software automatically puts the analysis report on the web-page to instantaneously allow sites operators and engineers to view the fault report and waveforms and enable them to take quick corrective action.

Non-intrusive Assessment of Transmission Tower Grillages (ongoing)
In order to determine the condition of NYPA's transmission towers, this project has developed and implemented a non-intrusive method for testing of transmission tower lattice structures to accurately determine the actual physical condition and the integrity of the structure. The leg of the transmission tower showing the worst condition is excavated completely to a depth of 10 feet to validate the report of the non-invasive system. Repairs (steel splices and coating) are performed if the loss of the cross section due to corrosion is more than 20 percent. Confirmation that this non-intrusive system provides reliable results will allow NYPA to inspect all its towers using this technology and save O&M costs and increase reliability.

Antenna Array System for Monitoring Substations
Partial discharge (arcing) inside power equipment can lead to equipment failures and long outages. Early identification of partial discharges allows system operators to take remedial action to prevent the catastrophic failure of equipment. This project developed a non-invasive technique for monitoring partial discharge activity at NYPA substations and pinpointing the location of equipment (transformers, reactors, breakers, etc.) that generate partial discharge. Four antenna arrays have been installed at Massena substation to monitor the partial discharge activity throughout the substation. Similar systems have been installed Marcy and Niagara.

Hydro Generator Monitoring (ongoing)
Partial discharge (arcing) inside hydrogenerators can lead to equipment failures and long outages. Early identification of partial discharges allows system operators to take remedial action to prevent the catastrophic failure of generators. NYPA has installed HydroTrac (continuously acquires data from existing sensors installed on the generators and provides plant operators with meaningful diagnoses of the stator winding condition) and FluxTrac (records rotor air gap magnetic flux and partial discharge) on most of its hydro units. Vibration monitoring

systems have also been installed on these units to detect excessive vibration and potential damage.

Smart Grid Related R&TD (ongoing)
NYPA has been a pioneer in the area of Smart Grid technologies. These technologies are expected to improve the operation and control of the power grids and enhance their efficiency, reliability, and safety. GPS-based precise measurement devices called the Phasor Measurement Units (PMU) have been installed at NYPA substations and have been providing valuable system data or 20 years. NYPA is working closely with the NYISO as a partner in the DOE SGIG Stimulus project to deploy additional PMUs as well as the required communication links to securely send this data to NYPA energy control center and the NYISO.

Maintenance and Upgrade of the CSC at Marcy (ongoing)
NYPA operates the world's most advanced high power electronics controller installed at Marcy substation called the Convertible Static Compensator (CSC). This device has unique capabilities in controlling the system voltage and if necessary transmission line power flows. NYPA system operators as well as the NYISO operators rely on the CSC for reliable and secure operation of the NYS transmission system. NYPA R&TD is currently working to ensure longevity and continuous availability of this device. Work is on-going to prepare the upgrade of the CSC's computer-based Controls. The CSC project helps relieve congestion in the NYS transmission system and allows nearly 200 MWs more power to be transferred from north and west to NYC area while increasing the system reliability and resiliency. The CSC project has fully recovered its cost and is a source of income for NYPA during transmission congestion periods.

Astoria 500-MW Performance Enhancement (ongoing)
NYPA is implementing several studies at the Astoria 500-MW plant to help increase its performance and efficiency. Among them, the Desuperheater Performance Tuning and Optimization to optimize the performance of the existing high pressure and reheat desuperheating systems, the Thermal Energy Storage for Combustion Turbine Inlet Cooling (study of the operational and economic benefits of installing a thermal energy storage system for cooling combustion turbine inlet air), and Combustion Dynamics Monitoring and Auto-Tuning Algorithm Development (installation of high temperature acoustic sensors on each of the fourteen combustion cans) on the 7FA CT to tune the Dry Low NOX combustion system much more accurately and provide continuous data acquisition.

Real Time Transmission Line Monitoring (ongoing)
NYPA is working with EPRI and NYSERDA on two projects which will install dynamic line rating equipment with real-time monitoring capabilities on a number of transmission lines to send data on real-time loading capability of these lines to the system operator for enhanced operations of the New York State power grid and maximum utilization of transmission assets.

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