

# **Greening the Apple: Progress and Lessons Learned from the City of New York's Greenhouse Gas Reduction Initiative**

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## **ABSTRACT**

This paper summarizes the City of New York's Greenhouse Gas Reduction initiative. This initiative was launched in October 2007 in response to the Mayor's Executive Order that required City agencies to reduce greenhouse gas emissions from buildings and other operations 30 by percent in 10 years. The paper focuses on the challenges encountered and lessons learned in the course of developing and implementing a comprehensive greenhouse gas reduction program for a municipal government that encompasses over 20 operating agencies, 4,000 facilities, and 27,000 vehicles. It concludes with a view of remaining challenges and lessons learned.

## **Background**

### **PlaNYC and Executive Order 109**

In Fiscal Year 2006, the municipal government of the City of New York produced approximately 3.8 million metric tons of greenhouse gas (GHG) emissions per year, and consumed about 6.5 percent of New York City's total energy usage. That year, the City paid roughly \$900 million in energy bills; annual energy spending has risen to nearly \$1 billion since then. As part of PlaNYC, a broad policy and program initiative launched in December 2006 to improve the physical environment of New York City, the municipal government undertook to make significant reductions in its own greenhouse gas emissions.

On October 22, 2007, Mayor Michael R. Bloomberg signed Executive Order 109 and established the Energy Conservation Steering Committee. The committee was charged with developing and implementing a comprehensive action plan (Plan) to reduce energy consumption and GHG emissions of City buildings and operations by 30 percent by 2017, thus advancing a key PlaNYC energy initiative. In addition, the Mayor announced an annual commitment equal to 10 percent of the City's energy budget to finance the Plan. That amounted to roughly \$900 million to be paid out over 10 years. Finally, the Executive Order called for the action plan to be submitted no later than June 30, 2008. The City Council subsequently enacted Local Law 22 which codified the GHG reduction goals laid out in Executive Order 109.

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Executive Order 109 and Local Law 22 thus provided four elements that are critical to the success of any large scale public initiative:

- Endorsement from the highest political authority;
- Pledge of significant, long-term funding;
- Clear, quantifiable statement of goals; and,
- Clear identification of the officials and agencies responsible for the first steps in implementation, coupled with accountability for completing an acceptable plan on a relatively short deadline.

### **The Baseline Situation: Early Challenges**

While the leadership of the Mayor and the City Council created many of the necessary conditions for success, the members of the Steering Committee knew that they faced enormous challenges in developing a viable approach to achieving the GHG reduction goals. Among the greatest of these challenges were the following.

- **Scale.** The City's inventory of GHG-emitting assets includes over 4,000 facilities and 27,000 vehicles. The facilities range in size and complexity from heated comfort stations in the parks to large waste water treatment plants and Rikers Island, which houses tens of thousands of prisoners. There are over 1,200 schools in the City.
- **Complexity.** The City's inventory of vehicles and facilities is used and maintained by 20 operating agencies. Each has its own mission and list of budget priorities, which do not include energy efficiency and greenhouse gas reduction. The characteristics and uses of the building inventory vary greatly from one agency to another, as does the level and organization of operations and maintenance (O&M) departments that serve those buildings. Finally, several large property-owning agencies, such as Health and Hospitals, are formally outside the Mayor's and City Council's authority to require compliance with the Executive Order.
- **Incoherence of the energy management function.** Prior to the Executive Order, the City had undertaken some initiatives to increase energy efficiency. However, these efforts had been inconsistent and scattered over a number of agencies, with no central coordination and little visibility. For example, The Department of Design and Construction (DDC), which oversees construction projects for most agencies is responsible for enforcing the Local Law regarding the energy efficiency of newly constructed buildings.. The City's Office of Environmental Coordination was responsible for reporting on this Local Law, and a new office, the Office of Long-Term Planning and Sustainability, set the City's energy and climate change goals. Meanwhile, the NYC Economic Development Corporation (NYCEDC) was responsible for development of the City's energy policy. Finally, the Office of Energy Conservation in the Department of Citywide Administrative Services (DCAS) managed the City's contract with the New York Power Authority for technical assistance in carrying out energy efficiency retrofits. To complicate matters further, DCAS, NYCEDC, the two "green" offices, and DDC were under different Deputy Mayors.
- **Low priority for energy management efforts.** Prior to PlaNYC, the Mayor's office had not exercised a strong leadership role in energy management or in greenhouse gas

reduction. The Mayor's Office of Management and Budget therefore did not place high priority on energy management objectives, and often rejected proposals for capital projects aimed primarily at reducing energy consumption and costs. The operating agencies had little motivation to expend political effort to secure funding for energy efficiency investments. Energy bills for most agencies are sent directly to and are paid by DCAS. The operating agencies are not held accountable for meeting energy budgets and do not benefit in any way from achieving energy savings.

- Lack of information. As mentioned, DCAS received and paid the energy bills for all City facilities. This provided a central repository of energy use information that could be used to guide energy management capital investments and operations. However, these data resided on a "legacy" computer system and were extremely difficult to manipulate into reports that could be used to benchmark and track consumption at the facility level or to support higher-level planning activities. There were other kinks as well. For example, oil deliveries were not recorded at the facility level, but rather at a "route" level that encompassed multiple building. Finally, the City and some individual operating agencies maintained a variety of asset management databases, some of which contained information that is extremely valuable in planning energy programs: building size, construction type, HVAC equipment type, date of construction, presence of elevators, and so forth. However, the coverage of these systems was incomplete, and they differed in their data structure, property identifiers, and update cycles.

All of these challenges are familiar to any large, multi-facility organization. In the following sections, we describe how the City has addressed them over two and one-half years.

## **Getting Organized**

### **Convening the Steering Committee**

After the release of PlaNYC, it became clear that the Mayor was fully behind this effort, and that in fact, it was a priority of his administration. Mayor's endorsement of the economic case for energy efficiency investments contained in the PlaNYC document brought the Office of Management and Budget (OMB) on board. The next step, then, was to put *the right people at the table*.

First, the Executive Order designated the Deputy Mayor of Operations to chair the Steering Committee and charged him with the responsibility for meeting the GHG reduction goals. The Deputy Mayor of Operations oversees many departments with large building inventories, including DCAS (the courts and major office buildings), the Department of Environmental Protection (waste water treatment facilities) and the Department of Sanitation. As discussed earlier, DCAS also housed many of the energy accounting and retrofit project management functions that would need to be incorporated into an improved and expanded energy management program. Second, the Executive Order required the presence of other central administrative agencies whose missions touch upon energy efficiency and GHG emission reductions: the Department of Design and Construction, the Mayor's Office of Operations (which includes Long-term Planning and Sustainability), and the Economic Development Corporation. Finally, the Office of Management and Budget was represented and played a prominent role both in the planning phase and in subsequent implementation activities.

## Developing the Plans

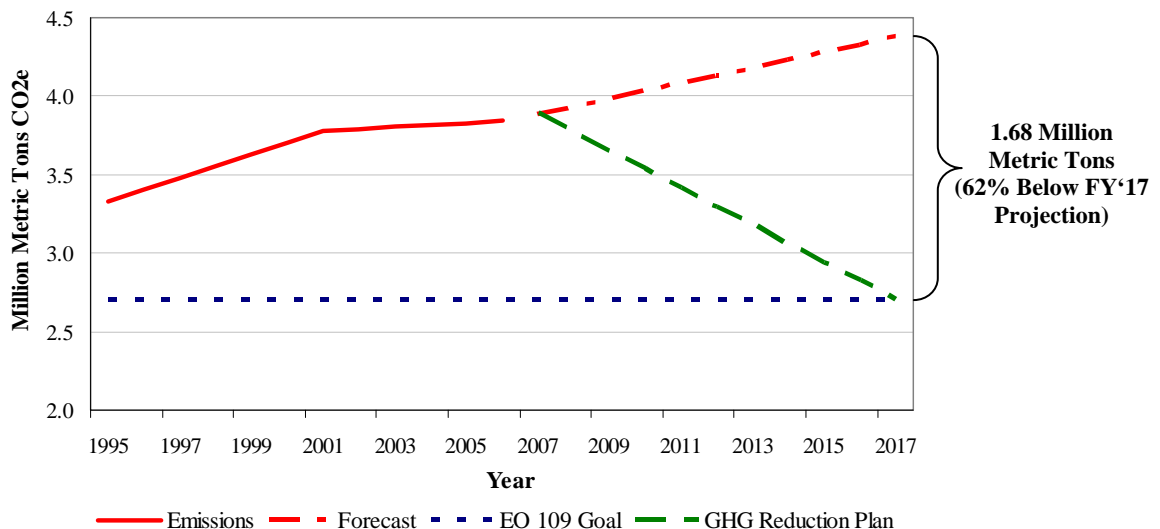
**The comprehensive plan.** In late February 2008, the Steering Committee engaged a team of consultants from KEMA, Inc. and AECOM Technology to develop the comprehensive plan for the GHG reduction initiative. The Steering Committee was aware of the wide range of organizational challenges described above. However, the scope of the planning activity was quickly narrowed to address the following technical and financial questions:

- What specific kinds of capital and operating improvements would the City need to undertake to reduce GHG emissions by 30 percent by 2017, and at what volume?
- How much would these activities cost?
- How much energy cost savings would be achieved through these measures?
- To what extent would energy cost savings offset the capital and operating costs of the energy efficiency improvements, as measured by conventional financial indicators such as Net Present Value?

The financial focus of the plan reflected both the presence of the Office of Management and Budget on the Steering Committee and the seriousness of the mandate.

The first step in developing the *Long Term Plan* (Energy Conservation Steering Committee, 2008) as this document came to be known, was to estimate the absolute level of reductions in annual GHG emissions required to meet the goals in the Executive Order, which referred explicitly to emissions levels at the time of its release. Figure 1 depicts this calculation, which forecasted the growth of emissions based on energy consumption and greenhouse gas inventories going back to the mid-1990s. Using this process, the cumulative emissions reduction goal was set at 1.68 million metric tons.

**Figure 1. Forecasted Emissions versus Goals**



Once the goal was thus quantified, the consultant team set about assessing potential energy use reductions in the full range of City assets, as shown in Figure 2. The Steering Committee set a financial threshold of a 15-year payback for all measures combined. For some

categories of measures, such as replacement vehicles, recent technical studies were available for guidance. For most, however the consultant team needed to generate estimates of potential savings and project costs by researching the size of the asset inventory and analyzing current patterns of consumption. The largest of these efforts characterized capital and operating efficiency measures in existing buildings. The consultant team consolidated energy consumption records and information from other asset databases to the facility level. We then applied energy efficiency potential models typically used to support utility-sponsored energy efficiency programs to assess the applicability of various end-use measures along with their aggregate costs and savings. This model became a core analytical resource to support the initiative's implementation.

**Figure 2. Potential for Annual Greenhouse Gas Reductions by Project Group  
Total = 1.68 Million Metric Tons (mt) per Year**

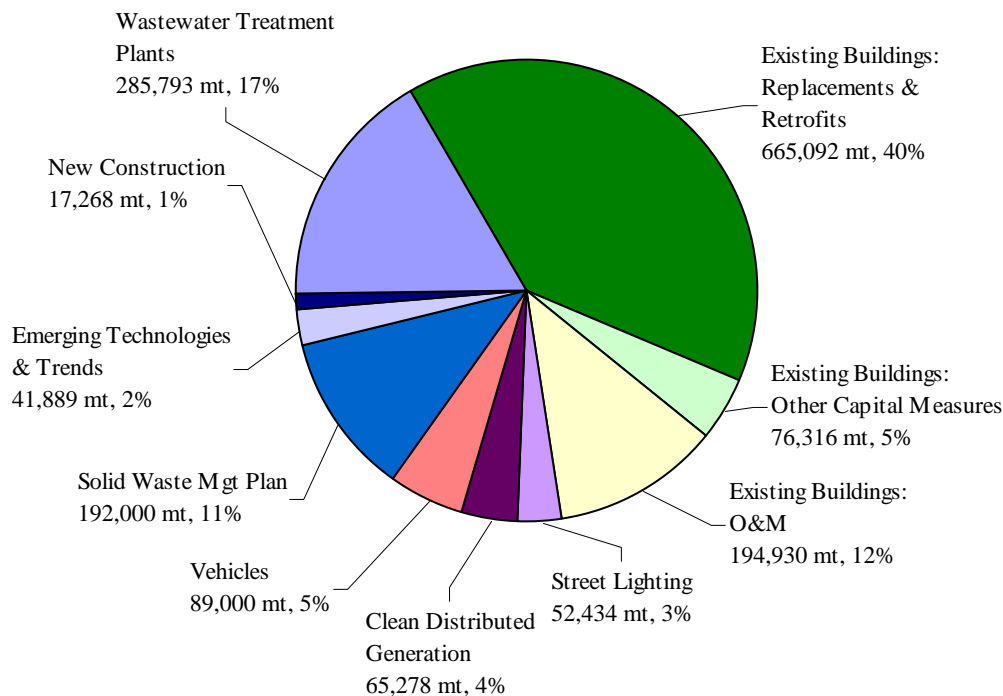


Table 1 summarizes the financial results of the plan. The implementation costs for the projects identified totaled roughly \$2.34 billion: \$1.9 billion in capital plus incremental expenditures of \$435 million over ten years for improved operations and maintenance services. Annual potential savings were estimated at \$306 million, yielding a simple payback period of 7.6 years. The plan included a net present value analysis of energy efficiency related expenditures and benefits over a 25-year horizon. The analysis took into account inflation in fuel and construction costs, the sequencing of measure implementation, financing costs, and the effective useful life of the measures installed. The base case net present value for these investments in energy efficiency was \$554 million. Under sensitivity scenarios that covered variations in assumptions concerning energy price inflation, construction cost inflation, project completion risks, and performance risks, the NPV ranged from \$240 million to \$699 million.

**Table 1. Summary of Financial Costs and Benefits by Project Group**

Project Group	Investment Costs		Annual Bill Savings		Payback Period in Years
	\$ Million	% of Total	\$ Million	% of Total	
Equipment Replacement & Retrofit	\$ 1,184	50.6%	\$ 179	58.5%	6.6
Other Capital Measures	\$ 219	9.4%	\$ 20	6.6%	10.9
Building Operations & Maintenance	\$ 435	18.6%	\$ 54	17.7%	8.1
Street Lighting	\$ 47	2.0%	\$ 13	4.2%	3.6
Clean Distributed Generation	\$ 126	5.4%	\$ 11	3.6%	11.5
Vehicles	\$ 218	9.3%	\$ 12	3.9%	18.2
Wastewater Treatment Plants	\$ 78	3.3%	\$ 12	3.9%	6.5
New Construction	\$ 32	1.4%	\$ 5	1.6%	6.4
<b>Total</b>	<b>\$ 2,339</b>	<b>100.0%</b>	<b>\$ 306</b>	<b>100.0%</b>	<b>7.6</b>

The analysis found that retrofit and replacement of inefficient equipment in existing buildings offered the largest opportunities for cost-effective energy savings. Those activities accounted for 58.5 percent of the potential savings and 50.6 percent of the total investment costs. The next largest category of savings opportunities identified was improvement to building operations and maintenance procedures, including retrocommissioning of up to 100 large facilities. Improvements to operations and maintenance accounted for roughly two-thirds of the potential savings and costs in this category; retrocommissioning accounted for the remaining potential savings and costs.

**The operations and maintenance (O&M) plan.** Upon completion of the *Long-term Plan* the Steering Committee and the consultant team embarked on the development of a comprehensive plan to improve energy-related operations and maintenance processes in City agencies. The planning effort included extensive interviews and facility observations occupied by 11 operating agencies, development of more detailed technical models of the cost and benefits of improved building operations and maintenance, and identification of best practices for improved energy-related O&M at the central City, agency, and facility levels. (AECOM Technology Corp. and KEMA, Inc., 2009). Key findings and recommendations from this planning effort included the following:

- The general level of costs and savings for enhanced O&M practices developed for the Long-term Plan were validated.
- The cost of improving preventive maintenance procedures to manufacturer-specified levels for major energy systems in the building inventory ranged from \$31 million to \$43 million, depending on the degree to which the services were performed by City employees versus outsourced to contractors.
- The greatest potential energy savings could be generated by better monitoring of building energy use and rapid response to rapid changes or anomalies in energy use.

The findings from this plan were used to structure a pilot to improve energy-related O&M practices in two major property-owning agencies: the Department of Education and DCAS.

## **Creating the Division of Energy Management**

Once the Energy Conservation Steering Committee released the *Long-term Plan*, it was time to set *the right structure* to allow for its implementation. This took time as it was unclear at first where management of the Plan should sit to ensure it remained a priority, while supporting the basic technical capabilities required. It was clear, though, that responsibility for implementation of the Plan needed to be assigned to a single organization to support a more integrated approach to energy management.

The Deputy Mayor for Operations eventually decided to assign the responsibility to DCAS, but at a higher level than the existing Office of Energy Conservation. To accomplish this, the City created a new division—the Division of Energy Management (DEM)—with a new Deputy Commissioner who reported directly to the agency’s Commissioner, as well as the to the Energy Conservation Steering Committee. The Committee no longer manages day-to-day implementation of the GHG reduction initiative, but rather serves as a vehicle to keep other agencies engaged, hold DCAS accountable for reaching the Mayor’s goals, and represent the initiative’s accomplishments and resource needs at City Hall.

DEM continues to execute the tasks of the previous DCAS office related to energy procurement and management of retrofit projects through NYPA; however, it is now also overseeing the complete implementation of the Long-Term Plan, tracking and reporting on progress; and seeking to improve overall improve energy management of City buildings. Its mission is to serve as the hub for energy management of City government operations, from energy procurement to performance tracking, improved operations and maintenance, and building retrofits to ensure clean, reliable energy to support City operations and to reduce greenhouse gas emissions of operations. To support achievement of these objectives, the City organized the new division into four offices: Office of Energy Budget & Procurement, Office of Performance Tracking and Analysis, Office of Agency Support and Special Projects, Office of Energy Conservation. These offices act as an integrated team for which collaboration and communications are paramount.

## **Getting Funded**

Once the *Long-term Plan* was completed, the Steering Committee and DEM needed to identify cost-effective equipment and replacement projects for funding in the current fiscal year and to put in place a system that could be used to identify and expedite funding of projects in years to come. This effort faced the following challenges.

- Expediting the project identification and completion process. Over the thirteen years prior to the completion of the *Long-term Plan*, the City had completed 297 major energy-efficiency related capital improvements with a total capital cost of \$239 million. These projects had been undertaken with the assistance of the New York Power Authority’s ENCORE program, which provides technical and project management assistance to municipalities for identifying and implementing energy efficiency improvements to

existing buildings.<sup>2</sup> Most of these ENCORE projects had involved lighting equipment retrofit and replacements only. Moreover, upcoming projects will need to address the full range of technical opportunities for energy savings, not just lighting replacement. Finally, the ENCORE project engineering and management process requires the completion of a lengthy technical assistance study that details measure applicability, potential savings and costs. In order to meet the goals of Executive Order 109, the City will need to implement nearly four times that number of projects in a period of nine years. It will also need to match levels of project engineering and management resources to the technical requirements of the individual projects in order to stretch those scarce resources. As discussed below, DEM has already made important strides in addressing this set of issues.

- Obtain additional sources of funding. The City's commitment of \$900 million over ten years towards energy efficiency investments and improved energy management – generous as it is – does not cover the \$2.4 billion price tag identified in the *Long-term Plan*. DEM plans to address this issue through a number of steps. First, it has undertaken a systematic measurement and verification programs to document the magnitude of savings achieved through energy efficiency projects in City facilities. Second, it has begun to explore alternative sources of funding for capital improvements. We summarize these efforts below.

### **Expediting Project Identification and Completion**

In the first year after the development of the *Long-term Plan*, the Steering Committee and DEM focused on developing a large volume of projects. Working with their technical consultants, DEM developed a set of tools that enabled facility managers in the operating agencies to identify and characterize energy efficiency-oriented capital improvements in their facilities. These tools consisted of walk-through audit form with extensive instructions and education material, and a project cost and savings calculator based on the models that supported the *Long-term Plan*. Agency personnel identified the measures applicable to their facilities and filled in some basic facility data including size in square feet, space uses, current levels of energy consumption, and the percentage of space to which the measures applied. The calculator then generated estimates of energy costs and savings, taking into account measure interactions and end-use saturations particular to the type of building in question. These tools proved sufficiently accurate to support the development of capital budget requests. Using the tool set, the operating agencies and DEM, working together, were able to identify over 100 cost-effective replacement and retrofit projects and to complete over 60 of them in the first year of program operation.

Despite this success in building project volume, program managers realized that the system would need to be changed in a number of ways to use available funds most effectively in reducing emissions. First, because the system assigned project identification initiative to the operating agencies, those agencies that had already begun to pursue energy efficiency on their own submitted the most applications. However, because those agencies had already improved some of their worst-performing buildings, the projects they submitted had lower-than-average savings per dollar of program expenditure. Meanwhile, less motivated agencies with some of the

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<sup>2</sup> The ENCORE program also provides project financing services. However, the City has elected to finance ENCORE projects using its own resources.



least efficient buildings did not generate any project applications. Second, even the more active agencies continued to pursue a very narrow range of technical opportunities, primarily lighting retrofits. Since project economics were assessed at the building level, the practice of pursuing low hanging fruit served to render the more complicated but productive measures, such as improvements to HVAC equipment and controls, less cost effective than they would have been when bundled together with lighting measures. Finally, agencies were motivated to overestimate the applicability of various measures, which required further DEM to conduct further review to validate the project plans.

DEM has completely revised the capital project identification and planning process to address these issues. First, DEM now takes the initiative to identify facilities in need of improvements using a data-driven approach based on building benchmarking. For larger buildings with significant opportunities for energy savings, DEM requires comprehensive energy audits by independent contractors to identify and characterize the costs and energy savings associated with the full range of feasible measures. DEM then selects facilities for comprehensive treatments that address operating improvements as well as capital needs. For large projects funded through the ENCORE program, DEM has worked with NYPA to streamline the audit/retrofit process by using one implementation contractor to do both tasks instead of separating the two as was previously required. Finally, to address opportunities in smaller buildings in a cost-effective manner, DEM has developed turnkey contracts for improvements to lighting, packaged HVAC and motor systems. This approach economizes on scarce project management resources and provides contractors with the motivation to identify cost-effective projects.

### **Demonstration of Energy Savings**

Generally, the administrators of energy efficiency programs need to wait at least a year to 18 months after program inception to evaluate savings gained through their efforts. It takes that long for a large cohort of projects in commercial buildings to be identified, qualified, designed, installed, and commissioned. The Steering Committee and DEM, recognizing that difficult fiscal conditions associated with the 2008 financial crisis could put pressure on the initiative budget, believed it was necessary to provide a concrete demonstration of the value of energy savings as early as possible. The Steering Committee therefore commissioned an independent evaluation of energy savings generated by lighting retrofit projects undertaken over the past ten year with the assistance of the New York Power Authority (NYPA). The City had completed 208 such projects between 1999 and 2007, and 97 of those facilities had sufficient billing data to support a regression analysis of the effect of the installations on weather-normalized electric use.

The evaluation found that, on average, the projects realized 91 percent of the energy savings that had been forecasted in the project engineering documents developed for NYPA, with an 80 percent confidence interval of  $\pm 15.3$  percent. The total cost of the projects was \$31.0 million. The simple payback for the projects was 8.15 years, and their net present value to the city was \$18.4 million,  $\pm 17$  percent. These positive results will provide confidence to financial officials in decisions to continue funding efficiency projects at their current level. (KEMA, Inc., 2010)

## **Investigation of Additional Funding Sources**

In 2009 – 2010 the City successfully pursued funds available through various federal stimulus programs to increase funding for energy-efficiency oriented capital improvements. Now that DEM has put key project management and M&V systems in place, it is in a position to work with the Steering Committee, and especially the Mayor’s Office of Management and Budget to pursue other funding opportunities. These may include increases to the allocation defined in Executive Order 109, approaches to state revenue bonding authorities, and use of third-party financing vehicles.

## **Getting Equipped**

### **Energy Management Tools for the Operating Agencies**

The experience of many municipalities and campus-based institutions show that conscientious, ongoing energy management and maintenance of energy systems is required both to achieve and to maintain energy savings. While DEM has made strides to rationalize and centralize capital project planning and implementation, it is impossible for a central office of roughly a dozen professionals to take responsibility for energy management in 4,000 facilities. This is clearly a task for the operating agencies, who are responsible for O&M in the facilities they occupy. However, research conducted for the *Long-term Plan* and the O&M Plan found that the operating agencies do not have staff resources, funding, or expertise to improve O&M as it relates to energy management. Plus, agencies often feel they are “in it alone” and do not know about available resources or lessons learned by other agencies.

The Steering Committee had anticipated the need to build up energy management capability in the operating agencies. Along with the studies that led to the *Long-term Plan* and the O&M Plan, its initial request for consultant assistance called for the development of a suite of O&M tools, including preventive maintenance protocols, standard maintenance contract terms, and training modules. Early in the O&M planning process it became apparent that City-wide deployment of a set of standard tools would neither be feasible nor effective in improving O&M practices. The operating agencies varied too much in terms of building inventory, O&M staffing levels and structure, and previous experience with energy management for a “one-size fits all” approach to work. Instead the Steering Committee and DEM directed the consultant team to develop a set of more open-ended tools for operating personnel to use in creating Energy Management Plans for individual facilities. The City piloted these tools in 6 DCAS and 10 Department of Education facilities. Future efforts in this area will include assistance to agencies in using computerized maintenance monitoring systems and other management tools. To support this effort further, DEM has partnered with the local chapter of the Association of Energy Engineers and the City University of New York’s Building Energy Lab to offer Certified Energy Manager and Building Operator Certification training to facilities staff.

## **Information Systems**

Improving energy management requires access to good data and the ability to share that data in concise, clear ways. Currently, the City has neither. This hinders project selection and implementation as well as the tracking of GHG emissions reduction efforts. Therefore, DEM has

worked with the operating agencies to benchmark energy consumption using the EPA Portfolio Manager in all buildings over 30,000 square feet. The benchmarking effort enables DEM and the agencies to better understand actual energy performance of buildings, track performance over time, compare like buildings, and prioritize energy-related investments where most needed to ensure best “bang for the buck.”

The City is creating a central database to collect, track and report on information concerning the energy and environmental performance of existing buildings and capital building projects. This database is intended to facilitate the collection and exchange of building related information relevant to agencies and to the Mayor’s Office. As such, it will track and organize a number of metrics and resources related to evaluating and improving the performance of the buildings for which the City covers energy cost and of the building projects to which it contributes capital funds. This database will also contain data related to properties and buildings that the City leases from private owners. The database will be designed to draw from and/or link to existing data sources that already exist in various City agencies and, in cases where the necessary data are not currently available, provide for its collection.

## **Getting Motivated**

Enhanced O&M is expected to account for 12% of emissions reduction with employee behavioral changes leading to further reductions. However, agencies have no incentive and few resources to promote O&M, educate staff, and encourage energy management activities. Central billing leaves agencies with no incentive to care about their energy use or costs; similarly, agencies do not benefit from the energy savings associated with efficiency even though many measures require use of their resources (e.g. O&M, capital replacements). Agencies do not pay for energy usage, and therefore, they have no incentive to keep usage/costs down. Conversely, all energy cost savings from energy efficiency goes to the City’s central budget, leaving agencies no incentive to invest time/resources into O&M and education.

DEM has been exploring various methods to provide direct incentives to operating agencies for good performance in energy management and cooperation in identification of cost-energy-related capital improvements that make best use of the City’s limited resources. So far, mechanisms for sharing savings or providing other tangible benefits such as additional staffing and training have been explored, but the issue is far from settled. While it is difficult respond to unfunded mandates of the type presented by Executive Order 109, it is not clear that DEM and the Steering Committee will be able to develop an alternative that is more satisfactory to the operating agencies.

## **Lessons Learned**

The City of New York has made significant progress towards meeting the ambitious greenhouse gas emission reduction goals adopted by its elected officials. Clearly, significant challenges remain in regard to funding and management of this massive effort. Key lessons to be taken from the City’s experience so far include the following.

- Strong leadership from the highest elected officials, including identification of long-term funding streams, is required to motivate the many agencies whose active participation is

needed to cooperate in the development and implementation of effective greenhouse gas reduction programs.

- A comprehensive planning process, properly managed, not only provides a roadmap for achieving greenhouse gas reduction goals but provides a forum for gaining buy-in from important actors in program implementation.
- Consolidation of administrative functions and accountability for implementation of greenhouse gas reduction plans into one office or agency greatly facilitates the process.
- Existing modes of capital project planning and management will need to be re-tooled to support expedited identification and implementation of energy efficiency projects.
- Improved energy management and O&M capabilities at the operating agency level are critical to overall program success. Efforts to improve these capabilities and capacities work best when targeted first to the individual facility level, then rolled out to the agency level.
- While political, legal, and accounting realities may prevent the sharing of energy savings with the operating agencies who contribute to their achievement, other types of incentives such as favorable consideration of capital project requests can be developed. Moreover, the City's experience to date demonstrates that much can be accomplished without a formal mechanism to enable the operating agencies to benefit directly from energy cost reductions.

## References

AECOM Technology Corp. and KEMA, Inc. **O&M Study**. 2009 New York, NY: Energy Conservation Steering Committee.

Energy Conservation Steering Committee. 2008. **Long-Term Plan to Reduce Energy Consumption and Greenhouse Gas Emissions of Municipal Buildings and Operations**. New York, NY: Office of the Mayor.

KEMA, Inc. 2010. **Impact Evaluation of ENCORE Lighting Retrofit Projects**. New York, NY: Department of Citywide Administrative Services