

**Smith House DSOM Installation**  
**CY 2005 Annual Report**  
**May 5, 2006**

**Background:** On October 13, 1999, the New York City Housing Authority (NYCHA) and Battelle Memorial Institute entered into an agreement to install a Decision Support for Operation and Maintenance (DSOM) system at the Governor Smith Housing Project in Manhattan, New York (“Agreement”).

Per contract requirements, Battelle conducted an initial assessment of the energy site and supporting infrastructure from November 29 through December 3, 1999. The major conclusions, issued in the characterization report dated March 7, 2000, were:

1. There is a major opportunity to improve the steam production efficiency of the boiler plant.
2. The steam distribution and condensate return systems were in good condition.
3. A second major improvement was identified in building energy management. Implementing an automatic feedback and control system to better regulate heat delivery to the apartments could dramatically reduce building steam demand.
4. By utilizing condition-based maintenance principles and advanced machinery diagnostics, a significant reduction in maintenance cost and improvement in life-cycle economics could be obtained.

In a letter dated March 17, 2000, NYCHA accepted Battelle’s characterization report and authorized Battelle to proceed with the installation of DSOM at Smith Houses.

In support of the system installation, Battelle entered into subcontracts with Alliant/Cogenex (which included Boorum Energy Engineers) for instrument installation and electrical wiring, and with Bambeck Inc. for the installation and commissioning of the boiler controls system.

Project implementation proceeded in accordance with the installation plan. Initial functionality of the system was achieved early in 2001.

An overview of the savings achieved during 2005, compared to previous years, is as follows:

Field	CY 2001	CY 2002	CY 2003	CY 2004	CY 2005
Therms Saved (normalized for weather)	376,666	478,794	397,062	358,766	333,090
Fuel Savings	\$152,512	\$181,224	\$168,910	\$161,660	\$173,174
Personnel Savings	\$0	\$35,339	\$70,678	\$89,022	\$88,483
Maintenance Savings	\$19,759	\$41,500	\$47,149	\$47,602	\$13,511
Total Savings	\$172,271	\$258,063	\$286,737	\$298,284	\$275,168

Additional detail concerning 2005 performance is provided below.

**System Performance:** During CY 2005, the overall system efficiency was a 19% improvement over the baseline period. Additional efficiency improvements are expected when effective O<sub>2</sub> trim can be accomplished to minimize the use of excess combustion air in the boilers. This improvement is dependent upon resolution of the stack draft issue (discussed in the ongoing efforts area).

**Total Savings:** In accordance with the Agreement between NYCHA and Battelle, the total savings generated as a result of the DSOM system installation, and its supporting infrastructure, are determined annually and the savings are shared based upon a pre-agreed formula. The total savings are the sum of fuel savings, personnel savings, and maintenance savings compared to the baseline, and normalized for variables such as weather.

The total savings during 2005 were \$275,168. These savings were calculated as follows:

**Fuel Cost Savings:** Following the same methodology as agreed to in the December 16, 2000 Modification to the Agreement, and as used for the final 2005 energy savings calculations, fuel savings formula is:

$$AES = [HWB + (SHDDB * HDD) - GEC] \times AFP$$

where:

HWB = Hot Water Baseline: The average therms (768,801) required during the baseline period (1995-1997) to generate domestic hot water.

SHDDB = Space Heating Degree Days Baseline: The average therms per heating degree day (205.23) during the baseline period (1995-1997) required to generate space heating only.

HDD = the actual Heating Degree Days for NYCHA/Smith House for the year being considered (2005).

GEC = the actual Gross Energy Consumption of fuel in therms at Smith House for heat and hot water for the year being considered (2005).

AFP = Annual Fuel Price

The term  $[HWB + (SHDDB * HDD)]$  determines the historical “pre-DSOM” fuel consumption based on baseline data adjusted for 2005 weather (as defined by Heating Degree Days). Using 4719 HDDs, the total historical “pre-DSOM” consumption is 1,737,284 therms. NYCHA records indicate that 1,404,194 therms were consumed during 2005 (GEC) indicating that the DSOM system saved 333,090 therms during the year.

Annual Fuel Price (AFP) as used in the fuel savings formula is the baseline period fuel price adjusted by the Consumer Price Index (CPI) for fuel in the Northeast. Using this method results in an AFP of \$ 0.5199/therm.

Thus the Actual Energy Savings (AES) for 2005 are \$173,174.

**Personnel Cost Savings:** In discussion with Housing Authority personnel, it was determined that operations personnel cost savings were contingent upon the development of an operations procedure, which delineated operator activities for a Housing Authority energy plant controlled by the DSOM system. NYCHA staff determined through analysis that the implementation of an operations procedure would result in reduced operational costs that were the equivalent of one Heating Plant Technician (HPT) and ½ HPT supervisor. Working together, this procedure was developed and implemented in 2002. Subsequently, Battelle and NYCHA agreed to accept these as a fixed cost savings for each year.

Using the criteria stated above, the personnel cost savings for 2005 are \$88,483.

**Maintenance Cost Savings:** Maintenance cost savings are determined by measuring the maintenance costs (normal and emergency) during the year being evaluated against those determined for the baseline years and reported in the Battelle Characterization Report. Maintenance costs savings were determined to be \$13,511.

**Shared Savings:** The Agreement specifies the formula for sharing the cost savings that have accrued during each year of the performance contract. The Agreement requires that NYCHA is to first receive savings in the amount of 10% of the actual construction and accumulated maintenance project (ACAMP) cost. Since the ACAMP cost through 2005 was \$1,380,627, the initial credited savings to NYCHA are \$138,063. Battelle is to receive savings in the amount of 3% of the ACAMP cost, which are \$41,419. Residual savings (those that exceed the combined total of the above amounts (\$179,482 for 2005) are then shared equally between NYCHA and Battelle. In 2005, there were residual savings of \$95,686, which are shared equally.

The total savings that are credited to NYCHA for 2005 are \$185,906. The total savings share to be paid to Battelle is \$89,262, for which the invoice is attached.

**On-going Efforts:** Although the DSOM system installation is complete for Smith House, Battelle and its subcontractors continue to provide support as required to answer questions from NYCHA staff or to fix/modify system discrepancies as discovered.

NYCHA, Battelle, and its subcontractors, continue to work together to remedy operational problems experienced at Smith House. In 2002, a concern over power quality led to the procurement of power conditioning modules for the boiler controls system. In 2003, a hardware failure of the main computer required Battelle assistance in data recovery and system reconfiguration. In 2004, the decision was made to replace the computer equipment. Battelle has purchased and configured the equipment prior to installation.

In 2005 it was identified that there were an increasing number of operational issues associated with the boiler control system developed by Bambeck, Inc. These issues directly resulted in a reduction of overall plant efficiency experienced during the year. The increased manpower required to operate the boilers resulted in a reduction of the maintenance savings for 2005. To mitigate this issue, a maintenance contract with Bambeck, Inc. was entered into with Battelle to provide boiler tune-ups twice annually and repairs to any on-site failures.

Continuing difficulties in maintaining O<sub>2</sub> trim are believed to be related to the physical size and configuration of the exhaust stack. Because system reliability is of over-riding importance to the Housing Authority, the O<sub>2</sub> range has been widened to reduce the number of boiler trips. While reliability has improved, it has been at the expense of system operating efficiency.

**Summary:** The DSOM system is achieving the expected level of performance projected in the characterization report. Battelle will continue to work with NYCHA on those areas described under the "On-going efforts."