



## SHOWCASE PROJECT: 344 EAST 28TH STREET

### SOLUTION OVERVIEW

344 East 28th Street is a 26-story residential building located in Manhattan's Kips Bay neighborhood. Constructed in 1971, the building has 225 units ranging in size from 1 to 4 bedrooms, and serves 450 low- and extremely-low-income residents. 344 East 28th Street, where the average monthly rent is \$442, is a critical affordable housing resource for the Kips Bay neighborhood, where the 2010-2014 median rent was \$2,131, and 61.8 percent of low-income families are severely rent-burdened (rents of 50 percent or more of income).

Before the retrofit project, the building used 28 percent more energy than the typical New York City multifamily building. Like most New York City multifamily buildings, the primary energy challenge for 344 East 28th Street is in conserving energy used for heat and hot water. Its heating EUI was comparable to NYC 2-pipe steam buildings, and was substantially better than the NYCHA median. However, the building's hot water-to-heat ratio was almost 50:50, which indicated that the hot water generation was likely extremely inefficient.

Rather than having its own steam boilers, 344 East 28th Street is one of 16 NYCHA developments that use district steam, about 50 percent of which is a by-product of electric generation. At these sites, high pressure steam from the district steam system enters the building, where pressure reducing valves (PRVs) reduce the steam pressure, and then direct the steam to two lines: one for heating and one for domestic hot water. On the heating side, steam is distributed to radiators throughout the building. Domestic hot water is heated by running the steam through large hot water tanks, which typically suffer high standing losses. Once the steam cycles through the system once, the condensate is tempered with cold water to lower its temperature to 130°F, then discharged into the city sewer system.

### SECTOR TYPE

Multifamily

### LOCATION

New York, New York

### PROJECT SIZE

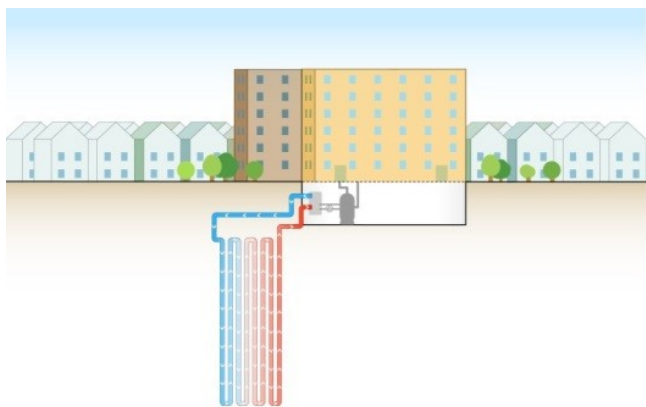
209,800 Square Feet

### FINANCIAL OVERVIEW

Project Cost: \$2,200,000

## SOLUTIONS

NYCHA used a combination of American Recovery and Reinvestment Act (ARRA) funds and a New York City capital grant to undertake a \$2.2 million lighting, heating, and hot-water modernization project, completed in 2012. NYCHA achieved a 55 percent reduction in the energy needed for heating domestic hot water by installing a ground source heat pump (GSHP) system, capturing waste heat in the steam condensate, and by replacing hot water tanks with instantaneous hot water heaters. The GSHP system consists of two 20-ton glycol ground source units and two 2,000-gallon cement-lined domestic hot water storage tanks. Cold water (50°F) from the City's supply is heated by the GSHP system to 80°-90°F, and then the instantaneous on-demand heater uses district steam to bring the supply temperature to 120°F for distribution to the apartments.



**Figure 1:** Ground-source heat pump (GSHP) system uses heat naturally occurring in the ground.

Heating modernization consisted of installing temperature sensors in every apartment, combined with new radiator valves and steam traps. Before this upgrade, whether the heat was on or not depended solely on the outdoor temperature, which meant that heat would be supplied on cold days even if the apartments were warm. The indoor temperature sensors key the heat to indoor temperature to eliminate overheating, thereby improving comfort for residents and eliminating energy waste that results when residents resort to opening windows. The addition of these heating controls improved the heating performance by 10 percent.

Finally, the project also included basic lighting upgrades:

- Replacement of T12 fluorescent fixtures in the building's common areas with energy efficient T8 lamps and replacement of magnetic ballasts with high-efficiency electronic ballasts
- Replacement of building public space exit signs with LED signs
- Replacement of kitchen lighting fixtures and distribution of CFL bulbs

Stakeholder alignment and communication: NYCHA expected to realize a 25 percent cost savings on district steam as a result of the improvements; however, the 2010 to 2015 cost comparison for

steam shows the overall cost savings to be only 8 percent. This underperformance of cost savings was the result of a lack of alignment between NYCHA's conservation goals and the steam utility. In 2014, the steam utility switched the building to a higher "stand-by" rate, interpreting the existence of the GSHP system to be equivalent to an "alternative fuel." Thankfully, the steam utility has since revised its policies and this building is expected to realize the full 25 percent savings in 2017.

## **OTHER BENEFITS**

The ARRA project at 344 East 28th Street stands out among recent energy efficiency projects as much for its surgical targeting of the primary source of energy waste (inefficient domestic hot water) as for NYCHA's first (and as of 2017, only) deployment of a renewable technology.

To continue to drive down energy consumption, NYCHA is evaluating additional interventions at this and other district steam buildings:

- Taming Window Air Conditioning: 344 East 28th Street, like almost all NYCHA developments, is master-metered for electricity. Absent a virtuous feed-back loop, many master-metered residents use much more energy (up to four times more) than their direct-metered neighbors. Of the major behind-the-apartment-door electric loads, NYCHA already supplies the light fixtures and the refrigerator. NYCHA is currently planning a pilot initiative to tame a third high-consuming appliance -- the ubiquitous NYC window air conditioner
- Cogeneration: In 2016, NYCHA, in partnership with the New York State Energy Research and Development Authority (NYSERDA), began to evaluate opportunities for Combined Heat and Power (CHP) at NYCHA developments. Initial findings showed that because of a favorable electric rate combined with low natural gas prices, CHP did not make sense in most NYCHA developments. The exception is district steam buildings because of the high price of steam. NYCHA is moving ahead with identifying up to six developments to incorporate CHP into the Pressure Reducing Station, taking advantage of the high-pressure steam to meet a portion of the building's electricity needs.
- NYCHA Call for Innovations: In 2016, NYCHA issued a solicitation of pilot projects focused on improving the efficiency of its 16 district steam developments. As a result of this competition, two teams were selected to pilot solutions.

NOTE: The figures below have been adjusted to incorporate New York City factors for consistency with the City's carbon reporting.

### Annual Energy Use

(Source EUI)

Baseline(2010)  
153.3 kBtu/sq.ft.

Actual(2015)  
125.9 kBtu/sq.ft.

### Energy Savings

23%

### Annual Energy Cost

Baseline(2010)  
\$631,600

Actual(2015)  
\$518,000

### Cost Savings

\$113,600



344 East 28th Street