

# Multifamily Housing at Continental Plaza, Chicago



Figure 1: Exterior of Continental Plaza's apartment building south façade and entrance.

### Summary

Continental Plaza is an affordable housing development consisting of one apartment building and nine sections of townhouses in South Side Chicago's Auburn Gresham neighborhood. Using Affordable Community Energy, Inc.'s innovative, mission-driven energy service company model, Continental Plaza's building owner has been able to dramatically reduce the building's energy and

water costs with minimal upfront investments.

The renovations included installing an extensive solar photovoltaic system on the Chicago rooftop, which generates about 200,000 kWh each year, and a micro combined heat and power system—a relatively new concept for multifamily housing in the United States—to generate electricity from wasted heat energy from the building's domestic hot water. In addition, a 10-year shared-savings energy performance contract and power purchase agreement gives the owner the added benefit of a third-party providing the operations and maintenance necessary to sustain the efficiency savings throughout the contract.

Through the retrofit measures, Continental Plaza reduced its annual utility costs by over \$47,000 under the shared-savings agreement—a 15 percent utility cost reduction. A building owner who receives all of the energy and water cost savings could have seen its 2014 utilities reduced by as much as \$109,282. Continental Plaza is an example of how energy and water upgrades can help preserve affordable housing while reducing carbon emissions and conserving natural resources.

**"As a subsidiary of a non-profit owner of affordable housing, we were purposely designed as a community-focused ESCO to bring comprehensive energy efficiency, water conservation, and clean energy retrofits to other mission-driven affordable housing owners by providing not only the necessary expertise and resources but the capital as well."**

*—Jeff Greenberger, Chief Operating Officer, ACE*

## Lessons learned

- A portfolio approach spreads performance risks and opens up capital sources not available to smaller projects, including New Market Tax Credits.
- Solar is expensive. Without significant subsidies, the solar panels would not have been installed as their NPV would have been negative. However, when bundled with energy and water measures with quick paybacks, the package can deliver attractive returns.
- Problems with the availability and quality of utility data make measuring savings more difficult.
- Getting Low-Income Housing Tax Credit (LI-HTC) investor consent to use property reserves can be challenging, but eventually most come around.
- Since most of the improvements installed only reduce consumption,<sup>1</sup> rate increases could still result in higher utility bills—but they would have been even higher if the improvements had not been made. In addition, because the baseline consumption is adjusted based on

<sup>1</sup> The solar PV and CHP provide more protection against future rate increases, particularly once the equipment reverts to the owner. At that point, the electricity produced is free, except for minor maintenance costs.

## Building Information

**Name:** Continental Plaza

**Location:** 1330 West 76th St., Chicago

**Type:** Affordable multifamily housing

**Units:** 164 one-bedroom apartments for seniors

**Year Built:** Built as industrial space in 1956; converted to multifamily in 1983.

temperature, a more severe summer or winter season might result in increased utility costs. On the other hand, less severe seasons will not result in a windfall savings paid to ACE.

- The ACE model is dependent on it being able to line up financing to pay for the work. Traditional lenders are becoming more comfortable in lending against energy savings and onsite production, but they still need to have adequate security to satisfy their underwriting requirements. Providing this security is a challenge, but there are emerging insurance and other credit enhancement alternatives that will help.
- There is a very real possibility that the existing tax credits and state, local, and utility subsidies could be reduced or eliminated entirely, which will make these types of programs even more difficult.

## Background

Continental Plaza's affordable housing apartment building, located at 1330 West 76th Street, has 164 one-bedroom apartments dedicated for seniors. Originally built in 1956 for Continental Can Company, the building was converted into multifamily housing in 1983. The apartment building is 240,430 square feet, of which 142,358 square feet is above-grade and varies from one to three stories high. Each one-bedroom apartment is about 550 square feet, for a total rentable area of 90,200 square feet. The 98,072-square-foot basement is sparsely used for mechanical equipment and storage.

Continental Plaza is managed by Hispanic Housing Development Corporation (HHDC), an affordable housing non-profit in Chicago. HHDC has developed 45 projects with over 3,500 housing units and currently manages 4,300 affordable housing units serving more than 12,000 residents. Continental Plaza Preservation II LP ("the Building Owner"), a for-profit affiliate of HHDC, owns Continental Plaza.

## Development Team

- Affordable Community Energy: owner of the energy project (subsidiary of HHDC)
- Tropic Construction: General Contractor (subsidiary of HHDC)
- eConserve: water conservation strategic partner
- dbHMS: project engineers

The multifamily property receives Section 8 and LIHTC subsidies, so there are affordability restrictions that regulate the legal rents that Continental Plaza may charge its tenants. The maximum contract rent is \$723 per month; tenants pay no more than 30 percent of their income in rent and the federal government pays the difference to Continental Plaza. In 2013, the average household income for Continental Plaza was under \$12,000.<sup>2</sup>

## The Project

In 2011, HHDC's founder and President Paul Roldan collaborated with Jeff Greenberger to form Affordable Community Energy (ACE), an energy service company (ESCO) and subsidiary

2 "Picture of Subsidized Households for 2013," U.S. HUD, last accessed April 12, 2015, <http://www.huduser.org/portal/datasets/picture/yearlydata.html#data-display-tab>.

**Figure 2: The largest of the three solar photovoltaic systems installed on the apartment rooftop.**



of HHDC. ACE's mission is to preserve affordable housing and protect the planet. ACE is a "one-stop shop" energy service provider for multifamily housing: using Bright Power's benchmarking tool, EnergyScoreCards™, ACE benchmarked 11 of HHDC's properties, including Continental Plaza, and then evaluated, installed, managed, and, most critically, financed retrofits for energy efficiency, renewable energy, and water conservation.

In September of 2013, HHDC and the Building Owner entered into agreements with ACE to make these comprehensive improvements. They also leased rooftop and equipment room space to ACE so it could install solar photovoltaic (PV) equipment and a combined heat and power (CHP) unit. ACE owns the renewable equipment, CHP electricity-generating equipment, and energy conserving equipment during the life of its agreement with the Building Owner.

In exchange for installing, operating, and maintaining the equipment, ACE receives 80 percent of the energy cost savings, with the Building Owner reserving the remainder of the savings. The Building Owner benefits from reduced energy consumption and more affordable power by purchasing power generated on site at a rate equal to 90 percent of what its utility would otherwise charge. In addition, when the contract ends in 10 years, the energy conservation and production equipment—and all of the value of all future savings and production—belong to the Building Owner.

For water conservation measures, ACE contracted with eConserve, a water efficiency services company. At its cost, eConserve performed a water conservation assessment, replaced fixtures, repaired leaks, and will continue to monitor leaks and maintain the fixtures during the 10-year water agreement. eConserve takes 50 percent of the water savings until it recoups its costs, while ACE and the Building Owner each benefit from 25 percent of the savings. At the current rate of savings, eConserve will recover its costs in 2.64 years, at which point it will take 25 percent of the



Figures 3 and 4: **The solar PV system equipment: the transformers and inverter (top) and the solar PV output meter.**

savings, while ACE and the Building Owner will split the remaining 75 percent for the duration of the 10-year contract.

## Efficiency Measures for the Apartment Building

The common area electricity, common area natural gas, and building-wide water utilities at the apartment building are master-metered, and the Building Owner pays for them. Common area equipment includes commercial water heaters and a boiler for heating, all of which are gas fired. Apartments are separately metered for electricity, so the electric utility bills tenants directly. Because of the utility structure, ACE and the Building Owner implemented retrofit measures focused on the Building Owner's operating costs.<sup>3</sup>

<sup>3</sup> ACE explored the option of retrofitting individual tenant apartments, but found that tenants usually do not approve individual access to utility data. Because ACE would not have a way to track the savings other than by whole-building aggregate data for tenant electricity, it was not feasible to pursue retrofit measures that would affect tenant electricity consumption. Tenant apartments have individual electric HVAC units.



Figure 5: **A 4.4kW DC-rated ecopower micro-combined heat and power system.**

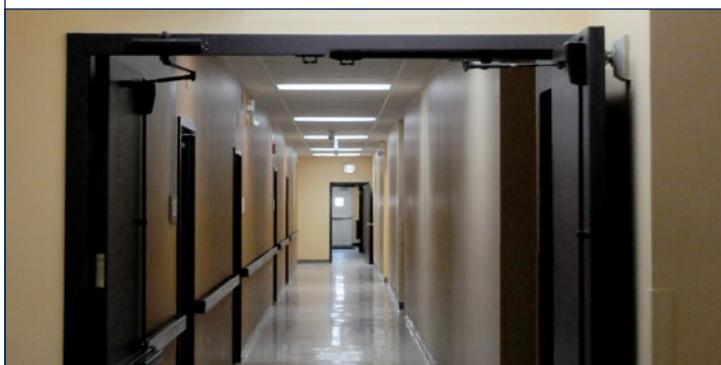
**On-site Energy Generation.** The apartment building has an east-west orientation, with the length of the building facing south to 76th Street—optimal conditions for solar. ACE installed a 186kW DC-rated PV electric production system on the apartment building rooftop. Each of the 775 panels has its own micro-inverter, which is more expensive upfront but makes the system easier to troubleshoot because identifying a malfunctioning panel is instantaneous and will not require shutting down and testing multiple panels as with systems with one central inverter.

Currently the on-site solar generation is used to meet real-time building demand for common area electricity. ACE is in the process of working with the utility to install a net meter, which will allow the building to receive a credit for any surplus electricity that it sends back to the grid. ACE pays a subcontractor to maintain the solar PV system during the 10-year power-purchase agreement (PPA).

In addition to solar PV, ACE installed a 4.4kW DC-rated ecopower™ micro CHP unit, which operates as the building's domestic hot water system. It converts heat energy that would otherwise be wasted in heating the water into electricity. Continental Plaza is an optimal candidate for CHP because the tenant demand for hot water is year-round and the building's domestic hot water load is large enough to make the CHP system worth the investment.



Figure 8: Fifteen high-efficiency gas-heat/electric-cooling units were installed.



Figures 6 and 7: Lighting upgrades replaced incandescent and fluorescent fixtures with more energy efficient fluorescents and LEDs in the basement hallways (top) and interior hallways.

***Lighting Upgrades.*** The Building Owner pays for lighting in the hallways, other common areas, and exterior property and parking areas. Before the retrofit, Continental Plaza used a mix of fluorescent and incandescent light fixtures in the interior spaces and high-intensity discharge (HID) fixtures for the outdoor areas. The building maintenance staff had to replace fixtures on a weekly basis and the Building Owner paid a third-party to replace outdoor lighting each time a light went out.

ACE addressed lighting in two ways: by using lighting controls to turn off lights when they are not needed and by installing lights that are more efficient. In common areas, ACE added occupancy sensors, retrofitted T12 fluorescent lamps and ballasts with more-efficient T8 fluorescent fixtures, and replaced incandescent emergency lighting with LEDs. Outdoors, ACE replaced HID fixtures with metal halide fixtures.

***HVAC Replacement.*** The apartment building's electric rooftop air handlers that supplied heating and cooling for the common areas were outdated

and in poor condition. ACE replaced the units with 15 high-efficiency gas heat and electric cooling packaged rooftop units that comply with ASHRAE 90.1 SEER and EER requirements.<sup>4</sup> Switching fuel sources from electricity to a more-efficient natural gas system resulted in an overall cost savings for the rooftop units because natural gas is a more cost-effective heat source compared to electricity.<sup>5</sup>

***Water Conservation.*** ACE contracted with eConserve, a water conservation consultant, to inspect and perform water conservation measures. eConserve's philosophy is to implement water conservation measures that are simple to maintain, so the building maintenance staff can perform general maintenance and extend the efficiency benefits in between site visits by eConserve staff.

eConserve implemented low-cost measures that have huge water savings. eConserve walked through each apartment unit and replaced every toilet's flapper and valve. For the kitchens, lavatories, and bathtubs, eConserve repaired leaks; fixed handles, stems, and washers; and installed aerators.

4 There are nine 3-ton units and three 4-ton units with 13 SEER and 11 EER ratings; two 8.5-ton units with 11 EEE and 11.2 IEER ratings; and one 10-ton unit with 11.10 EER and 11.8 IEER ratings. Thermal efficiency is between 80 percent and 82 percent.

5 ACE estimated that replacing the units would save 368,000 kWh but would increase fuel use by 20,545 therms on an annual basis. Actual fuel use increased by 12,135 therms in 2014.

**Operations and Maintenance.** One of the major benefits the Building Owner receives by contracting with ACE is the assurance that ACE will be motivated to conduct ongoing maintenance and operations of the energy conservation measures. Under the PPA agreement, ACE and third parties maintain all the energy conservation and on-site renewable equipment. ACE monitors the CHP and solar PV equipment using real-time software, and the Building Owner's staff calls ACE if there is a problem.

Likewise, ACE and eConserve share the cost savings from reduced water consumption with the Building Owner and remain vigilant in maintaining water conservation measures. Because leaks often go unreported or unrepaired, eConserve performs site visits as needed to recheck fixtures and maintain best practices. eConserve will perform its first follow-up inspection for Continental Plaza in March 2015, and it expects to return every nine to 12 months.

## Energy Savings Calculations under the ESCO Model

ACE determines how much the Building Owner saves each month by estimating the total building retrofit savings and deducting its ESCO fee using a discounted utility rate.<sup>6</sup> For electricity, ACE uses a utility rate of \$0.128 per kWh to calculate projected pre-retrofit weather-normalized electricity bills and charges the Building Owner for energy savings using a reduced rate of \$0.123 per kWh. For fuel, ACE uses the current rate of \$0.905 per therm to calculate projected pre-retrofit natural gas bills and deducts this amount from ACE's fee, since therms increased.<sup>7</sup> The 2014 results for the Building Owner was

<sup>6</sup> Building Owner Energy Savings = [(projected pre-retrofit annual energy use x projected rates) - (actual annual energy use x actual rates)] - (annual reduced energy use x ESCO discounted rates x ESCO share of 80%).

<sup>7</sup> Because electric heating equipment was replaced with gas equipment, the gas usage of the building increased even though overall energy consumption decreased.

a \$40,652 reduction in its apartment building energy bills.<sup>8</sup>

Average electricity costs for Chicago residents are higher than the national average, and have fluctuated in the past five years, though on average, the electricity rate increased by 4 percent each year.<sup>9</sup> Natural gas average prices in Chicago are lower than the national average, yet rates still increased by 1 percent over the past five years.<sup>10</sup>

For water, the Building Owner is entitled to 25 percent of the cost savings until eConserve recoups its upfront investment, and 37.5 percent of the water savings thereafter.<sup>11</sup> The sewer bill is a separate charge on the water bill and its rate is a percentage of the gross water bill, so a lower water bill results in a lower sewer bill for the Building Owner. Unless noted otherwise, water savings refers to the combined water and sewer savings.

The Building Owner saved \$6,413 in water costs during the first 12 months, which is 25 percent of the total annual water cost savings. As of March 3, 2015, eConserve has already recouped over 50 percent of its upfront costs. If savings continue at this rate, then the eConserve investment will be repaid by July 2016, at which time the Building Owner will begin to receive 37.5 percent of the water savings—almost \$10,000 per year at current water prices.

<sup>8</sup> Once the solar PV system is net metered, ACE will charge the Building Owner the reduced electricity rate of \$0.1107 for the energy generated from the solar PV system and the Building Owner will benefit from 10 percent of the energy savings for the solar PV instead of 20 percent.

<sup>9</sup> Electricity rates were \$0.142 per kWh in 2011; \$0.153 in 2012; \$0.153 in 2013; \$0.138 in 2014; and \$0.172 in 2015. "Average Energy Prices, Chicago-Gary-Kenosha, February 2015," U.S. DOL Bureau of Labor Statistics, accessed April 12, 2015, [http://www.bls.gov/regions/midwest/news-release/pdf/averageenergypices\\_chicago.pdf](http://www.bls.gov/regions/midwest/news-release/pdf/averageenergypices_chicago.pdf).

<sup>10</sup> In 2011, natural gas rates were \$0.835; \$0.782 in 2012; \$0.797 in 2013; \$0.909 in 2014; and \$0.862 in 2015. "Average Energy Prices, Chicago-Gary-Kenosha, February 2015."

<sup>11</sup> Until eConserve recoups investment, Building Owner Water Savings = (Projected pre-retrofit water bill - Actual water bill) x 25%. Thereafter, Building Owner Water Savings = (Projected pre-retrofit water bill - Actual water bill) x 37.5%.

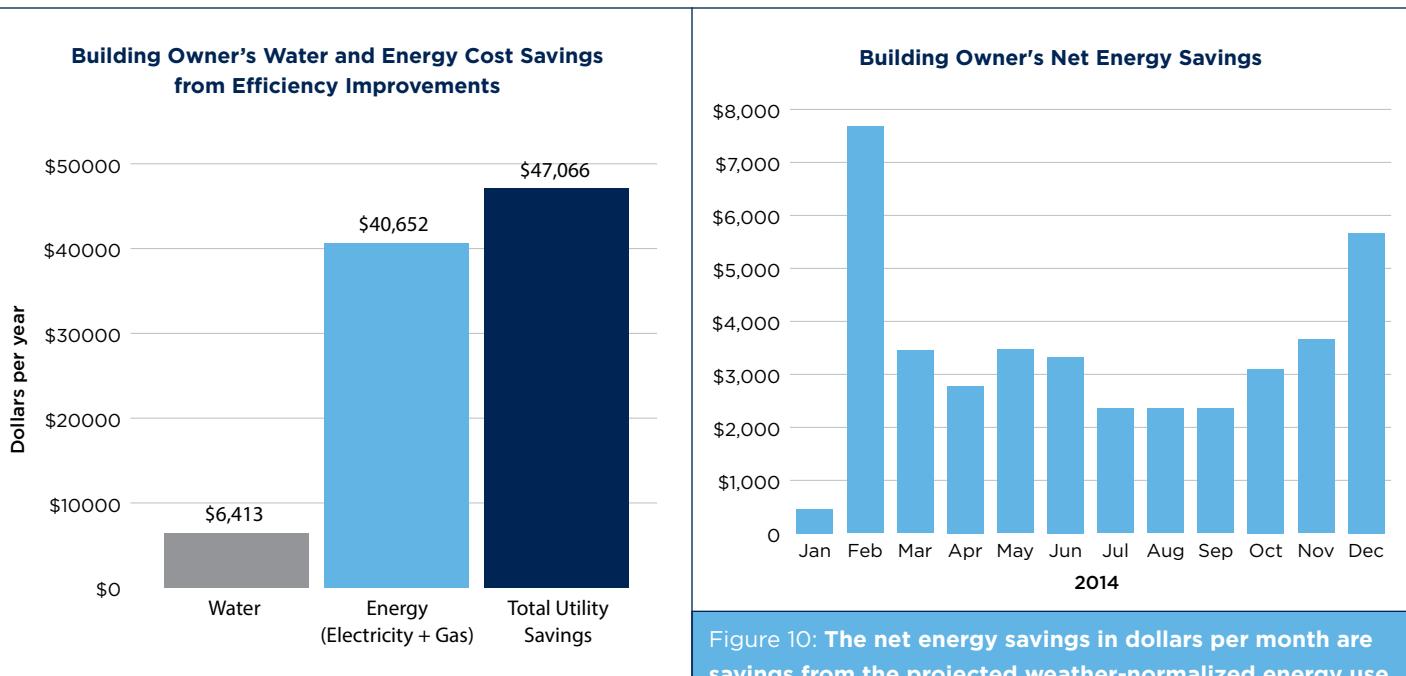


Figure 9: The annual savings in dollars are displayed for the first 12 months after the upgrades.

Since 2012, water prices have increased by 52 percent, from \$2.51 to \$3.81 per 1,000 gallons. Although no rate increase is set for 2016, future increases during the 10-year contract are likely. Moreover, the sewer rate charge has increased from 86 percent of the water bill in 2012 to 100 percent of the water bill in 2015.

**Verifying Data.** To show that reduced energy bills result from efficiency upgrades, the energy conservation measures were verified through a visual site inspection and through an assessment of weather-normalized energy bills. The solar PV and CHP systems are connected to the Internet, so that performance monitoring can be done in real time.

The normalized billing that ACE uses as the basis for its energy-performance contract with the Building Owner also confirms the efficiency measures. The baseline period is 10/1/2011 to 3/31/2013. ACE uses EnergyScoreCards<sup>12</sup> to weather normalize the electricity and gas baselines and apply them to the current billing period. Cost savings are determined by comparing

Figure 10: The net energy savings in dollars per month are savings from the projected weather-normalized energy use using baseline data compared to the actual energy use, less the ESCO fee.

pre-retrofit weather-normalized usage with actual usage, and using current utility rates to calculate the savings.

ACE has not adjusted for occupancy since the apartment building occupancy rates generally remain at 100 percent. eConserve confirmed the installation of water conservation measures. Water is not weather normalized; although consumption decreases in the winter and increases in the summer, it varies little from year to year based on outside temperatures. Senior housing is generally the most consistent of housing demographics, according to eConserve's owner. If occupancy rates change, then ACE and eConserve will normalize the data accordingly.

## Financial Performance

To perform the retrofits in the apartment building, ACE invested \$1,641,154 for energy efficiency and renewable energy measures, and eConserve invested \$30,692 for water conservation measures. Continental Plaza's Building Owner contributed just \$162,000 from replacement reserves to ACE's investment and received more than \$400,000 of capital expenses that the building would otherwise have had to fund.

12 EnergyScoreCards, [www.energyscorecards.com](http://www.energyscorecards.com).

For 2014, the Building Owner saved over \$47,000 in utility expenses, reducing its overall energy bills by \$40,652. A typical owner receiving all of the energy savings could reduce its annual energy bills by \$83,629, using \$0.128/kWh and \$0.905/therm rates; the savings could be even greater going forward since some energy-saving measures were not fully installed until March 2014. Moreover, through simple water conservation measures, the Building Owner saved \$6,413 its first year, which could benefit a typical building owner by \$25,654 in reduced annual water bills.

The 2014 fuel and electric utility expenses for the entire site were about \$132,900, with water utility costs at about \$131,250 for the entire property.<sup>13</sup> As total operating expenses were approximately \$2,490,195, the total owner-paid utilities for the apartment building and sections of townhouse properties were about 10.5 percent of the Building Owner's expenses. The annual savings of \$47,066 was about 2 percent of the 2014 total operating expenses.

ACE bills the Building Owner for electricity savings at a discounted flat rate of \$0.123/kWh. If the business-as-usual bill and actual bill escalate at 4 percent each year, while the ESCO fee rate remains flat, the Building Owner's savings will be greater.<sup>14</sup> The cost of electricity produced onsite will be 90 percent of what the Building Owner would otherwise pay to its utility, once net metering is installed, though the Building Owner's share of savings will be reduced from 20 percent to 10 percent.

In the future, ACE will likely expect no upfront capital contribution from affordable housing

owners. The building owners will only invest their time for due diligence on the deal and through the associated soft costs that could include internal review, advisory fees, and HUD or LIHTC investor consent requirements, where applicable.

#### ***Financial Calculations for Hypothetical Models: Shared Savings ESCO v. Direct Ownership.***

In Figures 11 and 12, the individual retrofit measures are analyzed by their net present value (NPV), internal rate of return (IRR), total return on investment (ROI), and annual ROI.<sup>15</sup> As of publication date, a typical large multifamily affordable housing property in Chicago can access financing at interest rates around 3.5 percent to 5.5 percent. This case study uses a discount rate of 5 percent to calculate the NPV to account for the multi-tiered capital stack employed on this property.

In Figure 11, a hypothetical building owner has entered into a 10-year shared-savings energy performance contract with an ESCO, similar to the Continental Plaza and ACE agreement: the building owner has contributed \$162,000 to the investment, after 10 years the equipment belongs to the building owner, and water cost savings are calculated at 25 percent of the retrofit savings. The main distinction from the Continental Plaza model is that this hypothetical building owner's cost savings are calculated by taking 20 percent of the weather-normalized annual energy savings for simplicity.<sup>16</sup> First-year annual utility savings are potentially \$23,139, with an NPV of \$381,187. Water measures are extremely cost-effective, with an IRR of 224 percent and total ROI of 2,548 percent.

In Figure 12, a hypothetical building owner has pursued the same retrofit measures but has not used an ESCO. Thus, the building owner paid for

13 Utility costs are estimated by taking total expenses for the entire property, including the apartment building, sections of townhouses, and exterior, from the November 2014 operating statement and prorating for the full year.

14 Building Owner Energy Savings = [(projected pre-retrofit annual energy use x projected rates) - (actual annual energy use x actual rates)] - (annual reduced energy use x ESCO discounted rates x ESCO share of 80%). If there were fuel savings, ACE would use a reduced therm rate of \$.90 to determine its ESCO fee.

15 NPV is the sum of the present values in incoming and outgoing cash flows over a period of time. IRR is the discount rate that sets the NPV = 0, i.e. the break-even point of the investment.

Total ROI is the present value divided by the upfront investment cost. Annual ROI is the Total ROI divided by the useful life.

16 Hypothetical Building Owner Energy Savings = (projected pre-retrofit annual energy use - actual annual energy use) x 20% shared savings.

Hypothetical Building Owner Under Simplified 10-Year Shared-Savings Contract: Paid \$162,000 Upfront and Receives 20% of Energy Cost Savings and 25% or 37.5% of Water Cost Savings

Apartment Building Conservation Measures	Installation Completed	Useful Life	Proportion of Total Upfront Cost of \$162,000 (excludes O&M)	First Year Utility Savings (at \$0.128/kWh and \$0.905/therm)	NPV of Savings at 5% Discount Rate	IRR	Total ROI	Annual ROI
Energy Efficiency Measures: Lighting and HVAC (20% of energy cost savings)	Lighting 3/31/14; HVAC 8/31/13.	10 years	\$46,528	\$10,648	\$53,017	23%	214%	21%
Comments: Building owner receives 20% of energy cost savings from total annual output. The estimated 501,746 kWh electricity savings was calculated by taking ACE-provided 2014 total annual electricity savings of 723,836 kWh less actual solar PV output (193,833 kWh through 12/31/14) and less actual CHP output (28,257 kWh pro rated though 12/31/14). The electricity savings is offset by the added 12,135 therms at a cost of \$10,982, due to the HVAC switch. Calculations use utility escalation rates of 4% for electricity and 1% for fuel. O&M excluded for simplicity.								
Combined Heat and Power (20% of energy cost savings)	3/31/14	10 years	\$7,420	\$925	\$1,025	8%	114%	11%
Comments: Building owner receives 20% of energy cost savings from total annual output. The estimated 36,150 kWh from 3/31/14 to 3/30/15 was calculated by pro rating the known kWh output of 36,547 kWh as of 4/4/15. Actual operating hours on 4/4/15 was 8,800 hours, which is approximately 8,704 hours in operation each year. Calculations use utility escalation rates of 4% for electricity. O&M excluded for simplicity.								
Solar PV System (20% of energy cost savings)	1/31/14	25 years	\$105,102	\$5,152	\$254,933	14%	343%	14%
Comments: Building owner receives 20% of energy cost savings from total annual output. Continental Plaza's actual solar PV output from 4/1/14 to 3/31/15 = 201,251 kWh. Calculations use utility escalation rates of 4% for electricity and solar degradation rate of 0.5%. O&M excluded for simplicity.								
Water Efficiency (25% and 37.5% of water cost savings)	11/1/13	10 years	\$2,950	\$6,413	\$72,212	224%	2,548%	255%
Comments: Building owner receives 25% of total annual water cost savings until eConserve recoups its costs. Estimated from total costs and savings for entire property to get per unit cost and savings, multiplied by 164 units. \$11,419 / 292 total units x 164 Apartment units = \$6,413. After eConserve recoups its investment, expected to be 2.64 years, Building Owner savings increase to 37.5% of annual savings, which would be \$9,620. Calculations use a utility escalation rate of 3% for water. O&M excluded for simplicity.								

Figure 11: Each retrofit measure's cost-effectiveness is analyzed for a hypothetical building owner who pays for the upfront costs, without subsidies, and who receives all of energy and water cost savings.

all costs but also receives all of the savings. The cost-effectiveness of each measure is analyzed as if no subsidies were incorporated, as incentives vary widely by jurisdiction, building owner type, project year, and project type. First-year annual utility savings are potentially \$109,282. Although energy efficiency and water conservation measures have positive NPVs, the unsubsidized renewable technologies have negative NPVs that produce an overall NPV of -\$373,243.

In the Figure 12 scenario, the unsubsidized solar PV system has a negative NPV of -\$545,552 and a negative IRR of -0.13 percent. The system is not cost-effective until at least 50 percent of the cost is subsidized through rebates, tax credits, and other incentives, of which ACE and many others take advantage. For example, ACE financed its portfolio with 64 percent in tax credits

and incentives that helped buy down the cost of renewable and energy efficiency equipment. In addition, ACE uses the faster paybacks from some of the energy efficiency measures and the water conservation measures to "average down" the cost of the solar PV and other improvements with slower paybacks. Other owners with multi-family buildings located in areas with much higher solar insolation values than Chicago, such as the Southwest and Southeast, can expect their solar PV systems to produce significantly more electricity, leading to greater annual savings and financial returns.<sup>17</sup>

17 Solar insolation is a measure of solar energy radiation on a given surface over a period of time. "How Much Could You Save with Solar Panels?", SPI, last accessed April 12, 2015, <http://www.solarpanelinfo.com/solar-panels/insolation>.

Hypothetical Building Owner: Paid for 100% of Unsubsidized Costs and Receives 100% of Utility Cost Savings (No ESCO)								
Apartment Building Conservation Measures	Installation Completed	Useful Life	Total Upfront Cost (excludes O&M)	First Year Utility Savings (at \$0.128/kWh and \$0.905/therm)	NPV of Savings at 5% Discount Rate	IRR	Total ROI	Annual ROI
Energy Efficiency Measures: Lighting and HVAC	Lighting 3/31/14; HVAC 8/31/13.	10 years	\$484,154	\$53,241	\$13,572	6%	103%	10%
	Comments: The estimated 501,746 kWh electricity savings was calculated by taking ACE-provided 2014 total annual electricity savings of 723,836 kWh less actual solar PV output (193,833 kWh through 12/31/14) and less actual CHP output (28,257 kWh pro rated though 12/31/14). The electricity savings is offset by the added 12,135 therms at a cost of \$10,982, due to the HVAC switch. Calculations use utility escalation rates of 4% for electricity and 1% for fuel. O&M excluded for simplicity.							
Combined Heat and Power	3/31/14	10 years	\$77,207	\$4,627	-\$34,982	-5%	55%	5%
	Comments: The estimated 36,150 kWh from 3/31/14 to 3/30/15 was calculated by pro rating the known kWh output of 36,547 kWh as of 4/4/15. Actual operating hours on 4/4/15 was 8,800 hours, which is approximately 8,704 hours in operation each year. Calculations use utility escalation rates of 4% for electricity. O&M excluded for simplicity.							
Solar PV System	1/31/14	25 years	\$1,093,653	\$25,760	-\$545,552	-0.13%	50%	2%
	Comments: Continental Plaza's actual solar PV output from 4/1/14 to 3/31/15 = 201,251 kWh. Calculations use utility escalation rates of 4% for electricity and solar degradation rate of 0.5%. O&M excluded for simplicity. A solar PV system with 50% subsidies could achieve a positive NPV in this scenario. ACE financed its entire portfolio with a capital stack comprised of 64% in tax credits and incentives that helped buy down the cost of renewable and energy efficiency equipment.							
Water Efficiency	11/1/13	10 years	\$30,692	\$25,654	\$193,719	86%	731%	73%
	Comments: Total building savings = \$45,676 / 292 total units x 164 Apartment Building units = \$25,654 total savings for Apartment Building. Calculations use a utility escalation rate of 3% for water. O&M excluded for simplicity.							

Figure 12: Each retrofit measure's cost-effectiveness is analyzed for a hypothetical building owner who uses an ESCO to help pay for upfront costs but who then shares energy and water cost savings with the ESCO throughout the shared-savings agreement.

**Retrofit Potential Effects on Net Operating Income.** The property's net operating income (NOI) is calculated by subtracting total operating expenses from total revenues. A capitalization rate (cap rate) is an indicator of property value and used by appraisers under the income capitalization approach to value. Dividing the NOI by a cap rate derived from the market by an appraiser translates the retrofit's effects on the NOI into potential contribution to value.

Market surveys of large multifamily housing in Chicago show cap rates of 3.9 percent to 7.5 percent. Therefore, this case study uses a 6 percent cap rate because of the consistent cash flow but restricted rental income upside. Based on this cap rate, the potential added value from the energy and water measures, which increased the NOI by \$47,066 from reduced operating expenses, is \$784,433, or approximately a 5 percent to 6.7 percent increase in value. A definitive

assessment of value, however, would require a new appraisal and is beyond the scope of this assignment.

The potential added value could be even higher, as the \$47,066 figure is for 2014 savings, and some measures only became fully operational at the end of January and end of March. Yet, the change in solar PV shared savings from 20 percent to 10 percent could offset this potential increase. As it gets closer to the end of the ACE contract, increasing value could be placed on the fact that the energy savings will be increased five-fold and the production savings will be increased ten-fold.

**Retrofit Potential Effects on Property Value.** In 2009, Developers Mortgage Corporation commissioned an appraisal of Continental Plaza by Howard B. Richter & Associates, and Howard Richter, MAI, inspected the property on August 24, 2009.

The report determined the market value of the property, which includes the apartment building and the nine sections of townhouses, to be \$11,750,000.<sup>18</sup> The appraisal report cited a cost approach value of \$12,700,000, a sales comparison approach value of \$11,650,000, and an income capitalization approach value of \$11,800,000. The report concluded that the income approach deserved the most weight in reconciliation.

The market today for this property is notably stronger than the market in which the 2009 appraisal was performed. Furthermore, an understandable shortcoming of the 2009 appraisal is that it used older sales because market activity had halted during this time. Nonetheless, the market today for large, income-producing properties is stronger than it was in 2009 and general feedback indicates that the value of the building is greater today than in 2009, even if no improvements were made to the building. The building has almost certainly increased in value because of the general economic improvement as well as further improvement due to increase in NOI. Such results would come from a new appraisal but that is beyond the scope of this assignment.

**Equipment Ownership at Year 11.** The solar PV system has a life expectancy of 25 years, while the inverters have a conservative life expectancy of 15 years. The CHP engine life is conservatively estimated at 40,000 hours, but CHP systems routinely last for much longer in operation.<sup>19</sup> In the first 12 months of operation, the CHP system ran for over 8,700 hours, which is about 5 years of the conservative estimate. Maintenance and operation costs for these systems are borne by ACE during

the term of its agreement but must be taken into account by the Building Owner when it takes over the equipment.

## **Additional Considerations for Affordable Multifamily Housing and Property Value**

### ***Rating Systems and Energy Benchmarking Laws.***

Rating systems can help market participants, including appraisers, identify green features. Continental Plaza has not yet pursued green certification. Under the new (2014) Chicago benchmarking law, Continental Plaza will have to benchmark, verify, and report its 2015 energy and water data using ENERGY STAR Portfolio Manager. Now that there is an ENERGY STAR Score for Multifamily Housing, Continental Plaza will be able to show how it performs compared to its multifamily peers and possibly meet the threshold level for ENERGY STAR Certification. Chicago will publish all large buildings' scores, allowing tenants and the market to compare for the first time the energy performance of Continental Plaza and its peers.

***Utility Risks.*** Continental Plaza has reduced risk from energy price fluctuation by locking in a 10-year energy contract with ACE that uses a predetermined, discounted rate to charge them for both energy savings and renewable energy. Thus, the cost of the 10-year contract is predictable and consistent, which is very important for a multifamily building owner with relatively fixed sources of income.

***Government Subsidy Compliance.*** Continental Plaza is a subsidized property that the Building Owner must keep in a state of good repair as a condition to receiving HUD subsidies. Properties that fail inspection are subject to HUD enforcement and could result in subsidy abatements or Housing Assistance Payment (HAP) contract termination. Since Continental Plaza receives 77 percent of its rental income from HAP, maintaining

<sup>18</sup> The appraisal is subject to the “extraordinary condition that the current HUD Section 8 HAP contract is abrogated and the property has already achieved stabilized occupancy at its economic rent.”

<sup>19</sup> “Residential & Light Commercial Applications of MicroCHP,” last accessed April 12, 2015, <http://www.nist.gov/el/upload/5-2-Cocking-Ecopower.pdf>.

a passing score is critical for the Building Owner. In 2013, Continental Plaza scored well above the minimum requirement.

HUD conducts physical inspections of properties that it subsidizes and deducts points for things such as broken lighting and exit signs, broken HVAC systems, as well as damaged and leaking plumbing fixtures—all of which the retrofit project helped address. For example, the building's Maintenance Supervisor Helpis Genao said, “the lighting upgrades make our lives a little easier, because before we would have to replace lights every week. In the last year and a half, I've only had to change one light bulb and it was because a tenant broke it.” This is especially useful for the parking lot fixtures; since the lamps are too tall for the maintenance staff to reach, Continental Plaza has to hire an outside contractor to replace fixtures at an added expense of around \$2,000 to \$3,000 annually.

In addition, residents are getting the benefit of better lighting quality and a heightened sense of security from consistently well-lit corridors, stairwells, and outdoor areas. The retrofit improvements will likely help the Building Owner maintain passing scores, especially since the Building Owner, ACE, and eConserve have a monetary incentive

## Key Results

- Retrofit measures resulted in over \$784,000 in potential added value, approximately a 5 percent to 6.7 percent increase.
- Under the shared-savings model, Continental Plaza reduced its 2014 utility costs by over \$47,000, which is a 23 percent energy bill reduction and nearly a 5 percent water bill reduction.
- A typical building owner who receives all of the energy and water cost savings could have seen its 2014 utilities reduced by as much as \$109,282.

to ensure that the energy and water conservation measures are working properly.

**Potential Effects on Rents and Utility Allowances.** The Building Owner's goal was not to increase rents, nor could they because of the rent restrictions. As of February 2015, HUD contract rent for the one-bedroom apartments was \$723, with a utility allowance of \$91.<sup>20</sup> The contract rents include the amount that the tenant pays, capped at a percentage of their income, plus the subsidy paid on behalf of the tenant. Where tenants pay utility bills directly, a utility allowance is used. In the apartment building, tenants pay for electricity so a utility allowance of \$91 is factored into the maximum the tenants pay each month.<sup>21</sup>

In Continental Plaza's case, utility savings that would adjust the utility allowance would likely benefit the housing authority providing the subsidy, and not the building owner.<sup>22</sup> But, conventional multifamily building owners, and even certain LIHTC properties, could improve their rent structures by making similar efficiency upgrades.

## Conclusion

Multifamily affordable housing owners can enter into shared energy performance contracts that can reduce operating expenses, offer discounted and predictable energy costs, transmit real-time reporting of energy consumption to allow for timely troubleshooting, and increase property value due

20 “Multifamily Portfolio Datasets, Contract with Rent Amt and Utility Allowance Amt,” U.S. HUD, last accessed April 12, 2015.

21 “Picture of Subsidized Households for 2013,” U.S. HUD, last accessed April 12, 2015, <http://www.huduser.org/portal/datasets/picture/yearlydata.html#data-display-tab>.

22 “When UA is decreased, tenant rent contributions increase and property cash flow may increase subject to programmatic conditions. But, for some HUD programs, tenant rent increases might reduce the amount of federal rent subsidy, and thereby Gross Rent Levels, leaving cash flow unchanged, unless HUD agrees to share savings.” “Covering the Gap: Utility Allowances and Innovative Strategies to Pursue Energy Efficiency Retrofits,” California Housing Partnership, HUD, and National Housing Law Project, last accessed April 12, 2015, <https://www.housingonline.com/library/?method=get&id=116&download=true>.

to increased NOI. ACE has used the HHDC portfolio as a laboratory to validate its ESCO model and is now in position to support affordable housing while maintaining a financially sustainable business. Encouraged by the results of Phase I, ACE and HHDC are now proceeding with similar measures on an additional round of HHDC properties and beginning to offer ACE's services to other owners. In addition, private multifamily building owners can apply the results that HHDC experienced to undertake their own energy efficiency, renewable energy, and water conservation improvements.

## Appendix A. Results

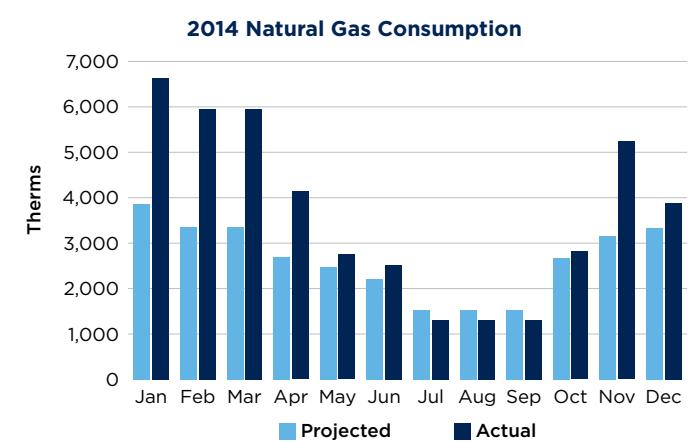
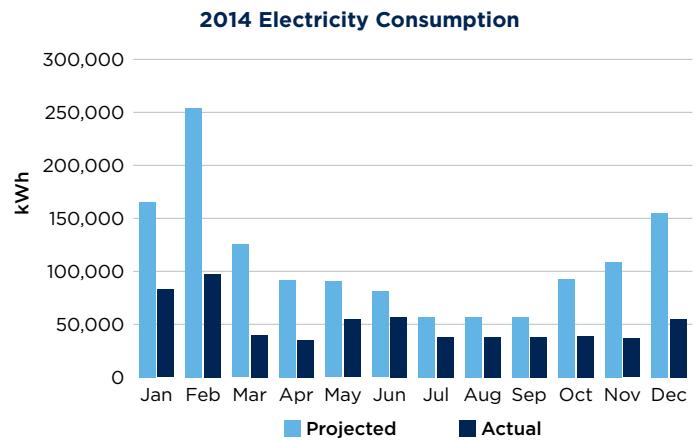
See the graphs at right.

## Appendix B. ACE Financing for Phase I

ACE's philosophy to retrofits is to do all of the energy efficiency and renewable energy improvements that are technically and financially feasible. ACE focuses on the financial returns for the portfolio of properties in each project as a whole, not on the returns for individual properties. However, as ACE performs work for third parties, it will probably have to pay more attention to the degree to which one property might be subsidizing another. On the portfolio-basis, ACE has massaged the scope and the costs so that its cash flow provides adequate debt service coverage (hopefully of 1.20), with the main lever that ACE has to adjust the returns being the amount of solar panels installed.

ACE funded the Continental Plaza retrofit project using Solar Investment Tax Credits, New Market Tax Credits, a HUD Energy Innovation Fund grant, state and utility incentives, property reserves, deferred developer fees, other equity and in-kind funding, and a bank loan.<sup>23</sup> This kind

<sup>23</sup>Affordable Community Energy, "Financial Partnerships to Advance Energy Efficiency," presented at DOE Better Buildings Summit, May 2014, <http://www1.eere.energy.gov/buildings/betterbuildings/summit/documents/presentations/multifamily-financial-partnerships-to-advance-energy-efficiency.pdf>.



Figures 13 and 14: Business as usual energy and actual energy are displayed.

### Pre- and Post-retrofit Water Usage for Continental Plaza

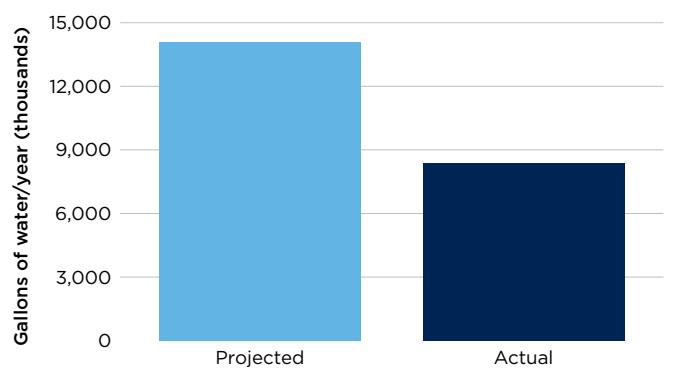


Figure 15: The building reduced its water consumption by 41 percent in the first year.<sup>24</sup>

<sup>24</sup>Water use for the apartment building is estimated based on overall savings for Continental Plaza and determining a per-unit ratio.

of multifaceted financing strategy is becoming common throughout the business sector.

Because of the total size of its many roofs, Continental Plaza was the only property in ACE's Phase I project where it did not put the maximum amount of panels that would fit on the roofs. Again, looking forward, as ACE obtains more market rate debt and equity, it expects a need to generate even greater returns, though they are not yet sure what the target return will be under those circumstances.

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## Disclaimer

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## About the Institute for Market Transformation (IMT)

The Institute for Market Transformation (IMT) is a Washington, DC-based nonprofit organization promoting energy efficiency, green building, and environmental protection in the United States and abroad. IMT's work addresses market failures that inhibit investment in energy efficiency and sustainability in the building sector. For more information, visit [imt.org](http://imt.org).

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