Managing Lean and Green: How Efficient is Your Building?

• Quantifying your Energy Use
• Your Building: Pig or Gnat
• Heating vs. hot water fuel usage
• What’s your biggest bill
• Managing your energy and water usage
• Make building more profitable
• Also safe, durable, comfortable, efficient

Pratt Center for Community Development
SHNNY/UHAB/ANHD
December 1, 2010

F.L. Andrew Padian
VP for Energy Initiatives
apadian@communityp.com
212-869-5300 x544
The Community Preservation Corporation

- Non-profit 501 c(3) Mortgage Finance Company
- Founded in 1974 by NY Clearinghouse Banks
- Funded via consortium of more than 70 banks and insurance companies
- Serving the tri-state region – NY, NJ and CT
CPC Mission – Restoring Urban Communities

• Investment in multifamily and mixed use properties in low and moderate neighborhoods
• Diversify risk for our participating institutions
• Provide an economic platform of investment to spur recovery in distressed communities
• Develop and enhance public/private partnerships
CPC History and Performance

• Since inception more than 136,000 units of low and moderate income housing have been financed
• Combined public and private investment of over $7 billion
• Loan losses of less than 2% since inception
Energy Analysis:  
Who’s the Pig,  
Who’s the Gnat?
The Math

1) Get a year of heating fuel deliveries (gas/oil)
2) Every delivery, every date
3) Calculate average daily summer usage
4) Multiply by 365
5) Subtract from total of 1) above
6) 4) is non-heating fuel usage (hot water)
7) 5) is heating fuel usage
8) What percentage of 1) is 4)?
### Calculating Base Energy Usage

1. **Get a printout of your fuel usage**  
   *(not bills, but consumption)*

Select approximately a one year period of fuel usage

Get the annual consumption from this total = 60,355  
*(Because you ignore the first delivery)*

<table>
<thead>
<tr>
<th>Date</th>
<th>Usage</th>
<th>Date</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>010999</td>
<td>2913</td>
<td>010999</td>
<td>2913</td>
</tr>
<tr>
<td>012599</td>
<td>3435</td>
<td>012599</td>
<td>3435</td>
</tr>
<tr>
<td>020699</td>
<td>2939</td>
<td>020699</td>
<td>2939</td>
</tr>
<tr>
<td>041499</td>
<td>1951</td>
<td>041499</td>
<td>1951</td>
</tr>
<tr>
<td>050299</td>
<td>2932</td>
<td>050299</td>
<td>2932</td>
</tr>
<tr>
<td>060299</td>
<td>2949</td>
<td>060299</td>
<td>2949</td>
</tr>
<tr>
<td>070699</td>
<td>3445</td>
<td>070699</td>
<td>3445</td>
</tr>
<tr>
<td>081499</td>
<td>2953</td>
<td>081499</td>
<td>2953</td>
</tr>
<tr>
<td>102799</td>
<td>2943</td>
<td>102799</td>
<td>2943</td>
</tr>
<tr>
<td>111499</td>
<td>2930</td>
<td>111499</td>
<td>2930</td>
</tr>
<tr>
<td>112799</td>
<td>2930</td>
<td>112799</td>
<td>2930</td>
</tr>
<tr>
<td>121199</td>
<td>2932</td>
<td>121199</td>
<td>2932</td>
</tr>
<tr>
<td>121999</td>
<td>3417</td>
<td>121999</td>
<td>3417</td>
</tr>
<tr>
<td>122899</td>
<td>2725</td>
<td>122899</td>
<td>2725</td>
</tr>
<tr>
<td>011000</td>
<td>2926</td>
<td>011000</td>
<td>2926</td>
</tr>
<tr>
<td>011200</td>
<td>2915</td>
<td>011200</td>
<td>2915</td>
</tr>
<tr>
<td>012600</td>
<td>2928</td>
<td>012600</td>
<td>2928</td>
</tr>
<tr>
<td>020400</td>
<td>2911</td>
<td>020400</td>
<td>2911</td>
</tr>
<tr>
<td>021200</td>
<td>2916</td>
<td>021200</td>
<td>2916</td>
</tr>
<tr>
<td>021900</td>
<td>2915</td>
<td>021900</td>
<td>2915</td>
</tr>
<tr>
<td>030500</td>
<td>3427</td>
<td>030500</td>
<td>3427</td>
</tr>
<tr>
<td>032000</td>
<td>2916</td>
<td>032000</td>
<td>2916</td>
</tr>
<tr>
<td>040700</td>
<td>2929</td>
<td>040700</td>
<td>2929</td>
</tr>
<tr>
<td>050600</td>
<td>2931</td>
<td>050600</td>
<td>2931</td>
</tr>
<tr>
<td>060700</td>
<td>2950</td>
<td>060700</td>
<td>2950</td>
</tr>
<tr>
<td>071500</td>
<td>2949</td>
<td>071500</td>
<td>2949</td>
</tr>
<tr>
<td>082600</td>
<td>2952</td>
<td>082600</td>
<td>2952</td>
</tr>
<tr>
<td>100700</td>
<td>3431</td>
<td>100700</td>
<td>3431</td>
</tr>
<tr>
<td>110600</td>
<td>3430</td>
<td>110600</td>
<td>3430</td>
</tr>
<tr>
<td>112400</td>
<td>2925</td>
<td>112400</td>
<td>2925</td>
</tr>
<tr>
<td>120800</td>
<td>2917</td>
<td>120800</td>
<td>2917</td>
</tr>
<tr>
<td>122300</td>
<td>2403</td>
<td>122300</td>
<td>2403</td>
</tr>
<tr>
<td>010301</td>
<td>2906</td>
<td>010301</td>
<td>2906</td>
</tr>
</tbody>
</table>
Highlight the summer (non-heating) months
Find the total usage between the summer periods on a daily basis

Average daily oil usage in summer =
2949 + 2952 + 3431 = 9332/122 days
= 76.5 gallons/day x 365 =
27,922.5 gallons oil for DHW use/60,355 =
46.3% oil usage for DHW

60,355 - 27,922.5 =
32,432.5 gallons of oil for heating
Calculations Cont.

- 32,432.5 gallons of oil for heating
- 10,267 square feet per floor
- 6 floors
- total square feet = 10,267 x 6 = 61,602
- 32,432.5 / 61,602 = .53 gallons of #4 oil per square foot for heat
- 145,000 Btu per gallon of #4 oil = 76340 Btu’s/square foot per year for heat
What is a Heating Degree Day?

• If the day's high temperature is 60 and the low is 40, the average temperature is 50 degrees – 65 minus 50 is 15 heating degree days
• Heating degree days can be found in the newspaper each day
• Cumulative HDD’s can be found at [www.weather.gov](http://www.weather.gov) then by clicking on your city on the map
In an average winter, NYC has 4888 Heating Degree Days (HDD)

<table>
<thead>
<tr>
<th>Site (Countywide Averages)</th>
<th>HDD</th>
</tr>
</thead>
<tbody>
<tr>
<td>NYC</td>
<td>4888</td>
</tr>
<tr>
<td>Yonkers</td>
<td>5497</td>
</tr>
<tr>
<td>Albany</td>
<td>6750</td>
</tr>
<tr>
<td>Syracuse</td>
<td>6834</td>
</tr>
<tr>
<td>Buffalo</td>
<td>6922</td>
</tr>
<tr>
<td>Hamilton County</td>
<td>9350</td>
</tr>
</tbody>
</table>

HDD notes the severity of weather in a particular location. The more HDD’s, the colder the weather is.
Now back to our Model Building

• \( \frac{32,432.5}{61,602} = 0.53 \) gallons of #4 oil per square foot for heat

• \( 145,000 \) Btu per gallon of #4 oil = \( 76340 \) Btu’s/square foot per year for heat

• Divided by \( 4888 \) HDD = \( 15.6 \) Btu/ft²/HDD
Comparing Building Heating Usage

• Compare by square foot

• Adjusted for weather

• We can compare buildings from Buffalo to NYC using the same measurement

• And that is one of our goals
Range of Energy Usage in Buildings

- Heat
- Hot Water

All listed in Btu/ft²/HDD

- Single Family USA
- Low Income Single Family NYS
- Low Income Multi-Family NYS 1996
- Selected New Afford. Rehabs NYC 1996
- Middle Income Multi-Family NYS 2006
- Melrose Commons 2002
# Boston Property Maintenance Costs

<table>
<thead>
<tr>
<th>Category</th>
<th>Low</th>
<th>Mean</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water and sewer</td>
<td>$117</td>
<td>$516</td>
<td>$977*</td>
</tr>
<tr>
<td>Pest control</td>
<td>$32</td>
<td>$75</td>
<td>$156</td>
</tr>
<tr>
<td>Painting</td>
<td>$13</td>
<td>$72</td>
<td>$189</td>
</tr>
<tr>
<td>Landscaping</td>
<td>$0</td>
<td>$72</td>
<td>$187</td>
</tr>
<tr>
<td>Appliances</td>
<td>$0</td>
<td>$22</td>
<td>$79</td>
</tr>
<tr>
<td>Cabinets - Maintenance</td>
<td>$0</td>
<td>$34</td>
<td>$83</td>
</tr>
<tr>
<td>Cleaning supplies</td>
<td>$2</td>
<td>$33</td>
<td>$65</td>
</tr>
<tr>
<td>Lighting fixtures and bulbs</td>
<td>$6</td>
<td>$17</td>
<td>$38</td>
</tr>
<tr>
<td>Ovens and ranges</td>
<td>$0</td>
<td>$15</td>
<td>$26</td>
</tr>
<tr>
<td>Windows</td>
<td>$0</td>
<td>$5</td>
<td>$26</td>
</tr>
<tr>
<td>Lighting – Fixtures only</td>
<td>$0</td>
<td>$9</td>
<td>$18</td>
</tr>
<tr>
<td>Kitchen and bath fans</td>
<td>$0</td>
<td>$9</td>
<td>$2</td>
</tr>
<tr>
<td>Lighting - Bulbs only</td>
<td>$0</td>
<td>$3</td>
<td>$6</td>
</tr>
</tbody>
</table>

* High costs are due to an unnoticed water usage with an outside hose.
CPC buildings - Fuel (#2, #4 & #6)
Costs Per Sq. Ft.

avg = $1.88
CPC buildings - Fuel/Gas
Costs Per Sq. Ft.

avg = $1.44
CPC Buildings - Electric (Walkup)
Costs Per Sq. Ft.

Cost/Sq. Ft. ($)  

- $0-.20
- $0.21-.40
- $0.41-.60
- $0.61-.80
- $0.81-1.00
- $1.01-1.20
- $1.21-1.40
- $1.41-1.60
- $1.61-1.80
- $1.81-2.00
- $2.01-2.20
- $2.21-2.40
- $2.41-2.60
- $2.61-2.80
- $2.81-3.00
- Outliers

avg = $.44
CPC Buildings - Electric (Elevator)
Costs Per Sq. Ft.

Cost/Sq. Ft. ($)
CPC Buildings - Water and Sewer Costs Per Sq. Ft.

Cost/Sq. Ft. ($)

- $0-.20
- $0.21-.40
- $0.41-.60
- $0.61-.80
- $0.81-1.00
- $1.01-1.20
- $1.21-1.40
- $1.41-1.60
- $1.61-1.80
- $1.81-2.00
- $2.01-2.20
- $2.21-2.40
- $2.41-2.60
- $2.61-2.80
- $2.81-3.00
- Outliers

avg = $.48
CPC Buildings - Water Meter
Costs Per Sq. Ft.

avg = $.68
Ten Major Areas of Energy Inefficiency

Details that need more attention in every retrofit, rehab, and new construction job
1. Increase airsealing/firestopping in all apartment and common areas

Multifamily buildings leak excessive amounts of air, and airsealing and firestopping of holes from floor to floor, apartment to apartment, and inside to outside provides a few very positive effects:

• reducing transportation of warmed or cooled air (and apartment odors) from floor to floor;
• giving fewer avenues for vermin to move from inside to out or apartment to apartment; and
• making the building significantly safer in a fire, by reducing avenues for smoke and fire to travel.

• Solution: Seal penetrations from apartments to meet firestopping codes
• Cost: $100-$200 per apartment
• Potential Payback: Under one year
So where does all that heat go?
2. More efficient and properly sized heating, air conditioning, and hot water makers.

Owners routinely depend upon contractors to select both the model and the size of a replacement heating system encouraging simple yet oversized systems.

- **Solution:** Proper sizing and specification of high-efficiency systems
- **Cost:** Typically the same or less than larger inefficient system
- **Potential Payback:** Under one year
Condensing Boilers
A/C units: What are we thinking?

- 25 year-old building rehab
- Since new, we’ve insulated walls and replaced windows in these 900 square foot apartments, and painted them 8 times
- Do we think the apartments have become more efficient?
- So why are we replacing a three ton 10 SEER unit with a four ton 10 SEER unit?
3. More efficient heating, cooling, and hot water controls

- When windows are used to control the heat, it means there are no apartment controls (thermostats or thermostatic radiator valves), or the control device in the basement doesn’t work well.
- Add the inability to turn the heat back at night (quite common) and buildings become horrifically overheated, causing significant energy waste.
- Further, most buildings in NYC use 40-50% of their heating energy to make hot water, which is often dangerously hot (137º water burns human skin).
- Solution: Upgrade heating and Domestic Hot water controls
- Cost: $1200-$5000 per building
- Potential Payback: Under one year
Typical Hot Water Temperature Setpoint Measurement (Not Control)
Electronic Mixing valve

- High temperature control accuracy = savings
- Mixing valve operation is actually visible
Energy Management System (EMS) Basics
What an EMS *does* do:

- Typically measures temperatures in 10% of apartments
- Ignores high and low temperature
- Works to bring all other apartments to pre-determined average temperature
- Prevents overheating of building and H$_2$O
- If monitored properly, makes you a better energy manager
4. Better toilets, showerheads, aerators for water and hot water savings

High water usage caused by over-consuming toilets, showerheads, aerators, and leaks, waste both water and hot water.

• Solution: High Efficiency Toilets, Showerheads, Aerators
• Cost: Same as standard specification
• Potential Payback: Immediate
How much is fixing a leak worth?
(assumes $5.70/1000 gallons)

<table>
<thead>
<tr>
<th></th>
<th>Daily</th>
<th>Yearly</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GPD</td>
<td>Water</td>
</tr>
<tr>
<td>Slow drip</td>
<td>36</td>
<td>$0.08</td>
</tr>
<tr>
<td>Steady drip</td>
<td>180</td>
<td>$0.40</td>
</tr>
<tr>
<td>Toilets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seeping</td>
<td>30</td>
<td>$0.07</td>
</tr>
<tr>
<td>Leaking</td>
<td>250</td>
<td>$0.55</td>
</tr>
<tr>
<td>Running</td>
<td>6000</td>
<td>$13</td>
</tr>
</tbody>
</table>
Gardens, Lawns

- Consider greywater for gardens and lawns
- Consider roof run off into cisterns
- Reduce lawn water use with low-water ground coverings (xeriscaping)
- Use soaker hoses or trickle irrigation for trees and shrubs
- Use mulch
- Don’t water the sidewalk
5. Upgrading of ventilation systems where present

- Existing ventilation systems installed in windowless kitchens and baths are typically centralized, with oversized fans and little if any balancing controls.
- State-of-the-art non-mechanical balancing controls and properly sized fans reduce energy lost from the building, as well as fan energy.
- Solution: Clean, seal and balance ventilation system
- Cost: $500-$1000 per line; requires much building-wide organization
- Potential Payback: Under one year
• Works with gravity.
• Exhaust systems are simple!
• Openings at each floor temporarily blocked with friction fit foam blocks (Apartment Access!).
6. Complete apartment, common area, and exterior lighting retrofit

Incandescent lights still exist in many buildings, and new fluorescent and other technologies are significantly more cost effective.

- Common area and outdoor lights need to be controlled by motion and light sensors, to reduce their on-time.
- Solution: Building-Wide Lighting Retrofit
- Cost: $200-$300 per apartment; $100-$150 per common area fixture;
- Potential Payback: Under one year for lights on 24-7; within 4 years for other lights
Discussion points:

• No incandescent lights
• High performance fluorescents everywhere
• High efficiency exterior lighting
• All frequently and infrequently used rooms on motion sensors
• All exterior lights on daylight sensors
• All lights near daylit windows on daylight sensors
7. Energy Star™ Appliances and more efficient motors and pumps

- At typically the same cost as standard issue, Energy Star™ refrigerators, dishwashers, clothes washers, and air conditioners use up to half the electricity as their non Energy Star™ counterparts.
- Motors use half of the electricity in the US, and whether powering a fan, pump, elevator, or similar device, are typically oversized.
- Solution: Energy Star appliances or equivalent to use 20-50% less electricity
- Cost: Typically the same to less
- Potential Payback: Under one year
Energy Star Appliances

http://www.energystar.gov/
8. Better specifications for windows and insulation

- Keeping the warm and the cold in the building is a function of the thermal properties of the windows, walls, and roof.
- As these systems are replaced, they need to be replaced with state-of-the-art insulated systems that work better, as their lifetimes are typically in the 20+ year range.
- Solution: Specify better window, wall, and roof systems upon replacement
- Cost: As low as Zero, as high as 50% more; includes a learning curve which can be steep
- Potential Payback: One to 5 years considering incremental cost of the upgraded system
Window Discussion points:

- Low E Glazing Required
- Ultimately start with Energy Star Windows where available
- Proceed to windows rated by National Fenestration Rating Council (www.nfrc.org)
- General beefing up of window installation specifications
- Phase out aluminum, then vinyl, go to fiberglass and wood for better performance
No Matter the Insulation Type:

- Insulation should fit snugly in the cavity
- It should not be compressed
- In the best of all worlds, it should be inspected prior to sheetrock installation
- It should be cut to fit around electrical boxes, pipes, and other framing members
1" rigid mineral wool insulation on perimeter walls
Plus 3½” fiberglass batt = R-20.5 wall assembly

- Engineers, architects, consultants
- Managers, Maintenance, Fiscal staff
- Board, Residents, Tenants
- Outside contractors
- Suppliers of Cleaning Materials
10. Better coordination with existing programs: State, Federal, Utilities

• There are numerous grant, loan, and tax incentives available through city, state, and Federal government, and various utilities, that if streamlined through a more common system, could serve more people at reduced costs.

• Decades long proven programs such as the Weatherization Assistance Program (WAP) have Federal mandates that make them unique, yet WAP has been used for rehab projects across the country by savvy owners.

• Solution: Reduce paperwork and work together to improve all program delivery mechanisms
• Cost: Typically the same to less
• Potential Payback: Could be instantaneous
www.dsireusa.org

All incentives, all states, all buildings.
The Community Preservation Corporation’s Green Financing Initiative
Simple, Sensible, Sustainable Solutions
Idea for the Green Initiative

• Retrofit Recognized as a Community Need
• Economic Environment – Recession
  – Historic focus typically on the rent roll
  – Creating a new focus on the expense side of the equation – focus on savings
• Political Environment
  – PlaNYC – to reduce GHG
  – Executive Orders – Federal and State
    • Recover Through Retrofit
    • State Plan for 80% Carbon reduction by 2050
Scale of Potential Retrofit

- 3,382,000 residential units in NY City
- Typical Retrofit - $5,000 per unit
- Financing Required to meet the need:
  - $16,910,000,000 – just for the retrofit
- Public Incentives will NEVER be enough
  - So how does it all get done?
Financing Mechanisms

• Many Ideas Circulating
  – On Bill Financing – via utility companies
  – Energy Services Companies – ESCOs
  – Property Assessed Clean Energy (PACE)
    • All models are short term
    • PACE and On bill are untested
    • ESCOs must be large

• Why Reinvent the Wheel?
  – Use the current 30 year mortgage model
  – Make an Energy Audit a standard Third Party Report
The Green Initiative
Launched September 2009

- **Simple**
  - $1 Billion for building owners who want to retrofit
  - A One Stop Shop: Construction and Permanent Financing blended with public incentives
- **Sensible**
  - Improve property cash flow & increase value
  - Comply with pending state & federal legislation
- **Sustainable**
  - Extend efficiency and life cycle of building systems
  - Provide a better environment for residents
Program Implementation

• Get Educated
  – Immediately hired and Energy Expert
  – What does it mean to be efficient?
    • CPC portfolio is evidence that we didn’t know
  – Enlighten staff, borrowers, investors, partners

• Housing vs. Energy
  – CPC is expert in housing
  – Housing is only one small sector in energy
    • Learn a new and far more technical language
Goals of Retrofit

• Measure Usage - Benchmark the Building
  – Create a Database of energy consumption
• Identify the Work Scope with an Energy Audit
  – What is cost effective?
  – What is the return on investment?
• Monitor the construction
  – Insure best practices
• One year post retrofit: Measure the savings
  – Goal is 20% savings on overall energy and water consumption
Program Parameters

- Existing **multifamily** housing stock throughout New York State
- Occupied rental properties and coops
- Measure energy usage up front so savings can be measured post retrofit
- Typical buildings are 20 units and larger
- Energy savings are NOT underwritten in deal
Benefits to Building & Residents

– Heating, Electric & Water usage reduction
  • Increase NOI and property value
– Improved systems
– Improved energy management
  • Training of maintenance staff
  • Engage employees and tenants
– Improved affordability, durability, health, safety, efficiency and comfort
Create a Reliable Database

- Economic benefits are not yet empirically proven
  - Prove the economic upside of building retrofit
  - Work with public partners to “incentivize” owners
    - One Stop Shop for public money and private debt
    - Partnerships with NYSERDA, Con Edison, HPD, NYS Weatherization Assistance Program (WAP)
- Create a platform for Retrofit Financing
  - Make an energy audit and building retrofit a standard part of the Mortgage Process
  - Prove the economic merits with the data
    - Deutsche Bank RFP to select a Database Management Firm
Program Investors

• Construction Facility - $150 million
  – Deutsche Bank, HSBC, Morgan Stanley, Amalgamated, MetLife Bank

• Permanent Financing - $350 million
  – NYC and NYS Pension Funds - $300 million
    • 30 year fixed rate mortgage with forward commitment
    • SONYMA credit enhancement
  – CPC Member Banks new facility - $50 million
Freddie Mac PILOT Program

- Up $500,000,000 commitment
- $1,000,000 - $12,000,000
- New York City - Waiver for Upstate NY
- Enhanced leverage - up to 80% LTV
- Better pricing - Up to 30 basis points
- Other subsidies
- Great interest in the database
Case Study

E. 189th Street
Belmont Neighborhood, Bronx, NY
The borrower approached CPC about a refinance and wanted some suggestions on reducing operating costs.
East 189\textsuperscript{th} - The Particulars

- 45 apartments
- 37,400 SF multi-family property
- Six story walk-up
- Built in 1913
- Located in the Belmont section of the Bronx
East 189th

- Contemplating a green retrofit to reduce heating, electric and W&S costs. Additional scope items are being considered.
- Current financing: $443,759 in unpaid principle balance.
- Owner pays for heat and hot water. Tenants are metered directly for electricity.
The CPC Energy Assessment Process

• CPC collects and analyzes 24 months of fuel (Gas or Oil) records from the borrower and accesses utility usage data for water and electricity.
• Building walk through with CPC Staff and Owner or Manager.
• Energy Retrofit Recommendations discussed with the owner and prepared by CPC – energy audit to confirm.
Benchmarking & Walkthrough

**Heating Fuel**

The annual fuel consumption is 24,582 Gallons. Of this total 11,135 Gallons (45%) were used Domestic Hot Water.

**Water & Sewer**

This building is on frontage. In 2009, the owner paid over $340 a room for Water and Sewer.

**Common Area Electric**

Expense actuals indicate that common area electric costs ($45/Per Room) are above average compared to similar buildings. The initial energy walk through indicated that hall lighting is on at full power 24/7.
Ballpark Conclusion

This building can save on energy costs.

• E. 189th burns #4 oil. Due to age and condition of boiler, we suggest an upgrade to a duel fuel system. System will include state-of-the-art efficiency controls.

• The property uses 45% of its fuel to provide hot water. The goal is 25 to 30%, which can be achieved with recommended upgrades.

• Common area electric and W&S charges can be reduced.
Green Scope Recommendations

- Roof cavity insulation
- Low-e windows
- Heat computer training
- Efficient boiler
- Efficient common area and apartment lighting
- Add low flow faucet aerators and new toilets (Less than 1.6 GPF).
- Remove and seal dumbwaiters
**Total Cost of Retrofit: $353,500**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Sealing, Bsmt to Roof</td>
<td>2,000</td>
</tr>
<tr>
<td>Boiler/Heat Upgrade</td>
<td>90,000</td>
</tr>
<tr>
<td>Bring Gas to Building</td>
<td>5,000</td>
</tr>
<tr>
<td>Hallway lights (Occusmart)</td>
<td>8,250</td>
</tr>
<tr>
<td>Basement Lights</td>
<td>2,750</td>
</tr>
<tr>
<td>Apt. Lights</td>
<td>22,500</td>
</tr>
<tr>
<td>Refridgerators-Energy Star</td>
<td>4,500</td>
</tr>
<tr>
<td>Water Closets</td>
<td>15,750</td>
</tr>
<tr>
<td>Bathroom and Kitchen Aerators, Showerheads</td>
<td>2,500</td>
</tr>
</tbody>
</table>

**Subtotal** 165,000

**Additional Scope Items**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof</td>
<td>48,750</td>
</tr>
<tr>
<td>Windows</td>
<td>114,750</td>
</tr>
<tr>
<td>Strip and Stucco Parapets</td>
<td>7,500</td>
</tr>
<tr>
<td>Scrape and Paint Fire Escapes</td>
<td>17,500</td>
</tr>
</tbody>
</table>

**Subtotal** 188,500

**Total** $353,500
### Annual Energy and Tax Savings: $27,696

**Estimated Annual Total Fuel/Utility Cost Savings**

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
<th>Annual J-51 Tax Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy Retrofit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roof Insulation</td>
<td>9,750</td>
<td>4,885</td>
</tr>
<tr>
<td>Seal Roof Dumbwaiters</td>
<td>2,000</td>
<td>above</td>
</tr>
<tr>
<td>Air Sealing, Bsmt to Roof</td>
<td>2,000</td>
<td>above</td>
</tr>
<tr>
<td>Boiler/Heat Upgrade</td>
<td>90,000</td>
<td>4,885</td>
</tr>
<tr>
<td>Bring Gas to Building</td>
<td>5,000</td>
<td>above</td>
</tr>
<tr>
<td>Hallway lights (Occusmart)</td>
<td>8,250</td>
<td>978</td>
</tr>
<tr>
<td>Basement Lights</td>
<td>2,750</td>
<td>326</td>
</tr>
<tr>
<td>Apt. Lights</td>
<td>22,500</td>
<td>to tenant</td>
</tr>
<tr>
<td>Refrigerators-Energy Star</td>
<td>4,500</td>
<td>to tenant</td>
</tr>
<tr>
<td>Water Closets</td>
<td>15,750</td>
<td>5,840</td>
</tr>
<tr>
<td>Bathroom and Kitchen Aerators, Showerheads</td>
<td>2,500</td>
<td>above</td>
</tr>
<tr>
<td><strong>Additional Scope Items</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roof</td>
<td>48,750</td>
<td>677</td>
</tr>
<tr>
<td>Windows</td>
<td>114,750</td>
<td>3,936</td>
</tr>
<tr>
<td>Strip and Stucco Parapets</td>
<td>7,500</td>
<td>125</td>
</tr>
<tr>
<td>Scrape and Paint Fire Escapes</td>
<td>17,500</td>
<td>833</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$353,500</td>
<td>$16,914</td>
</tr>
</tbody>
</table>

**Annual J-51 Tax Savings**

- Roof: $460
- Seal Roof Dumbwaiters: $37
- Air Sealing, Bsmt to Roof: $37
- Boiler/Heat Upgrade: $3,965
- Bring Gas to Building: $460
- Hallway lights (Occusmart): $978
- Basement Lights: $326
- Apt. Lights: $978
- Refrigerators-Energy Star: $978
- Water Closets: $750
- Bathroom and Kitchen Aerators, Showerheads: $978
- Roof: $677
- Windows: $3,936
- Strip and Stucco Parapets: $125
- Scrape and Paint Fire Escapes: $833
- **Total**: $10,782
WAP Incentive: $104,250  
Con Edison Incentives: $11,625

<table>
<thead>
<tr>
<th>Energy Retrofit</th>
<th>Total Cost</th>
<th>Con Ed</th>
<th>WAP</th>
<th>Freddie Mac</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof Insulation</td>
<td>9,750</td>
<td>9,750</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seal Roof Dumbwaiters</td>
<td>2,000</td>
<td>2,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air Sealing, Bsmt to Roof</td>
<td>2,000</td>
<td></td>
<td>2,000</td>
<td></td>
</tr>
<tr>
<td>Boiler/Heat Upgrade</td>
<td>90,000</td>
<td></td>
<td>90,000</td>
<td></td>
</tr>
<tr>
<td>Bring Gas to Building</td>
<td>5,000</td>
<td></td>
<td>5,000</td>
<td></td>
</tr>
<tr>
<td>Hallway lights (Occusmart)</td>
<td>8,250</td>
<td>6,188</td>
<td>2,063</td>
<td></td>
</tr>
<tr>
<td>Basement Lights</td>
<td>2,750</td>
<td>2,063</td>
<td>688</td>
<td></td>
</tr>
<tr>
<td>Apt. Lights</td>
<td>22,500</td>
<td></td>
<td>22,500</td>
<td></td>
</tr>
<tr>
<td>Refridgerators-Energy Star</td>
<td>4,500</td>
<td>3,375</td>
<td>1,125</td>
<td></td>
</tr>
<tr>
<td>Water Closets</td>
<td>15,750</td>
<td></td>
<td>15,750</td>
<td></td>
</tr>
<tr>
<td>Bathroom and Kitchen Aerators, Showerheads</td>
<td>2,500</td>
<td>2,500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Additional Scope Items**

<table>
<thead>
<tr>
<th>Item</th>
<th>Total Cost</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof</td>
<td>48,750</td>
<td></td>
<td>48,750</td>
<td></td>
</tr>
<tr>
<td>Windows</td>
<td>114,750</td>
<td></td>
<td>114,750</td>
<td></td>
</tr>
<tr>
<td>Strip and Stucco Parapets</td>
<td>7,500</td>
<td></td>
<td>7,500</td>
<td></td>
</tr>
<tr>
<td>Scrape and Paint Fire Escapes</td>
<td>17,500</td>
<td></td>
<td>17,500</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$353,500</strong></td>
<td>11,625</td>
<td>104,250</td>
<td><strong>237,625</strong></td>
</tr>
</tbody>
</table>
Summary of Loan Benefits

- $16,914 in Annual Energy Savings
- $10,782 in Annual Tax Savings
- $104,250 in sustainable retrofit work funded by the Weatherization Assistance Program
- $11,625 in sustainable retrofit work funded by Con Edison – local utility company
- Freddie Mac 30 bps discount saves up to $30,000 in interest during term of loan
Building Continuum: Different Solutions
CPC builds financial infrastructure to address financial and physical condition of various buildings at different income levels

Buildings physically and financially sound, but may need government incentives to support retrofit.

Financially and/or physically unhealthy buildings need finance and physical restructuring. Generally, these buildings need government assistance.
Underwriting the Savings

• Incentives will never be enough
• Existing property economics will not always provide for retrofit
  – Buildings are overleveraged
  – Affordable housing is already written to minimal DSC
• So…if a property saves 20%, what part of that can we underwrite…