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CHICAGO HOUSING AUTHORITY

CHA GREEN ASSESSMENT

LEED EBOM Compliance in Water Efficiency and Energy & Atmosphere

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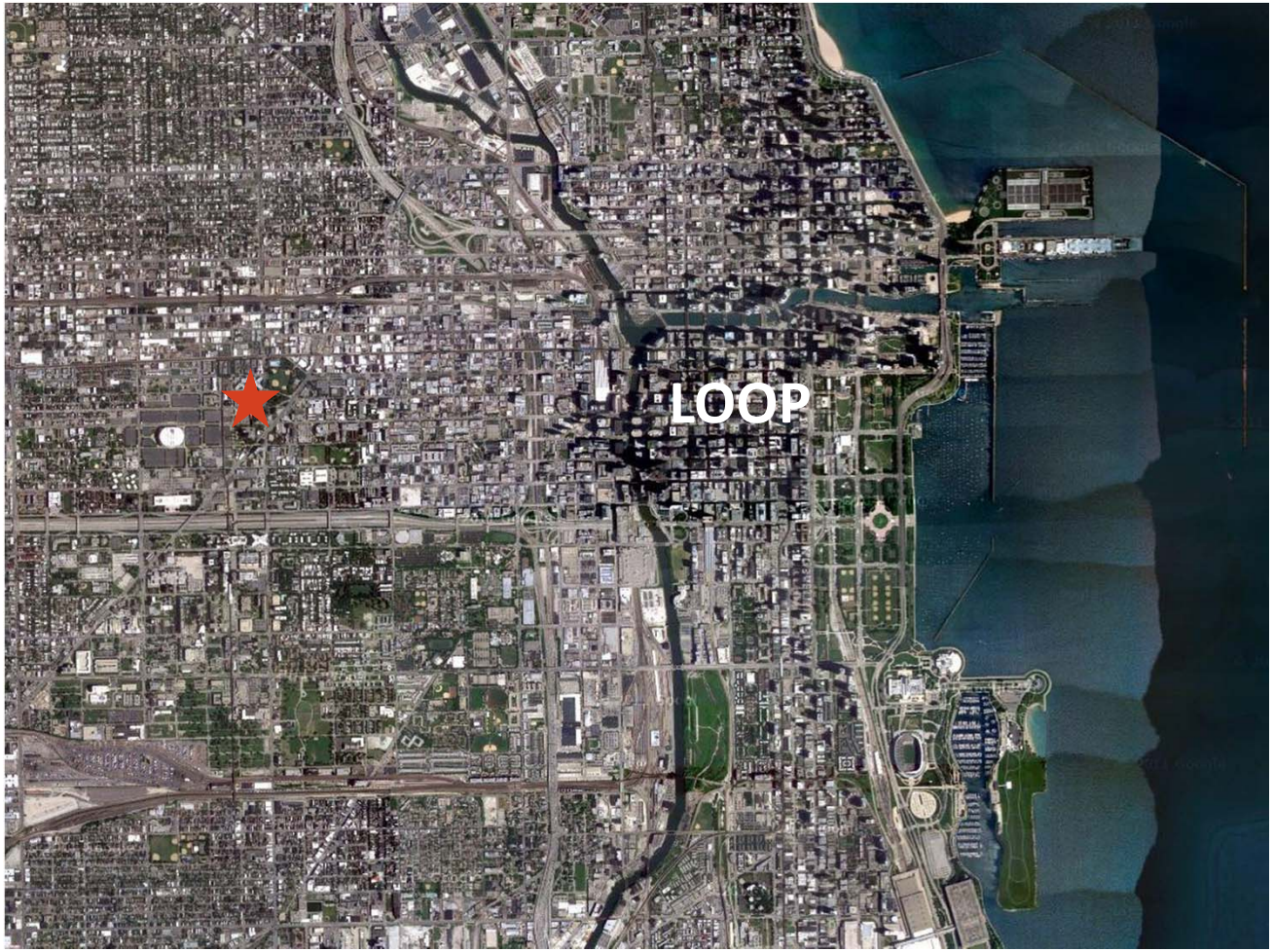
LOCATION MAP: PATRICK SULLIVAN APARTMENTS



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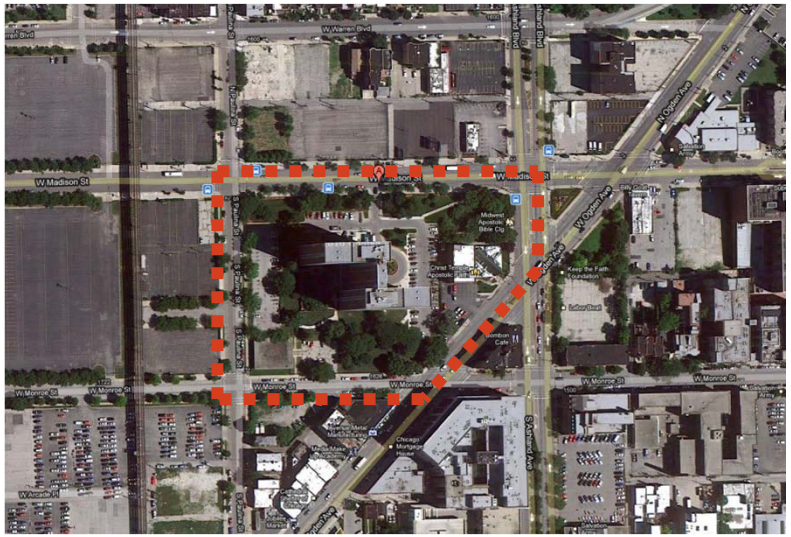
PATRICK SULLIVAN APARTMENTS



At A Glance

Property Name: Patrick Sullivan Apartments
AMP Number: IL002067
Property Type: Senior Housing / High-rise
PM Company: East Lake Management Group

Eligibility for LEED EBOM Certification: YES
- Prerequisites: 9
  - Achievable (A): 7
  - Short-term (S): 2

Property Characteristics:
- **22** stories
- **482** units
- **3.5** acres

Unit Breakdown:
- **346** occupied
- **131** vacant
- **5** non-dwelling
- **7** down (mold)

Unit Types
- **200** one-bedroom (non-ADA)
- **40** one-bedroom (ADA)
- **160** studio (non-ADA)
- **80** efficiency (non-ADA)
- **2** two-bedroom, two bath (non-ADA)

Data Sources:
- **8** units visited
- **25** residents surveyed
- (Sample size: **7%**)
- PM survey & follow-up interview

Quick Snapshot of Results:
- Currently Compliant (C): **14** pts
- Achievable (A): + **29** pts

LEED Certified Level Anticipated

- Short-term credits (S): + **28** pts
- Long-term credits (L): + **20** pts

- Current Energy Reduction: **32%**
- Current Water Reduction: **17%**

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RESIDENT SURVEY RESPONSES

CHA Green Property ASSESSMENT

SIEMENS

Please fill in your property name: _____

Mark your answers in the green boxes:

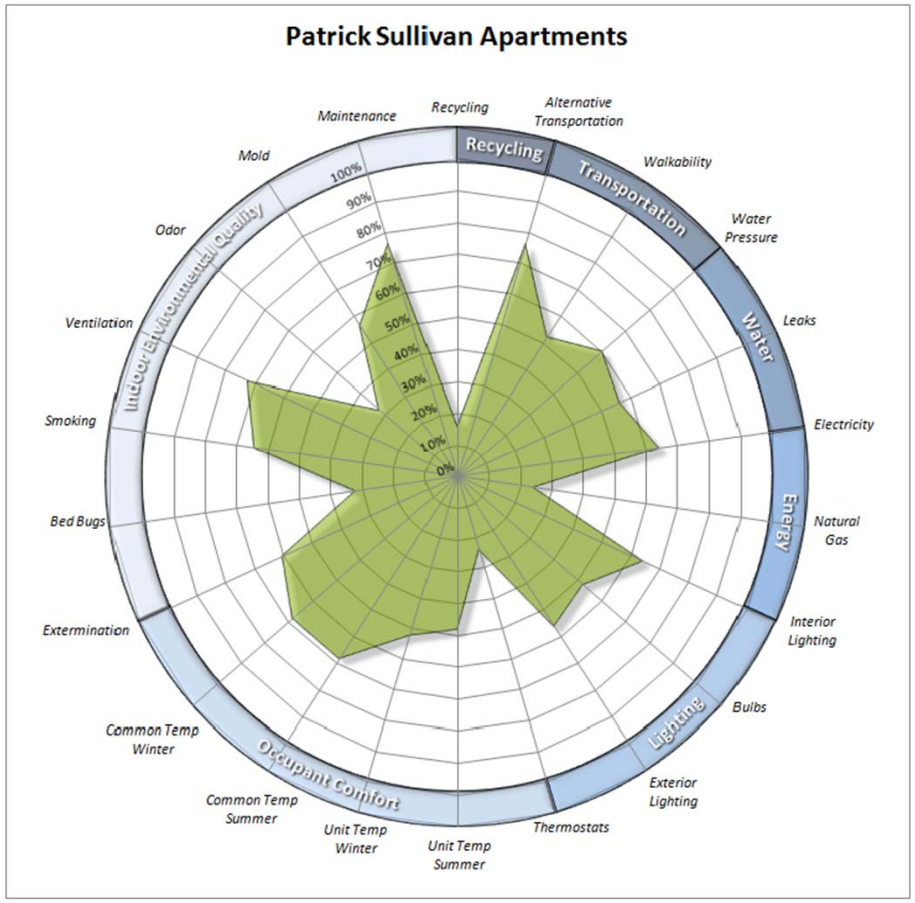
1. What is your primary method of transportation?
   - ☐ walk ☐ car
   - ☐ bike ☐ bus
   - ☐ train

   If you checked Bike, where do you store it? _____

7. What types of light bulbs do you use?
   - ☐ CFLs ☐ incandescents
   - ☐ combination of both

8. Are you comfortable with the outside lighting?
   - ☐ yes ☐ no, too bright ☐ no, not bright enough

- **20** question resident survey
- **7** main topics covered:
  - Recycling
  - Transportation
  - Water
  - Energy
  - Lighting
  - Occupant Comfort
  - Indoor Environmental Quality



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KEY SHEET

- C • Currently Compliant
- A • Achievable
- S • Short Term
- L • Long Term
- N • Not Achievable

Status	C	A	S	L	N
Points	0	0	0	0	0

Credit | Title

Intent	Describes the objective of each prerequisite/credit per the LEED EBOM Reference Guide.
Requirements	Describes what must be done to earn each prerequisite or credit per the LEED EBOM Reference Guide.
Alternative Compliance Path(s)	Showcases the applicable alternative ways of achieving the prerequisite/credit, if/when applicable. Either identify and focus on the most suitable path, or provide recommendations on several applicable ones with their associated costs and savings to assist with an educated decision.
Related Credits/Synergies	Synergy refers to the interrelation between the different LEED EBOM prerequisites/credits.
Implementation	Details the specifics of how to achieve the prerequisite/credit for each applicable Compliance Path (or Option).
Financial Impact *As determined by CHA*	No cost Low Cost (under $25,000 to implement) Moderate Cost (between $25,000 and $100,000 to implement) High Cost (over $100,000 to implement)
Comments	Project specific observations, remarks, considerations, unique issues, **exemplary performance** and **regional priority** potential etc.
Next Steps	- Unique steps to meet credit intent - References to applicable revised CHA PPMP Manual Chapters for policy/plan credits - **Performance Period** tasks if applicable - **CHA Resident Involvement** if applicable

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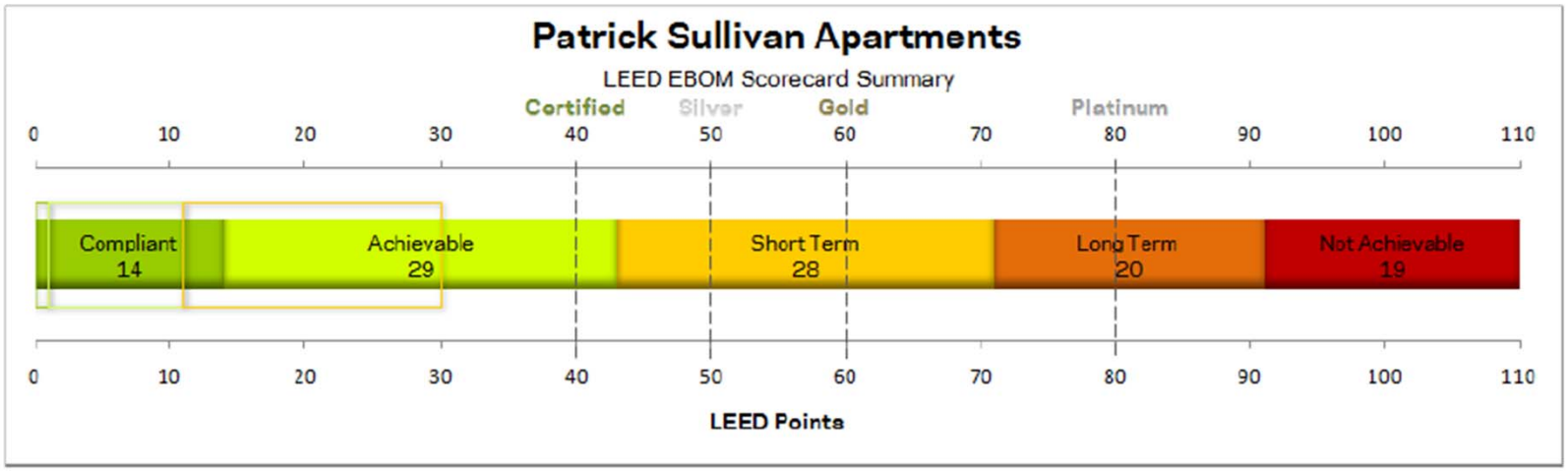
LEED SCORE

- Complies with 7 of 9 Prerequisites
  - EAp1 & IEQp2 are slated for short term with high priority



WATER EFFICIENCY

- Monitor Water Consumption Performance
- Reduce Indoor Potable Water Consumption
- Reduce Water Consumption to Save Energy & Improve Environmental Well-Being
- Practice Water-Efficient Landscaping

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WATER EFFICIENCY CHECKLIST

LEED EBOM 2009 Project Checklist

Currently Compliant	Achievable	Short-Term	Long-Term	Not Achievable			Total Possible Points
						Water Efficiency	
	x				WEp1	Minimum Indoor Plumbing Fixture and Fitting Efficiency	
1					WEc1.1	Water Performance Measurement: Whole Building Metering	1
		1			WEc1.2	Water Performance Measurement: Submetering	1
	2	3			WEc2	Additional Indoor Plumbing Fixture and Fitting Efficiency (10% = 1 Point; 15% = 2 Points; 20% = 3 Points; 25% = 4 Points; 30% = 5 Points)	5
			5		WEc3	Water Efficient Landscaping (50% = 1 Point; 62.5% = 2 Points; 75% = 3 Points; 87.5% = 4 Points; 100% = 5 Points)	5
				2	WEc4	Cooling Tower Water Management	2
1	2	4	5	2	**Total**	***14 Points Possible***	**14**

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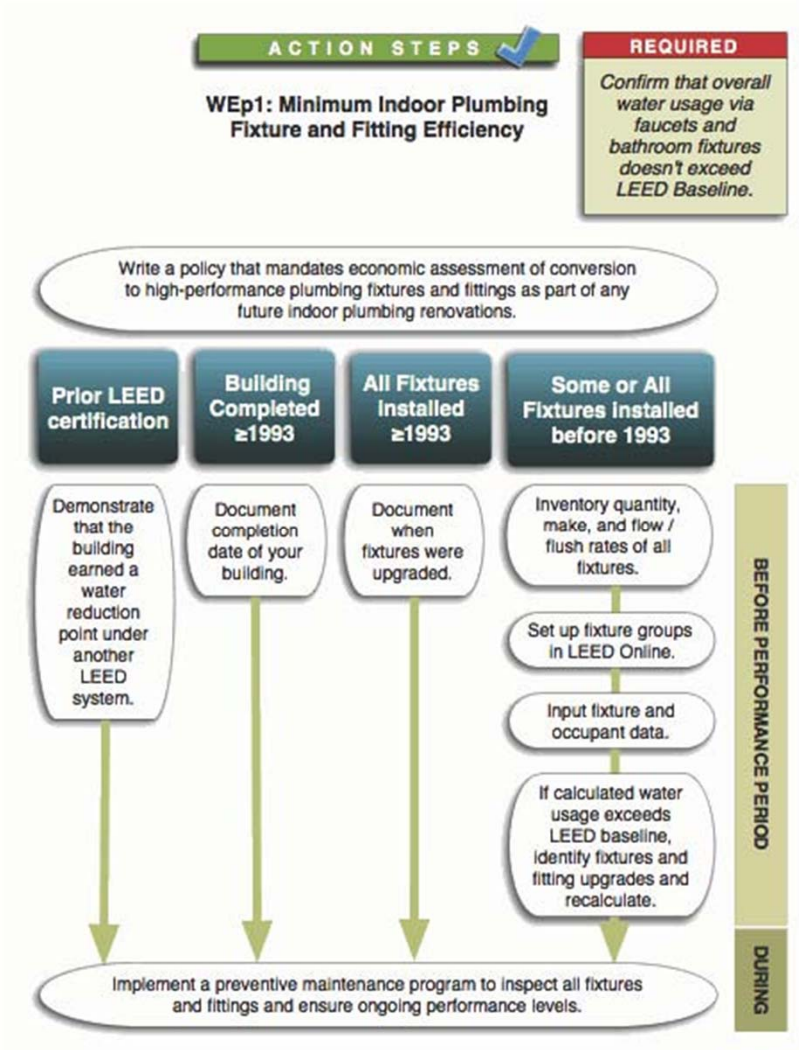
WEp1 – Minimum Indoor Plumbing Fixture & Fitting Efficiency



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At A Glance

- Low Cost
- Property-specific
- Measurement & Verification

Credit Highlights

- All prerequisites must be met to qualify for any level of LEED certification
- All water fixtures have been replaced to levels that are equal to or below the International Plumbing Code 2006

Status	C	A	S	L	N
Points		X			

WEp1 | Minimum Indoor Plumbing Fixture & Fitting Efficiency

Intent

To reduce indoor fixture and fitting water use within buildings to reduce the burdens on potable water supply and wastewater systems

Financial Impact

LOW COST – due to the audit requirement during the performance period

Comment

- All prerequisites must be met to be qualified for any level of LEED certification.
- Of the 7% response rate to the Resident Survey, only 60% of those residents reported that the water pressure in the units is acceptable.
- The current washing machines in the laundry rooms are not Energy Star labeled.
- All water fixtures have been replaced to the levels that are equal to or below the International Plumbing Code (IPC) 2006 (see Recommended Resources section for details) flow rates.

Next Steps

- Investigate and correct the cause of the low water pressure cited by the residents in the survey.

Performance Period

- The current potable water usage is below the LEED EBOM baseline and meets the prerequisite.
- The calculation required for this prerequisite is also required for the WEc2; hence an audit in the performance period is required for a definitive determination on the achievability of these credits.
- The use of energy-star washing machines in the laundry rooms should help with reducing the burdens on potable water supply.
- Implement the Sustainable Purchasing Policy for indoor plumbing fixtures and fittings that can be found in the revised CHA PPMP Manual.

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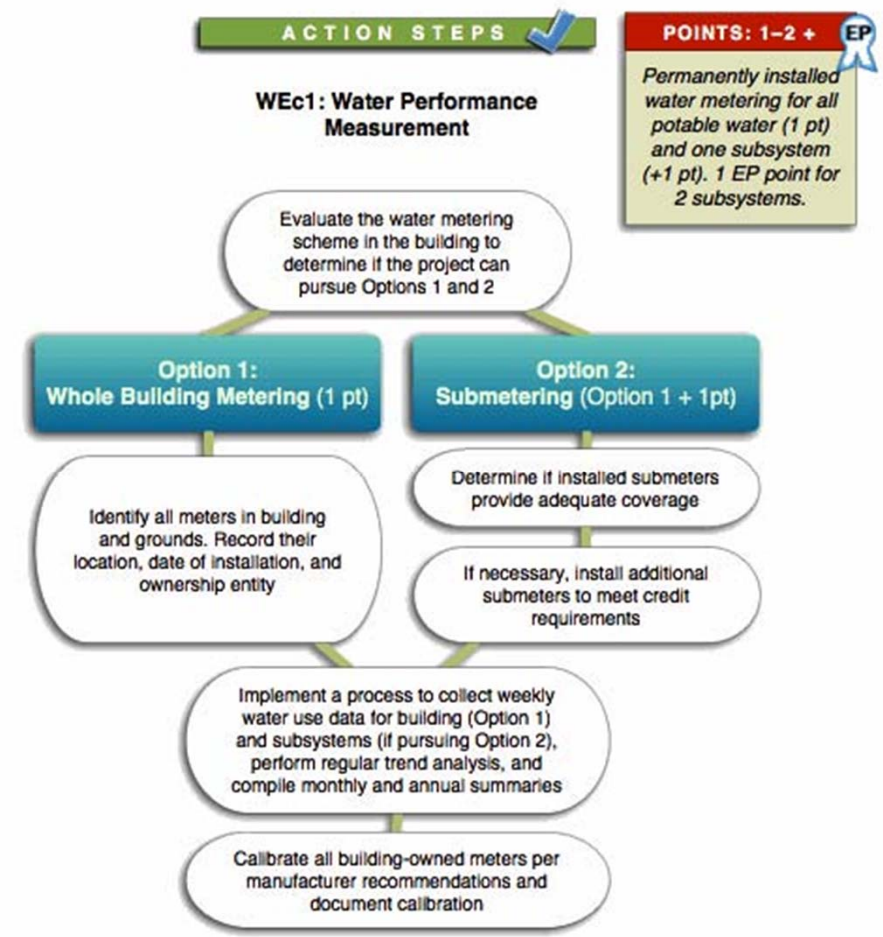
WEc1 – Water Performance Measurement: Whole Building Metering (Option 1 & Option 2)



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At A Glance

- No Cost
- Property-specific
- Measurement & Verification

Credit Highlights

- Most single building developments have whole-building meters
  - Multiple building sites are sometimes "master metered"

Status	C	A	S	L	N
Points	1	0	0	0	0

WEc1.1 | Water Performance Measurement – Whole Building Metering (Option 1)

Intent	To measure building and subsystem water performance over time to understand consumption patterns and identify opportunities for additional water savings.
Financial Impact	NO COST
Comment	· Water consumption for the entire building is currently metered.
Next Steps	· Intent of credit has been met. · To ensure compliance, data must be recorded on a regular basis and compiled into monthly and annual summaries.

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At A Glance

- Low Cost
- Property-specific
- Measurement & Verification

Credit Highlights

- Meter either domestic hot water or irrigation for credit compliance
  - Sub-metering can identify potential system issues and/or inefficiencies

Status	C	A	S	L	N
Points	0	0	1	0	0

WEc1.2 | Water Performance Measurement – Submetering (Option 2)

Intent

To measure building and subsystem water performance over time to understand consumption patterns and identify opportunities for additional water savings.

Financial Impact

LOW COST – due to installation of sub-meter

Comments

- Domestic hot water is a central system but is not currently sub-metered.
- Grounds surrounding the building are watered by hand using hose bibs. Water used for irrigation is not currently submetered.
- Indoor plumbing fixtures and fittings and other process water are not currently sub-metered.
- Credit eligible for **exemplary performance** if the irrigation, indoor plumbing fixtures and fittings, or other process water (i.e. dishwashers, clothes washers) is metered in addition to the domestic hot water use.

Next Steps

- Install sub-meters to measure the domestic hot water system or the total water use of the irrigation system.
- To ensure compliance, data must be recorded on a regular basis and compiled into monthly and annual summaries.

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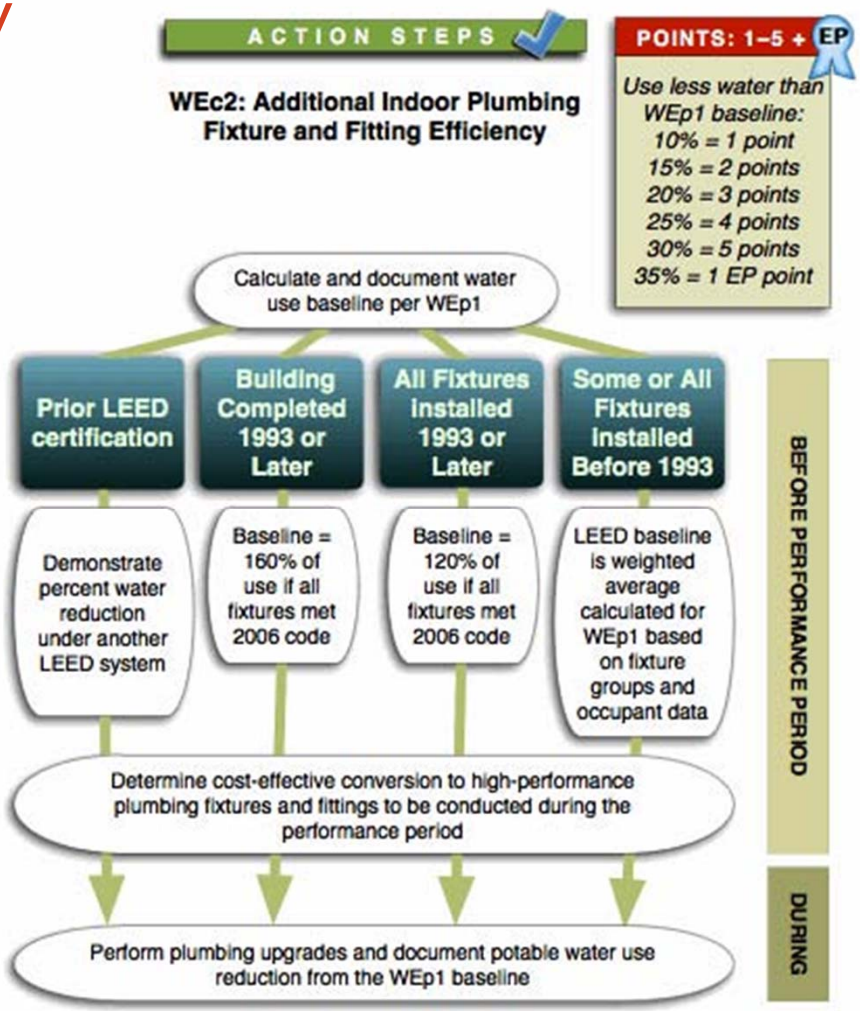
WEc2 - Additional Indoor Plumbing Fixture & Fitting Efficiency



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At A Glance

- Moderate Cost
- Property-specific
- Measurement & Verification

Credit Highlights

- Fixture replacements can offer water & cost savings while achieving LEED points

Status	C	A	S	L	N
Points	0	2	3	0	0

WEc2 | Additional Indoor Plumbing Fixture & Fitting Efficiency

Intent

To maximize indoor plumbing fixture and fitting efficiency within buildings to reduce the use of potable water and consequent burden on municipal water supply and wastewater systems.

Financial Impact

MODERATE COST - depending on the number of fixtures that will need to be replaced.

Comment

- Of the 7% response rate, only 56% of those residents reported that leaks are fixed in a timely manner.
- Based on the site observations and preliminary calculations of water consumption, it is anticipated that 2 points (17% reduction) are achievable and 3 points are slated for the short term.
- Credit eligible for **exemplary performance** when 35% reduction is achieved relative to the LEED EBOM baseline.
- Credit eligible for **Regional Priority** (additional 1 point).

Next Steps

- Inform operations and maintenance personnel of the benefits and water savings associated with timely repair of any leaks.

Performance Period

- Implement an audit of plumbing fixture and fitting efficiency during the performance period for a definitive determination on the achievability of this credit.
- Points slated for the short term can be achieved by replacing or modifying water fixtures with flow rates exceeding International Plumbing Code (IPC) 2006 values to have a flow rate less than or equal to the IPC 2006 Values.

CHA Resident Involvement

- Inform residents of the benefits associated with timely reporting of leaks in their units.

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WEc3 – Water Efficient Landscaping

DOCUMENTATION

WEc3: Water Efficient Landscaping

POINTS: 1–5

Reduce the consumption of potable water for irrigation by 50%–100%

Option 1: Compare metered data to LEED Baseline

Calculate the LEED Baseline by determining how much water would be consumed by conventional irrigation methods in mid-summer.

Meter potable water use.

Determine the percent reduction.

Option 2: Theoretical calculations to estimate consumption

Estimate mid-summer irrigation by assessing site area and vegetation types and using provided factors to quantify site characteristics.

Use the estimated and baseline case to determine percent reduction .

Option 3: Perform irrigation assessment with independent tools

Use irrigation performance and ranking tools based on local, regional, state or national sources to demonstrate reduction.

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At A Glance

- Low Cost
- Property-specific

Credit Highlights

- Large turf grass area & lack of irrigation system presents challenge

Site Size	LEED Points S	LEED Points L	LEED Points N	Requirements
Urban				
Planters (≤ 5%)	5			
Planters (> 5%)			5	
Small (< 1 acre)				
Perm. Irrigation System	3	2		moisture sensors and re-planting native species 40-50% of the site
Hose Bibs	2	3		replanting 50-65% of the site with native species
Medium (1 - 3 acres)				
Perm. Irrigation System	2	3		moisture sensors and re-planting native species 25-30% of the site
Hose Bibs		5		replanting 50-65% of the site with native species
Large (3+ acres)				
Perm. Irrigation System		5		re-planting of the site with native species or storm water reuse
Hose Bibs		5		replanting 50-65% of the site with native species

Status	C	A	S	L	N
Points	0	0	0	5	0

WEc3 | Water Efficient Landscaping

Intent

To limit or eliminate the use of potable water or other natural surface or subsurface resources available on or near the project site for landscape irrigation.

Financial Impact

LOW COST

Comments

- Site is watered by hand with hose bibs.
- The current site area is approximately 3.5 acres.
- The large area of turf grass presents a challenge for the achievability of the credit.
- Without the ability to implement moisture sensors, the achievability of this credit will require replanting 50-65% of the site with native species, slating 5 points for the long term.
- Rainwater collection from the roof will provide irrigation for all months for up to 10 times the area of the roof. Therefore, all irrigation loads can be met with rainwater collection, though this strategy is more feasible in the long term due to higher costs.

Next Steps

- Install weather data-based controllers or moisture sensors to reduce consumption and increase efficiency.
- Perform regular maintenance to the irrigation system to ensure the performance quality and plant recommended water efficient plantings as described in the Landscape Management Plan in the revised CHA PPMP Manual.
- If CHA decides to purchase Geosyntec Consultants' rainwater collection system for all its properties, using the captured rainwater for irrigation will increase possible points that can be achieved for this credit.

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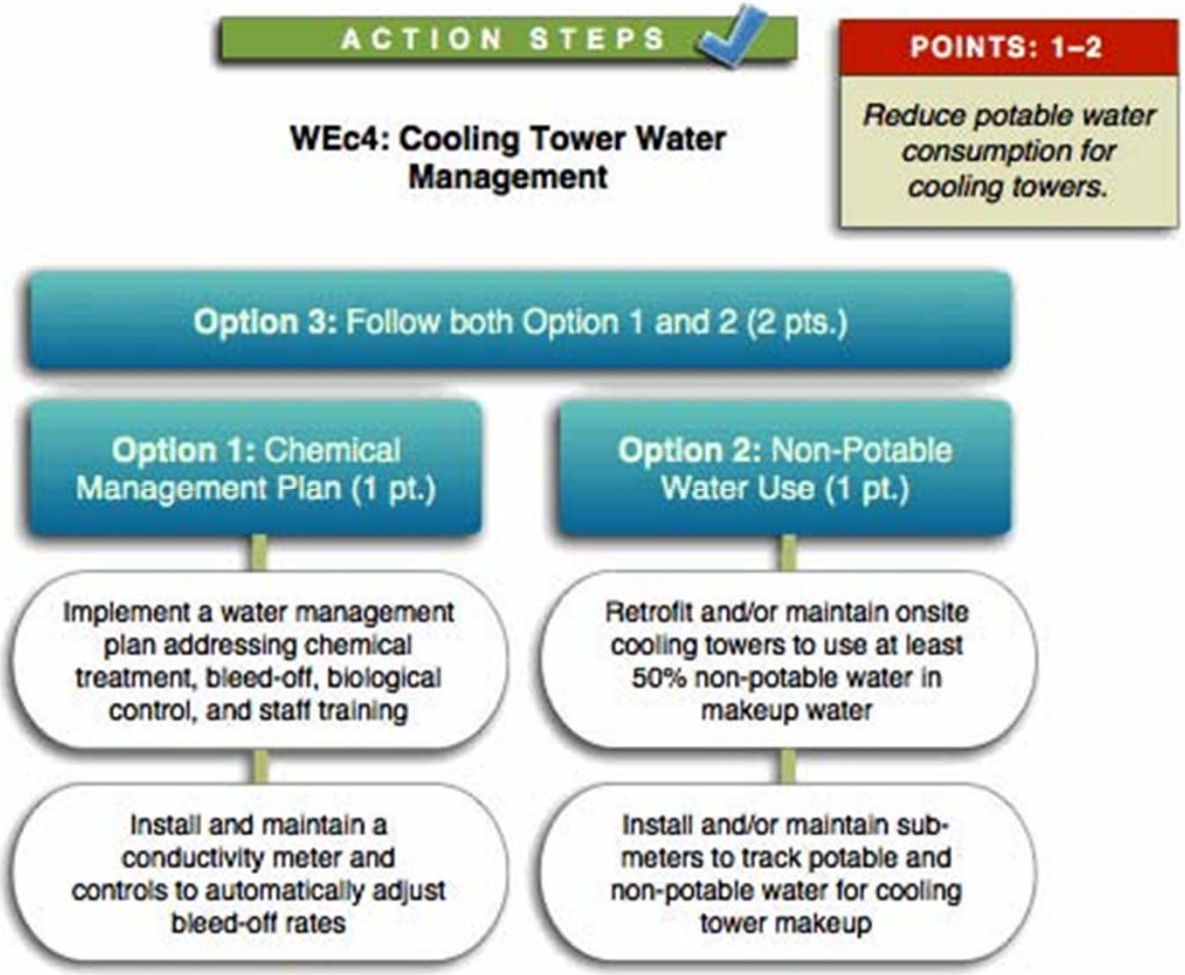
WEc4 – Cooling Tower Water Management



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At A Glance

- Property-specific

Credit Highlights

- Patrick Sullivan does not have a cooling tower & therefore cannot comply
- **This credit information is from Britton I Budd Apartments which does have a cooling tower**
- Half of credit is achieved through the existing cooling tower water management plan
- Other point requires non-potable water collection system

Status	C	A	S	L	N
Points	1	0	0	1	0

WEc4 | Cooling Tower Water Management

Intent

To reduce potable water consumption for cooling tower equipment through effective water management and/or use of non-potable makeup water.

Financial Impact

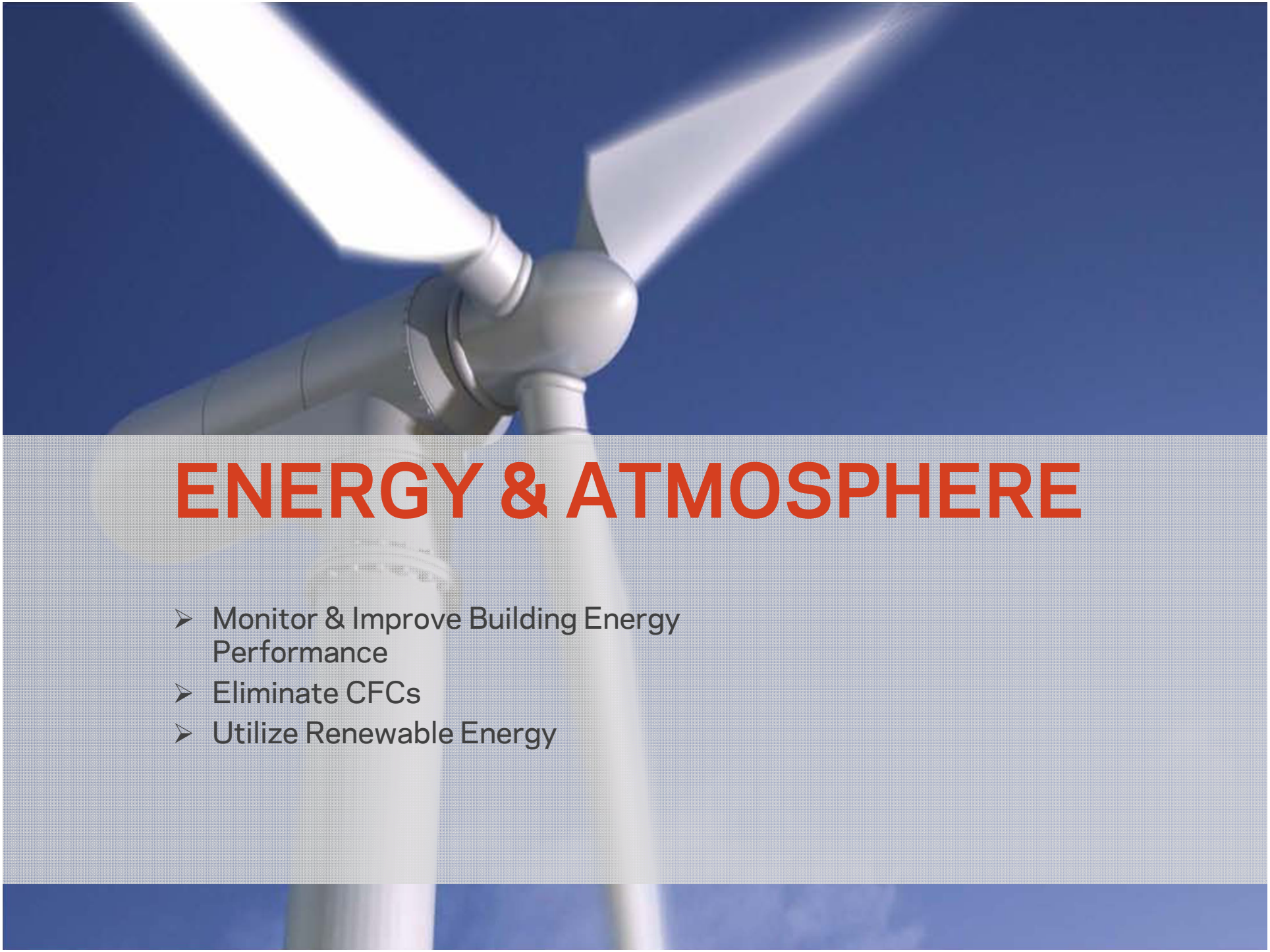
NO COST

Comments

- Cooling tower water chemical maintenance is performed by a contractor. The contractor visits the site once a month during cooling seasons to monitor cooling tower water conductivity and chemical concentrations.
- A cooling tower water management plan currently exists for the site, per the existing contract, and is maintained by the maintenance contractor.
- The site maintenance staff has received training on cooling tower operations and maintenance.
- The project is eligible for an additional point under Option 2 if non-potable water is used for at least 50% of the make-up water. The current system does not use non-potable water sources, such as collected condensate or rain water. It would be expensive to install a non-potable water collection system for cooling tower make-up.

Next Steps

- Intent of Option 1credit has been met. Intent of Option 2 credit has not been met.
- In order to earn OPTION 2, a non-potable water collection system needs to be installed. One option would be to collect condensate from the heat pumps and roof top unit to use for cooling tower make-up.



ENERGY & ATMOSPHERE

- Monitor & Improve Building Energy Performance
- Eliminate CFCs
- Utilize Renewable Energy

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ENERGY + ATMOSPHERE CHECKLIST

LEED EBOM 2009 Project Checklist

Currently Compliant	Achievable	Short-Term	Long-Term	Not Achievable			Total Possible Points
						Energy & Atmosphere	
		x			EAp1	Energy Efficiency Best Management Practices: Planning, Documentation, and Opportunity Assessment	
	x				EAp2	Minimum Energy Efficiency Performance	
x					EAp3	Fundamental Refrigerant Management	
11		2	2	3	EAc1	Optimize Energy Efficiency Performance	18
		2			EAc2.1	Existing Building Commissioning: Investigation and Analysis	2
			2		EAc2.2	Existing Building Commissioning: Implementation	2
			2		EAc2.3	Existing Building Commissioning: Ongoing Commissioning	2
				1	EAc3.1	Performance Measurement: Building Automation System	1
				2	EAc3.2	Performance Measurement: System Level Metering	2
	6				EAc4	On-Site and Off-Site Renewable Energy	6
			1		EAc5	Enhanced Refrigerant Management	1
		1			EAc6	Emissions Reduction Reporting	1
11	**6**	**5**	**7**	**6**	**Total**	***35 Points Possible***	**35**

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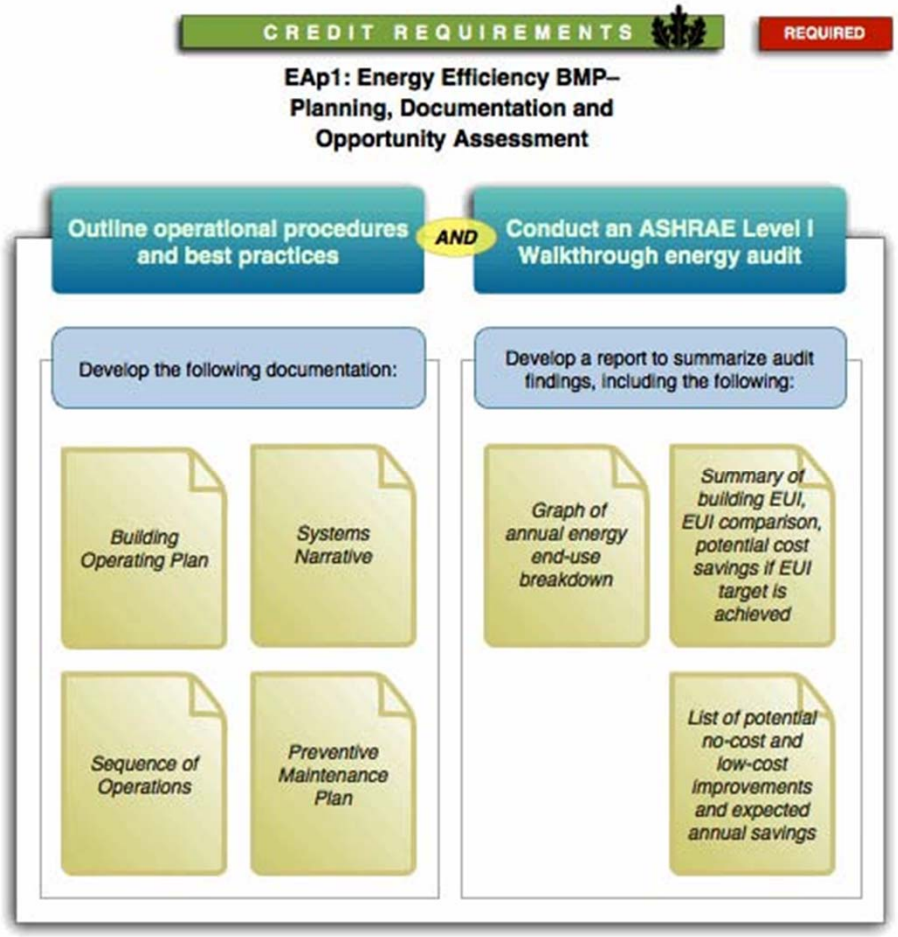
EAp1 - Energy Efficiency Best Management Practices: Planning, Documentation, and Opportunity Assessment



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At A Glance

- Low Cost
- Property-specific

Credit Highlights

- ASHRAE Level I Energy Audit may be performed in-house
  - Identifies no/low cost upgrades
- Need to formally document:
  - Systems Narrative
  - Building Operating Plan
  - Preventative Maintenance Plan
  - Sequence of Operation

Status	C	A	S	L	N
Points			X		

EAp1 | Energy Efficiency Best Management Practices: Planning, Documentation, and Opportunity Assessment

Intent

To promote continuity of information to ensure that energy-efficient operating strategies are maintained and provide a foundation for training and system analysis

Financial Impact

LOW COST - associated with ASHRAE (see Recommended Resources section for details) Level I Energy Audit which is generally performed by a 3rd party. Costs can be reduced or eliminated if the walkthrough is conducted by a member of the building operations staff.

Comment

- All prerequisites must be met to be qualified for any level of LEED certification.
- An ASHRAE Level I Energy Audit has not been completed for the management office or residential buildings.
- A Systems Narrative, Building Operating Plan, Preventative Maintenance Plan, and Sequence of Operation are not currently documented.

Next Steps

- Conduct an ASHRAE Level I Energy Audit
- To ensure eligibility, document the following:
  - a Systems Narrative which describes the heating, cooling, ventilation, domestic water heating, humidification, dehumidification, and lighting,
  - a Building Operating Plan that defines the delivered conditions required by building management and occupants for each space in order to successfully operate the building. This is also called the owner's project requirements,
  - a Preventative Maintenance Plan that describes each preventative maintenance measure and the scheduled frequency of activity,
  - a Sequence of Operation that defines what operational states are desired under what conditions in the building and should include specific information on operating phases, setpoints and controls, and feedback systems to monitor performance.

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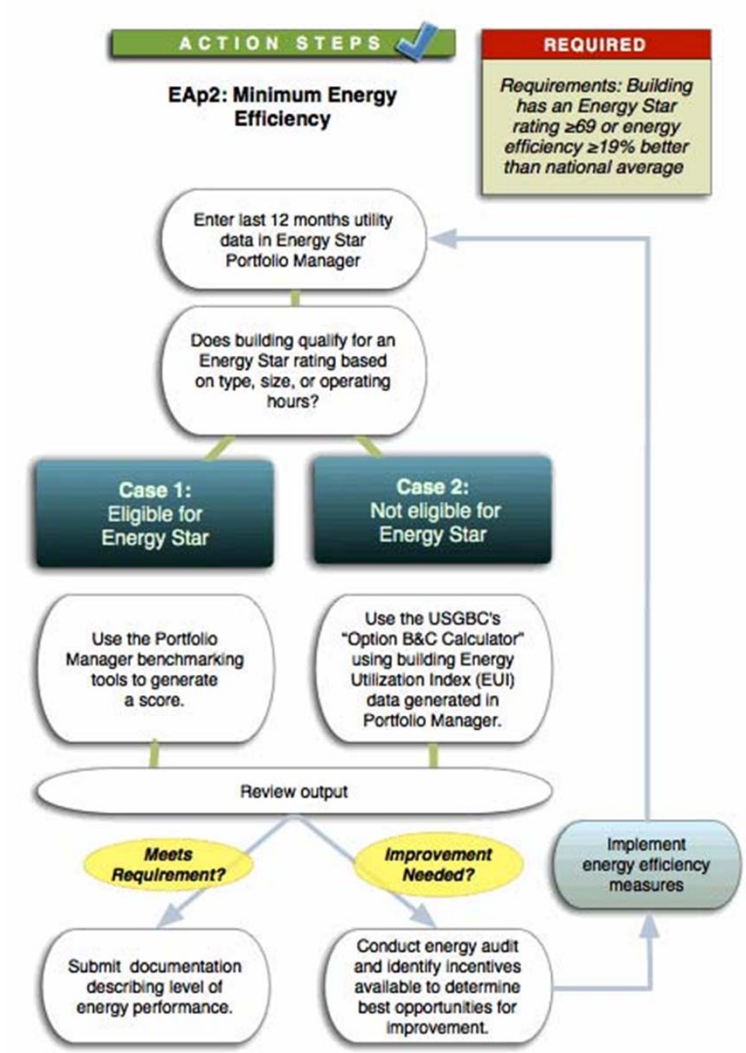
EAp2 – Minimum Energy Efficiency Performance



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At A Glance

- No Cost
- Property-specific
- Measurement & Verification

Credit Highlights

- Document energy use for 12 months
- Resident responses help to determine energy use awareness
- 64% of residents reported knowledge of their monthly electricity bill
- Baseline EUI: 170 kbtu/sf
- Property EUI: 94.9 kbtu/sf
- 32% better than average

Status	C	A	S	L	N
Points		X			

EAp2 | Minimum Energy Efficiency Performance

Intent

To establish the minimum level of operating energy efficiency performance for the building and systems

Financial Impact

NO COST

Comment

- All prerequisites must be met to be qualified for any level of LEED certification.
- Of the 7% response rate, only 64% of those residents reported knowledge of their monthly electricity usage.
- Natural gas is typically included in the rent and not individually tracked per unit or disclosed for the property as a whole.
- The property specific data input into Energy Star generates the source energy use intensity for the property based on the gross square footage (360,500 SF) and the energy consumption data representing all energy used by the base building and tenants.
- The property-specific annual weather-normalized Source Energy Use Intensity is 94.9 kBtu/sf.
- For the average for typical buildings of similar type, the annual weather-normalized Source Energy Use Intensity is 170 kBtu/sf.
- Comparing the Source Energy Use Intensity of the property-specific and average for typical buildings of similar type, the current score demonstrates the property's energy efficiency being 32% better than the average for typical buildings of similar type.

Next Steps

- The current score meets the prerequisite.
- See EAc1 - Optimize Energy Performance for details.

CHA Resident Involvement

- Educate the residents on the benefits of tracking energy use and simple methods to reduce usage.

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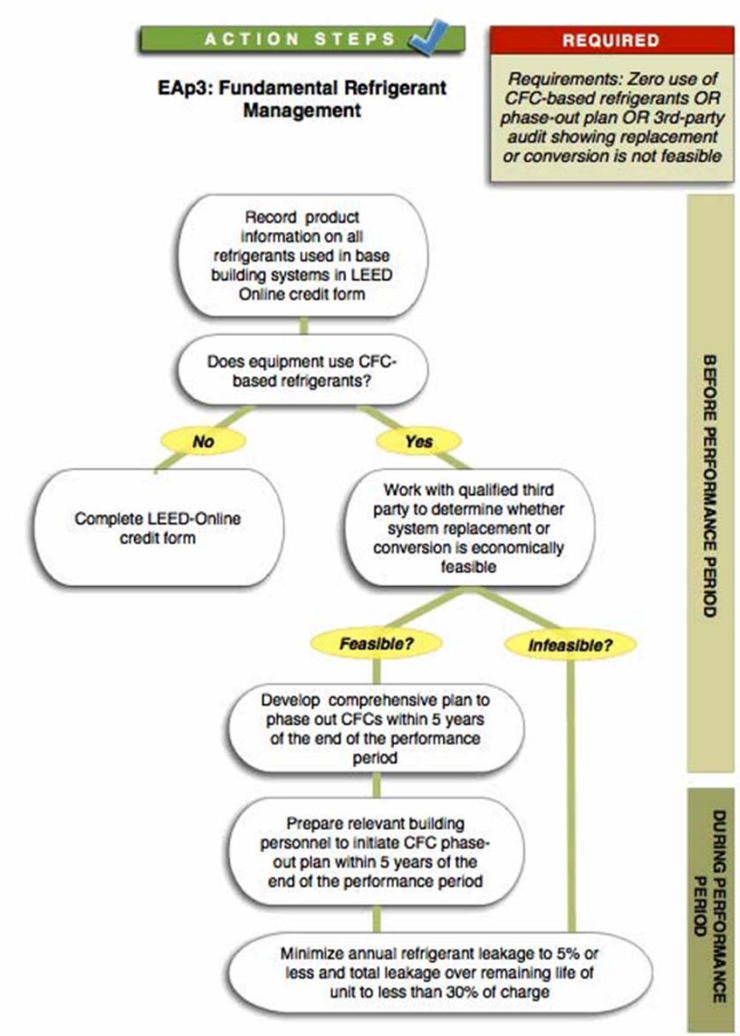
EAp3 – Fundamental Refrigerant Management



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At A Glance

- No Cost

Credit Highlights

- No CFCs on site

Status	C	A	S	L	N
Points	X				

EAp3 | Fundamental Refrigerant Management

Intent	To reduce stratospheric ozone depletion
Financial Impact	NO COST
Comment	· No CFCs were observed on site. All air conditioning units utilized R-22 as a refrigerant. R-22 is not a CFC based refrigerant and is therefore compliant with the prerequisite.
Next Steps	· Intent of prerequisite has been met.

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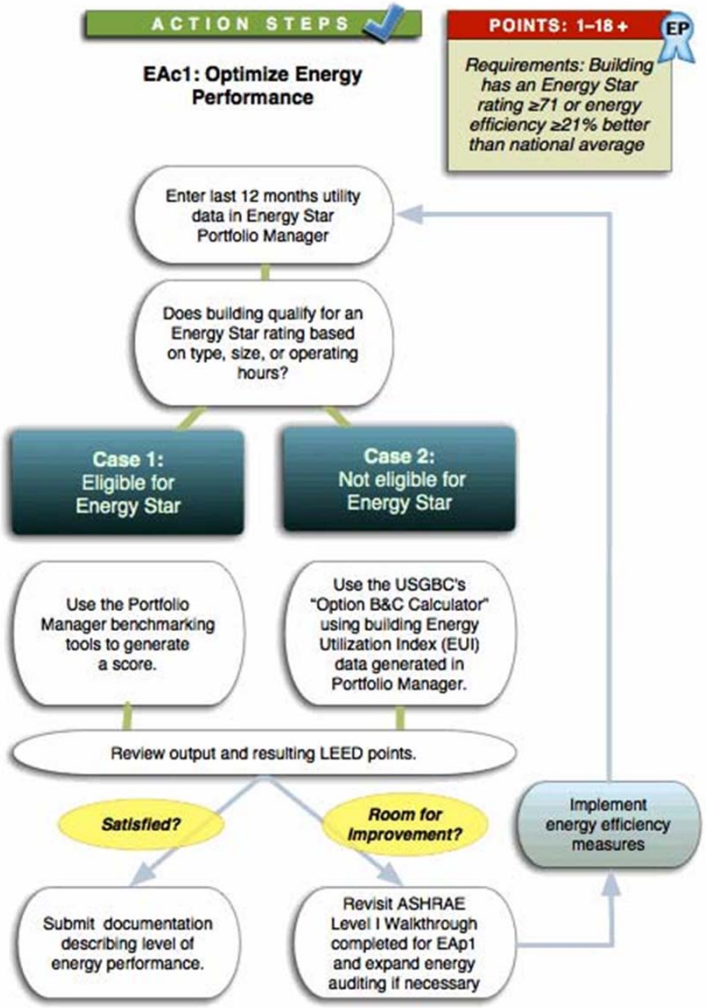
EAc1 – Optimize Energy Efficiency Performance



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At A Glance

- Property-specific
- Measurement & Verification

Credit Highlights

- Relatively new & efficient boilers
- Opportunity to further support CFL bulb integration in residences
- Residents reported less than satisfactory lighting levels
  - Will be taken into consideration during future building upgrades

Status	C	A	S	L	N
Points	11	0	2	2	3

EAc1 | Optimize Energy Efficiency Performance

Intent

To achieve an increased level of operating energy efficiency performance relative to typical buildings of similar type to reduce environmental impacts associated with excessive energy use.

Financial Impact

See ECMs below

Comments

- The current score demonstrates the property's energy efficiency being 32% better than the average for typical buildings of similar type, achieving 11 points out of a total of 18 points available for this credit. The annual weather-normalized Source Energy Use Intensity is 94.9 kBtu/sf.

- According to the Resident Survey:
  - Of the 7% response rate, only 64% of those residents reported feeling comfortable with the quality of the interior lighting.
  - Full integration of CFL bulbs is not yet complete for all units.
  - Of the 7% response rate, only 56% of those residents reported feeling comfortable with the quality of the exterior lighting.

- The ASHRAE Level I Energy audit required under EAp1 may also identify opportunities to improve energy performance.

- The building central heating hot water system recently went through a major renovation within the last 2 years. Five (5) new Thermal Solutions "Evolution" type boilers were installed. Each boiler has a capacity of 258,000 BTUh and each has its own recirculation pump. System operates by demand and not by outside air temperature. Boilers provide building heat by feeding two (2) heat exchangers, one heat exchanger serves the north zone and the second heat exchanger serves the south zone of the building. Hot water is distributed by two main building pumps.

- Building domestic hot water is provided by two (2) Burkay Genesis, AO Smith Space Saver series gas boilers. Both boilers have capacities of 1,250,000 BTUh. Boilers appear to have been installed in 2002. According to the building engineer, the boilers are reportedly slated to be replaced with new high efficient boilers in the near future.

CHANGE.
CHICAGO HOUSING AUTHORITY

Credit Highlights

- Relatively low energy rates affect Energy Conservation Measure (ECM) payback
  - CHA was the first PHA to negotiate a special electric rate for all uses
- Add Photocell Control to Exterior Lighting
  - Estimated Cost:
    - $5,300
  - Annual savings:
    - 3,552 kWh
    - $234

Status	C	A	S	L	N
Points	11	0	2	2	3

EAc1 | Optimize Energy Efficiency Performance *Continued*

Next Steps

- Consider increasing the wattage and altering the color spectrum of interior and exterior lamps in response to lighting quality concerns from the resident survey.
- The following Energy Conservations Measures (ECM) would increase the energy efficiency of the buildings. In all the ECMs below, the cost savings was projected using a blended electricity cost of $0.0659 and blended natural gas rate of $0.54/therm, based on excel sheets provided by CHA.

ECM 1 – Add Photocell Control to Exterior Lighting

During the site walkthrough, the project team noted that all exterior lighting fixtures are controlled by a time clock. Building personnel reported that electric lighting is often on during daylight hours and off during non-daylight hours because of needed time clock adjustment. Additional energy savings for the site could be realized if the pole mounted exterior lighting schedule were adjusted to better match non-daylight hours. In order to do this, the project team recommends installing photocells to control all exterior lighting fixtures ensuring that the electric lighting is on only during non-daylight hours. In addition, adding photocells will enhance security of the site because the exterior lighting fixtures will be on during all non-daylight hours. Photocell control will also decrease the number of hours per day that the exterior light fixtures are in operation which will also increase lamp life resulting in reduced maintenance costs.

The project team noted that each of the exterior lighting fixtures serving the parking lot contain (1) 250 W Metal Halide lamp and each of the exterior lighting fixtures serving the building perimeter contain (1) 75 W Metal Halide lamp. Exterior lighting fixtures serving the courtyard each contain (1) 75 W Metal Halide lamp. Exterior walkway ceiling light fixtures each contain (1) 13 W CFL lamps. Currently, the timeclock is set to turn on the exterior lighting fixtures each evening at 5:00pm and turn off the exterior lighting fixtures each morning at 8:00am. No adjustments are made to the timeclock to match seasonal sunlight variation. It is estimated that an energy savings of 3552 kWh and a cost savings $234 could be realized each year if photocell control of the exterior lighting fixtures is installed. The estimated cost of installation is $5,300 yielding an estimated payback of 23 years.

CHANGE.
CHICAGO HOUSING AUTHORITY

Credit Highlights

- Replace AC units with Energy Star rated units
  - Estimated Cost:
    - $117,000
  - Annual savings:
    - 0.35 kW/unit
    - 29,593 kWh
    - $1,950

Status	C	A	S	L	N
Points	11	0	2	2	3

EAc1 | Optimize Energy Efficiency Performance *Continued*

Next Steps

ECM 2 - Replace All Apartment Air Conditioning (AC) Units with Energy Star Rated AC Units

During the apartment walk through, the project team noted that all apartment vertical-wall AC units are sized at 12,000 Btu/h and had an unknown SEER rating, assumed at 8.2 SEER. In addition, many units were over 10 years old and were noted to have damaged condenser coils. A new AC unit with a high SEER rating is more efficient than an older, damaged AC unit with a low SEER rating. Also, the current unit use HCFC-22 refrigerant, which has a high ozone depletion potential and global warming potential. If replacing units, consider purchasing ones using a more environmentally preferable refrigerant such as HFC-410a.

By replacing all existing inefficient and/or damaged AC units with efficient 10.8 SEER AC units that meet current Energy Star requirements, each unit would save 0.35 kW per AC unit. Assuming 12 full load hours of operation, 7 days a week for 5 months, 29,593 kWh and $1,950 will be saved per year. The estimated cost of installation is $117,000, which produces an estimated payback of 60 years. Given that the payback period is greater than the life of the AC unit, it is therefore recommended that AC units only be replaced on an as needed basis.

Performance Period

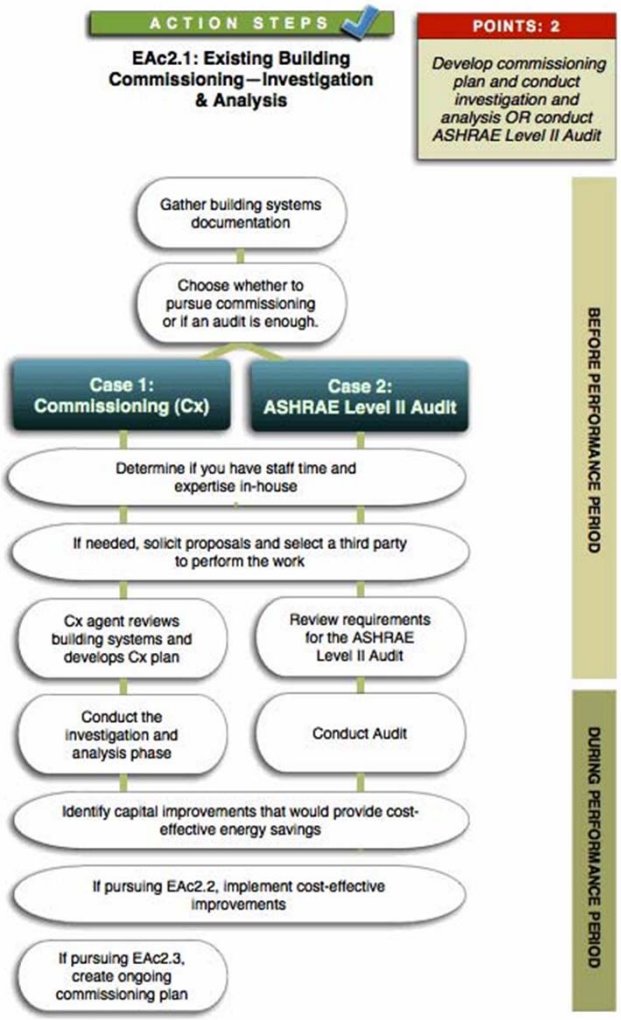
- Track the building's total energy meter output on a regular basis, over 1 year.

CHA Resident Involvement

- Educate residents on the financial and environmental benefits of using CFL bulbs.

CHANGE.
CHICAGO HOUSING AUTHORITY

EAc2.1 - Existing Building Commissioning: Investigation & Analysis



CHANGE.
CHICAGO HOUSING AUTHORITY

At A Glance

- Low Cost
- Portfolio-wide
- Measurement & Verification

Credit Highlights

- Retro-commissioning plan:
  - Site assessment
  - Energy use breakdown
  - Diagnostic monitoring
  - Functioning testing
- Pursuing this credit can help maximize energy efficiency of existing systems
- Allows pursuit of EAc2.2 & 2.3

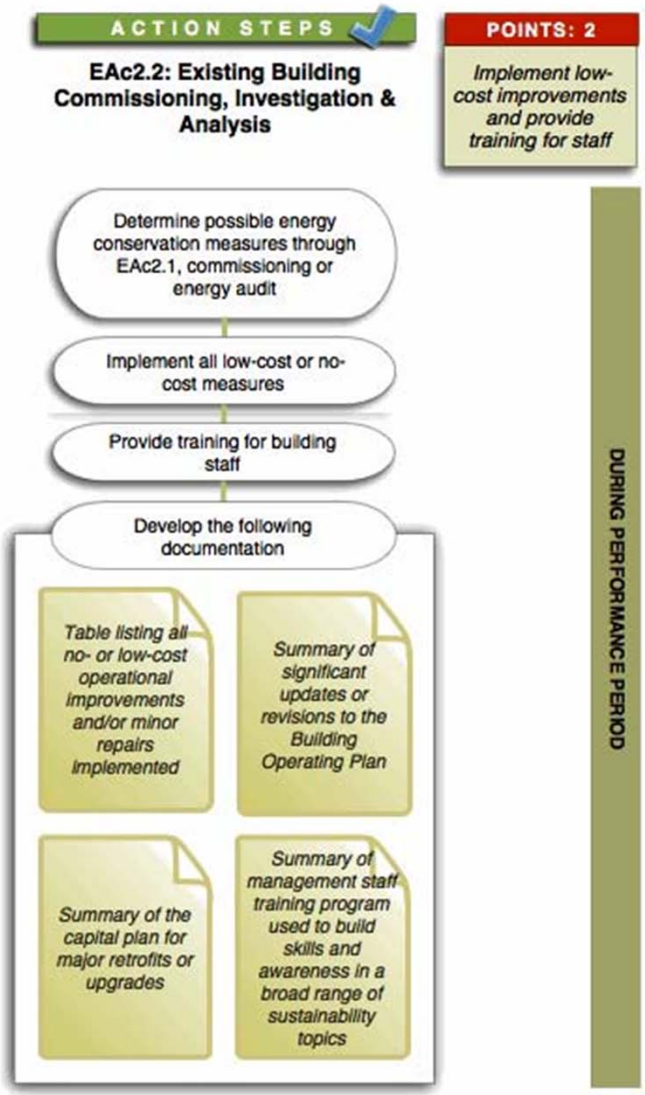
Status	C	A	S	L	N
Points	0	0	2	0	0

EAc2.1 | Existing Building Commissioning: Investigation & Analysis

Intent	Through a systematic process, to develop an understanding of the operation of the building's major energy-using systems, options for optimizing energy performance and a plan to achieve energy savings.
Financial Impact	LOW COST - due to a third party commissioning fee
Comment	· No previous ASHRAE energy audits or retro-commissioning activities have been completed for the site. · Pursuing the Commissioning Process in Option 1 allows for more possible points in EAc2.3.
Next Steps	· Engage a commissioning agent to develop a commissioning plan, complete a site assessment, energy use breakdown, diagnostic monitoring and functional testing, and master list of findings.

CHANGE.
CHICAGO HOUSING AUTHORITY

EAc2.2 – Existing Building Commissioning: Implementation



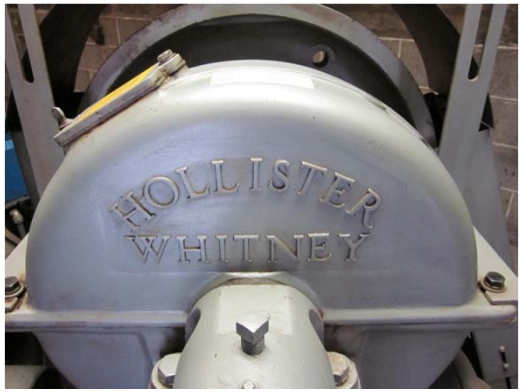
CHANGE.
CHICAGO HOUSING AUTHORITY

At A Glance

- Low Cost
- Property-specific
- Measurement & Verification

Credit Highlights

- Requires implementation of no/low cost items identified in EAp1



Status	C	A	S	L	N
Points	0	0	0	2	0

EAc2.2 | Existing Building Commissioning: Implementation

Intent

To implement minor improvements and identify planned capital projects to ensure that the building's major energy-using systems are repaired, operated, and maintained effectively to optimize energy performance

Financial Impact

LOW COST – associated with the implementation of low/no cost recommendations identified in previous prerequisites/credits.

Comments

- No previous energy audits or retro-commissioning activities have been completed for the site.
- EAc2.2 cannot be achieved unless EAc2.1 has been achieved.
- Compliance with this credit may not be determined until the ASHRAE Level I Energy Audit conducted in EAp1 is completed during the **performance period**.

Next Steps

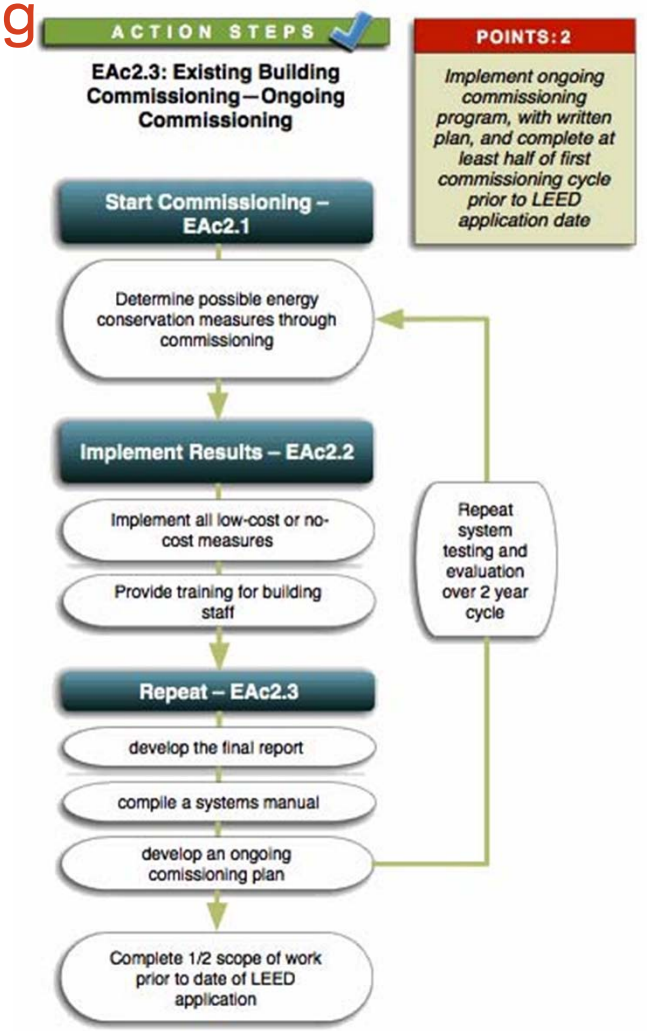
- Demonstrate the financial costs and benefits of measures that have been implemented.
- Update the Building Operating Plan as necessary.
- Provide training for staff on sustainable building operations topics.
- Create a plan for capital improvements based on higher cost items identified during the ASHRAE Level I Energy Audit.

Performance Period

- Implement all no/low cost energy efficiency improvements identified during the ASHRAE Level I Energy Audit.

CHANGE.
CHICAGO HOUSING AUTHORITY

EAc2.3 – Existing Building Commissioning: Ongoing Commissioning



CHANGE.
CHICAGO HOUSING AUTHORITY

At A Glance

- Moderate Cost
- Property-specific
- Measurement & Verification

Credit Highlights

- Ongoing Commissioning Plan:
  - Building equipment list with performance measurement frequency
  - Estimated **24-month** commissioning cycle budget
  - Complete **50%** of scope of first commissioning cycle

Status	C	A	S	L	N
Points	0	0	0	2	0

EAc2.3 | Existing Building Commissioning: Ongoing Commissioning

Intent

To use commissioning, address changes in facility occupancy, usage, maintenance, and repair. Make periodic adjustments and reviews of building operating systems and procedures essential for optimal energy efficiency and service provision

Financial Impact

MODERATE COST - due to the cost of performing at least half (with respect to total budget) of the necessary operational and equipment upgrades or maintenance during the first commissioning cycle (24 months) and the third party commissioning fees

Comment

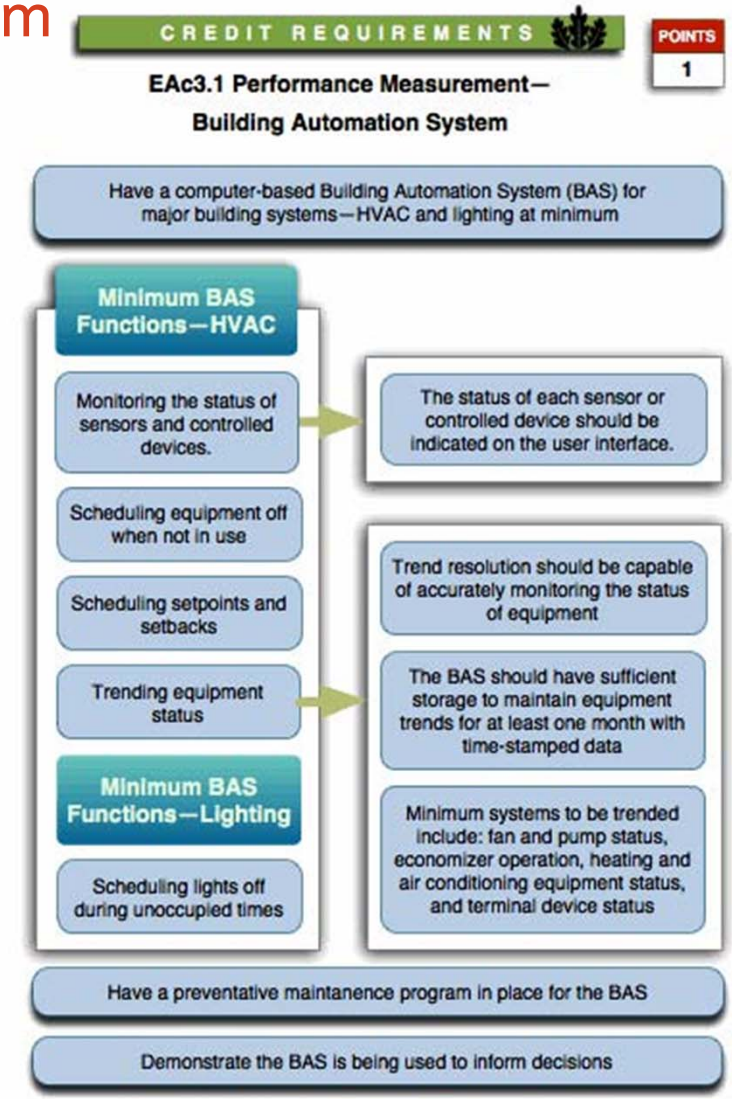
- No previous energy audits or retro-commissioning activities have been completed for the site.

Next Steps

- Engage a commissioning agent to develop an ongoing commissioning plan that includes a commissioning cycle frequency of no more than 24 months and implement at least half of the scope of work in the first cycle.
- Create a building equipment list outlined by system or component type, and include performance measurement frequency for each component type and procedures for responding to deviations from expected parameters.
- Provide an estimated budget for completion of the overall commissioning cycle with a breakdown of costs for complete of each major task within the cycle.
- Provide a table summarizing all tasks related to the commissioning program that have occurred in the past two years. Include the cost of each task, the date each task was undertaken/completed, and the total cost of the completed work. Include a summary that shows at least 50% of the scope was completed in the first commissioning cycle/prior to LEED EBOM application.
- Update the Building Operating Plan and/or Systems Narrative as necessary

CHANGE.
CHICAGO HOUSING AUTHORITY

EAc3.1 - Performance Measurement: Building Automation System



CHANGE.
CHICAGO HOUSING AUTHORITY

At A Glance

- High Cost
- Property-specific

Credit Highlights

- Local control of most resident systems prevents BAS installation
- CHA has automation systems for its central boilers

Status	C	A	S	L	N
Points	0	0	0	0	1

EAc3.1 | Performance Measurement: Building Automation System

Intent	To provide information to support the ongoing accountability and optimization of building energy performance and identify opportunities for additional energy saving investments
Financial Impact	HIGH COST - due to installation of BAS
Comments	· Boilers and domestic water heaters have own controls system and have the capacity for remote control. · Remaining systems and spaces are not connected to a Building Automation System (BAS). The domestic water pumps, AC units and lighting are controlled locally. In addition, the AC units are through-the-wall type and are plugged into a receptacle, therefore it is unlikely these units can be controlled or monitored via a BAS.
Next Steps	· Currently slated as a not achievable credit. CHA may reconsider pending a major rehabilitation decision and installation of BAS.

CHANGE.
CHICAGO HOUSING AUTHORITY

EAc3.2 – Performance Measurement: System-Level Metering

ACTION STEPS

EAc3.2: Performance Measurement—System Level Metering

POINTS: 1–2

Employ system-level metering covering 40% or 80% of total expected annual energy consumption and 80% of the largest energy use categories.

Assess the current level of submetering and the feasibility of adding more if needed

Record a breakdown of the building's significant end-use energy applications using results from the ASHRAE Level I energy audit completed for EAp1

For each major end use, compile the expected annual energy consumption, percentage of total annual energy use, and percentage of submetered energy consumption

If necessary, install additional submeters to meet the credit requirements

Employ system-level metering covering 40% or 80% of the total expected annual energy use

Calibrate meters and establish procedures for reviewing and using metered data to improve system performance

BEFORE PERFORMANCE PERIOD

DURING PERFORMANCE PERIOD

CHANGE.
CHICAGO HOUSING AUTHORITY

At A Glance

- High Cost
- Property-specific
- Calculation
- Measurement & Verification

Credit Highlights

- Local control of resident systems (AC, cooking gas) prevents system level metering
- Domestic hot water & heating is a central system that can be sub-metered
  - Natural gas consumption accounts for **89%** of total energy consumption

Status	C	A	S	L	N
Points	0	0	0	0	2

EAc3.2 | Performance Measurement: System-Level Metering

Intent

To provide accurate energy use information to support energy management and identify opportunities for additional energy-saving improvements.

Financial Impact

HIGH COST – due to the need for system-level metering

Comments

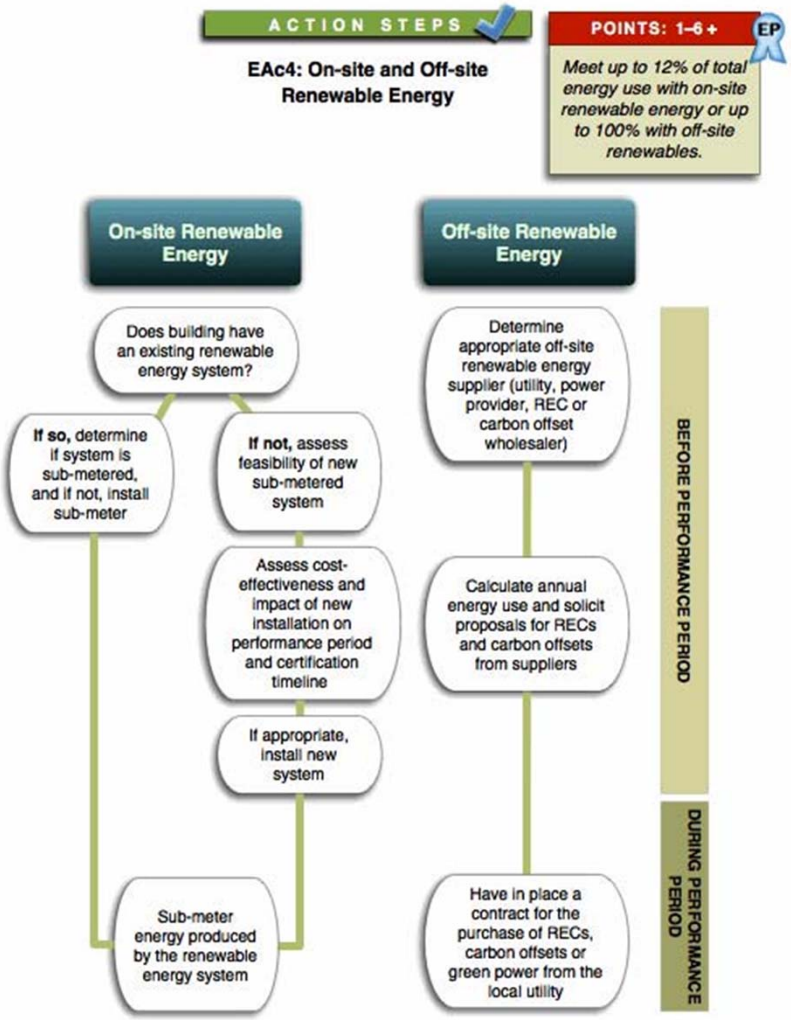
- All tenants pay for their individual electric utility bills.
- Cooling, receptacle loads, and lighting systems serving both the management offices and the residential units are not sub-metered. Cooling for the 1st floor management offices and social/common room is accomplished through four (4) split system ac units. Cooling for the residential units is accomplished through window AC units plugged into receptacles. Sub-metering for cooling, receptacle loads, and lighting will be difficult and expensive because of the number of separate systems serving the site.
- Domestic hot water is a central system and can be separately metered. It is expected that the natural gas used for domestic hot water is below the 40% needed to earn this credit.
- Gas for cooking can be separately metered in each entire building. It is expected that the natural gas used for cooking is below the 40% needed to earn this credit.
- Heating is accomplished through central hot water boilers feeding heat exchangers serving radiant floor heating. The central heating system is not separately metered and likely accounts for at least 40% of the building's total expected annual energy consumption. The combined natural gas consumption is 89% of the total energy consumption. Heating is likely a majority of this portion and domestic hot water is likely the second largest.

Next Steps

- Install sub-metering for central heating system and verify that the heating end-use consumption accounts for 40% or greater of the total annual energy consumption. Install sub-metering for the domestic hot water system and verify that the heating and domestic hot water end-use consumption together account for 80% or greater of the total annual energy consumption.
- Maintain documentation of the system-level metering operation and function, per the manufacturer's recommended interval. Maintain a written record of preventative maintenance practices relating to the system-level metering.

CHANGE.
CHICAGO HOUSING AUTHORITY

EAc4 – On-Site & Off-Site Renewable Energy



CHANGE.
CHICAGO HOUSING AUTHORITY

At A Glance

- Low Cost
- Portfolio-wide
- Calculation

Credit Highlights

- Purchase off-site renewable energy and carbon offsets only if in need of "buffer points"

Status	C	A	S	L	N
Points	0	6	0	0	0

EAc4 | On-Site & Off-Site Renewable Energy

Intent

To encourage and recognize increasing levels of on-site and off-site renewable energy to reduce environmental impacts associated with fossil fuel energy use

Financial Impact

LOW COST – for Option 2, due to REC and carbon credits

Comment

- Green-e certified Renewable Energy Certificates can be purchased for approximately $0.87/MWh at the time this report was written.
- Certified Emission Reductions (CERs) can be purchased for approximately $2.50/t$CO_2$ at the time this report was written.
- On-site renewable energy, Option 1, is a high initial cost creating a high payback period. If funds can be secured through grants, federal tax incentives, and utility programs, the following on-site renewable energy may be applicable to this site: Photo-Voltaic Panels, Solar Thermal Hot Water Heating, and Geothermal.
- Credit eligible for **exemplary performance** by meeting the next threshold of credit achievement, which could mean 13.5% on-site renewable energy, or, the equivalent calculated combination of on-site and off-site renewable energy, provided the percentage sum of off-site and on-site renewable energy is 100% or less.

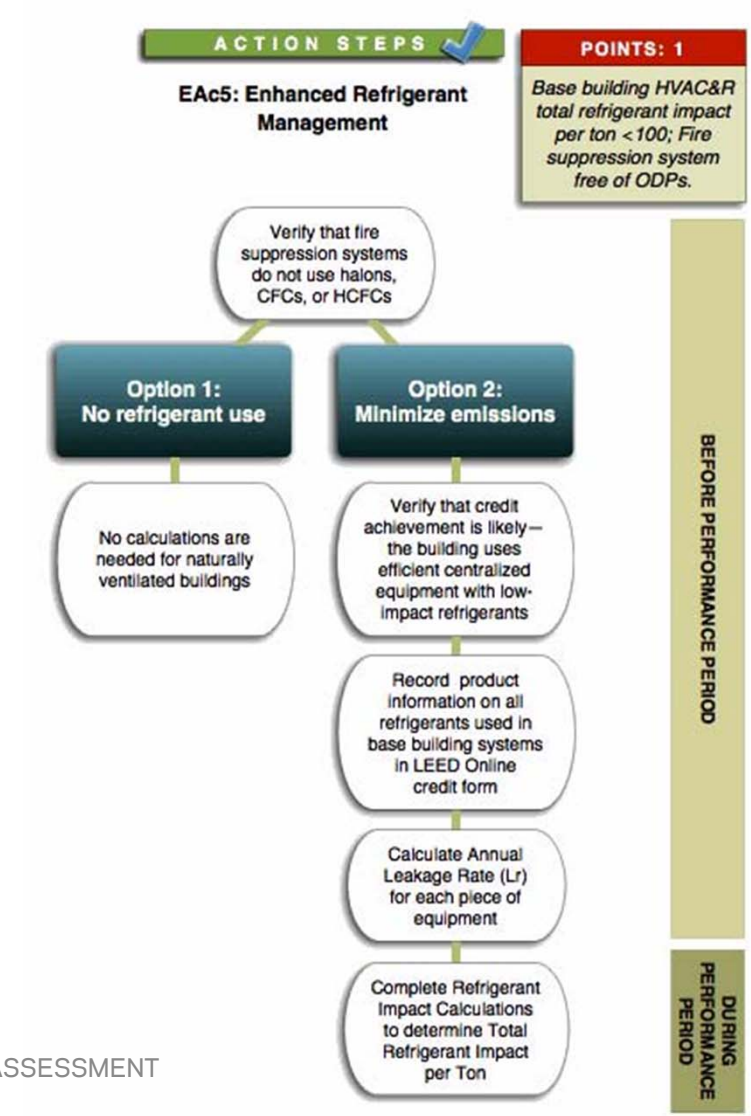
Next Steps

- Purchase RECs and/or carbon offsets for a minimum of 25% of electricity, purchased steam, natural gas, propane and fuel oil from a Green-e certified or equivalent provider*. A two year contract is required.

* *Although included in the assessment, this compliance path does not provide any environmental, social or financial return on investment and thus, is not recommended unless the property is in need of buffer points.*

CHANGE.
CHICAGO HOUSING AUTHORITY

EAc5 – Refrigerant Management



CHANGE.
CHICAGO HOUSING AUTHORITY

At A Glance

- High Cost
- Property-specific
- Calculation
- Measurement & Verification

Property Name	Patrick Sullivan			
Refrigerant	HCFC-22	HCFC-22	HCFC-22	HCFC-22
Unit Type	Room or Window AC Unit	Unitary, Split Packaged AC	Unitary, Split Packaged AC	Unitary, Split Packaged AC
ODP	0.04	0.04	0.04	0.04
GWP	1780	1780	1780	1780
Lr	0.02	0.02	0.02	0.02
Mr	0.1	0.1	0.1	0.1
Rc (lbs)	1.19	17.00	19.00	13.00
Life	10	15	15	15
Tons	1.00	10.00	12.50	5.00
# of Units	482	1	1	2
LCODP	0.001425	0.018133	0.020267	0.013867
LCGWP	63.413	806.933	901.867	617.067
Combined	205.91	2620.27	2928.53	2003.73
Baseline	100			
Property Average	224			

Status	C	A	S	L	N
Points	0	0	0	1	0

EAc5 | Refrigerant Management

Intent

To reduce ozone depletion and support early compliance with the Montreal Protocol while minimizing direct contributions to global warming

Financial Impact

HIGH COST – due to replacement of AC units

Comment

- Existing AC units all utilize R-22, an HCFC, which means the project is required to pursue Option 2.
- If information was unavailable on site, a default value from LEED was used for the refrigerant charge per ton. Typical values for refrigerant leakage rate and end of life refrigerant loss were obtained from the LEED Reference Manual as well.
- For the preliminary analysis, the following units were observed:
  - Apartment AC units: Approximately one (1) ton, 1.18 lbs of refrigerant
  - Social/Common Room: Two (2) split systems, 10 and 12.5 tons, containing 14 and 19 lbs of refrigerant, respectively.
  - 1st floor management offices: Two (2) split systems, 5 tons each, 13 lbs of refrigerant.
- Based on preliminary calculations, the combined global warming and ozone depletion potential of all AC units within the building is 224. Because this score is greater than 100, the property is anticipated to achieve 1 point in the long term.

Next Steps

- This preliminary analysis need to be expanded for the entire building by collecting the necessary data for each HVAC equipment piece containing greater than 0.5 lbs of refrigerant.
- In this preliminary investigation, replacing only the 4 split systems with units using HFC-410a will not achieve a score below 100. Consider replacing all apartment AC units with equipment using a more environmentally preferable refrigerant such as HFC-410a. Also, consider using equipment with lower refrigerant charge (pounds of refrigerant per ton of cooling).

CHANGE.
CHICAGO HOUSING AUTHORITY

EAc6 – Emission Reduction Reporting

ACTION STEPS

EAc6: Emissions Reduction Reporting

POINTS: 1

Identify, track, and record energy-related emissions reductions and report to a formal tracking program.

BEFORE PERFORMANCE PERIOD

- Track utility data related to onsite fuel use and electricity consumption
- Calculate associated emissions using third-party voluntary reporting programs

DURING PERFORMANCE PERIOD

- Produce documentation of participation in a third-party reporting program
- Provide a summary of actions relating to energy efficiency, renewable energy, and other building energy emissions reductions, including renewable energy credits, and estimate the relative contribution of each action

CHANGE.
CHICAGO HOUSING AUTHORITY

At A Glance

- Moderate Cost
- Portfolio-wide
- Calculation
- Measurement & Verification

Credit Highlights

- Utilizing data tracking system **(YARDI)** will help to lower documentation & calculation costs
- Benchmarking each property gives CHA accurate emissions profile

Status	C	A	S	L	N
Points	0	0	1	0	0

EAc6 | Emission Reduction Reporting

Intent	To document the emissions reduction benefits of building efficiency measures
Financial Impact	MODERATE COST - due to emissions study
Comment	· Currently no system in place for tracking and reporting emissions.
Next Steps	**Performance Period** · Establish a baseline for the building and report the reduction in greenhouse gas emissions using a third party voluntary reporting or certification program during the performance period. · Provide a summary of renewable energy sources, efficiency measures, etc. outlining how greenhouse gas emissions were reduced. · Complete a Carbon Footprint report for the site.

CHANGE.
CHICAGO HOUSING AUTHORITY

THANK YOU

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