

USGBC National Capital Region MasterClass Series: The Ins and Outs of Existing Building Commissioning – Analysis Credit

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LEARNING OBJECTIVES

1. Identify the key components of the “Existing Building Commissioning – Analysis” credit under the Energy & Atmosphere category of **LEED® for Building Operations & Maintenance, Version 4**.
2. Understand the two pathways for compliance with the “Existing Building Commissioning – Analysis” credit under the Energy & Atmosphere category of **LEED® for Building Operations & Maintenance, Version 4**: “Option 1 – Commissioning” and “Option 2 – ASHRAE Level II Energy Audits”.
3. Understand trade-offs of renovation and upgrade decisions (calculation methods Simple Payback Period, Return of Investment, and Cost-Benefit Ratio) for the “Existing Building Commissioning – Analysis” credit under the Energy & Atmosphere category of **LEED® for Building Operations & Maintenance, Version 4**.
4. Understand Required Documentation to achieve either option under the “Existing Building Commissioning – Analysis” credit under the Energy & Atmosphere category of **LEED® for Building Operations & Maintenance, Version 4**.





INSTRUCTOR & AUDIENCE INTRODUCTIONS

ENERGY & ATMOSPHERE CREDIT CATEGORY

- ✔ Worth 38 points under v4
- ✔ Addresses energy use reduction
- ✔ New emphasis on renewables
- ✔ Aims to reduce resource consumption



***Frequently
Used
Acronyms
&
Definitions***

CFR: Current Facility Requirements

Cx: Commissioning

DES: District Energy System

ECMs: Energy Conservation Measures

O+M: Operations + Maintenance

OPR: Owner's Program Requirements

ROI: Return on Investment



BACKGROUND & INTENT OF CREDIT



INTENT

*To use the existing building
Cx process to improve
operations, energy &
resource efficiency*



OTHER CREDIT INFORMATION

Changes from LEED 2009 (v3):

- No major changes for most buildings
- For District Energy Systems (DES), building-owned systems are treated the same as third-party systems

Referenced Standards:
ASHRAE Procedures for Commercial Building Energy Audits, 2nd Edition

No points for Exemplary Performance





STEP-BY-STEP GUIDANCE

Keys to Success

- ✓ Involvement of all project team members
- ✓ Clear lines of communication
- ✓ Access to reliable building data

01

Select One
Option: Cx or
Energy Audit

02

Identify Project
Team

03

Review
Performance
Specifications

04

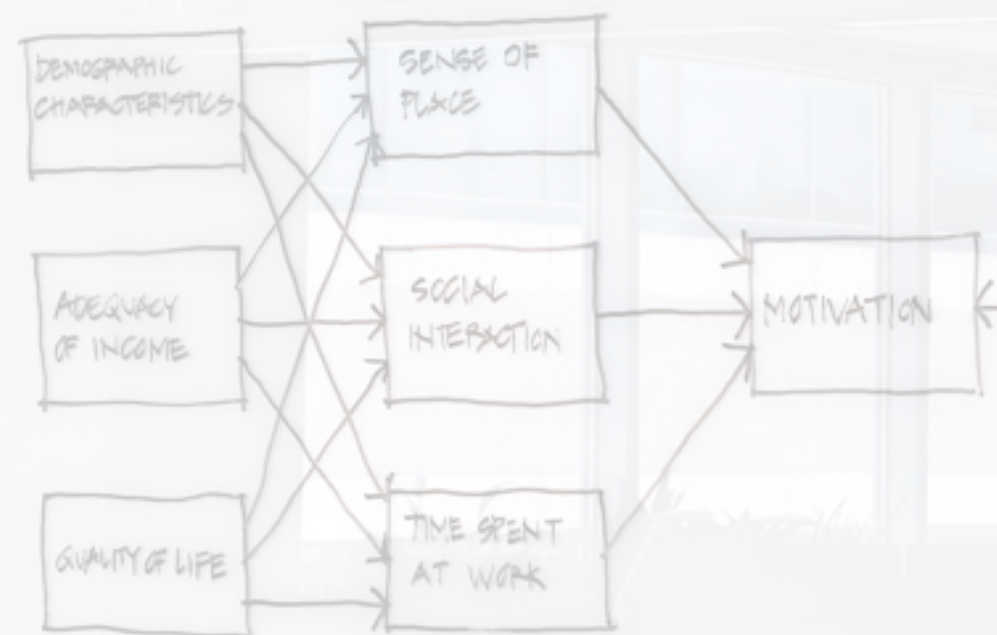
Identify Systems
& Estimate
Consumption

05

Develop Cx Plan
or Energy
Audit Plan

06

Develop
Schedule &
Timeline



01

Select One
Option: Cx or
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Identify Project
Team

03

**Review
Performance
Specifications**

04

**Identify Systems
& Estimate
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05

**Develop Cx Plan
or Energy
Audit Plan**

06

**Develop
Schedule &
Timeline**



**OPTION 1 VS.
OPTION 2**



Option 1: Commissioning

Plan includes:

- Updated CFR
- Team roles + responsibilities
- Approach
- Process
- Implementation Plan
- Format/content of eventual deliverables
- Proposed schedule

Step-by-Step Guidance:

1. Determine testing procedures & reporting format
2. Determine criteria for evaluating/prioritizing issues
3. Execute CX plan & document results
4. Document changes to CFR & O&M plan

Option 2: Energy Audit

Plan includes:

- Team roles + responsibilities
- Approach
- Process
- Implementation Plan
- Format/content of eventual deliverables
- Proposed schedule

Step-by-Step Guidance:

1. Determine analysis approach & reporting format
2. Perform energy audit & document results
3. Document changes to CFR & O&M plan



Option 2: Energy Audit

Building the Audit

Choose the Auditor

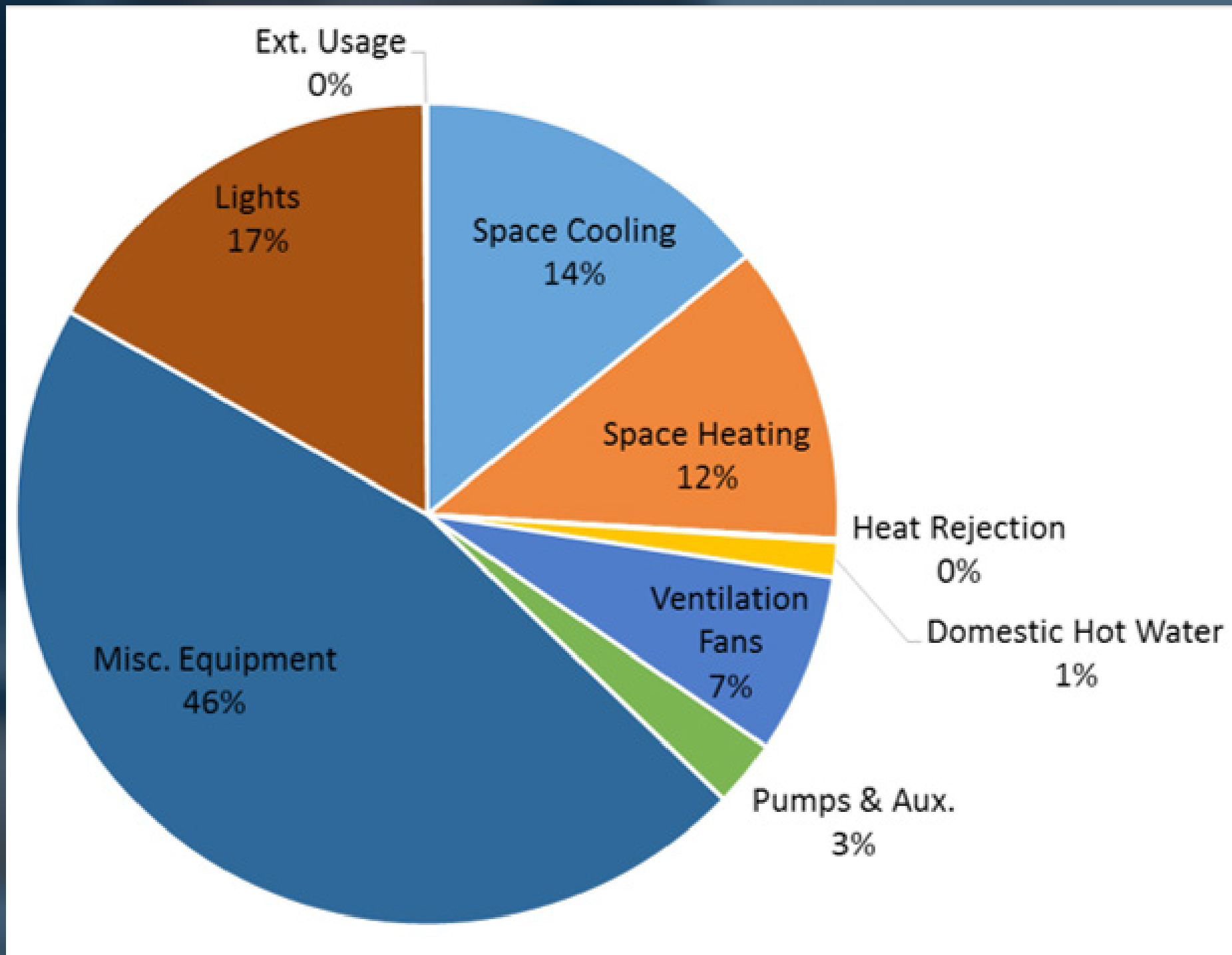
Allow Time for Planning & Collaboration

- Sample forms
- Electronic data gathering
- Fee for service method

Determine Major Energy End Uses

Create an Energy Model

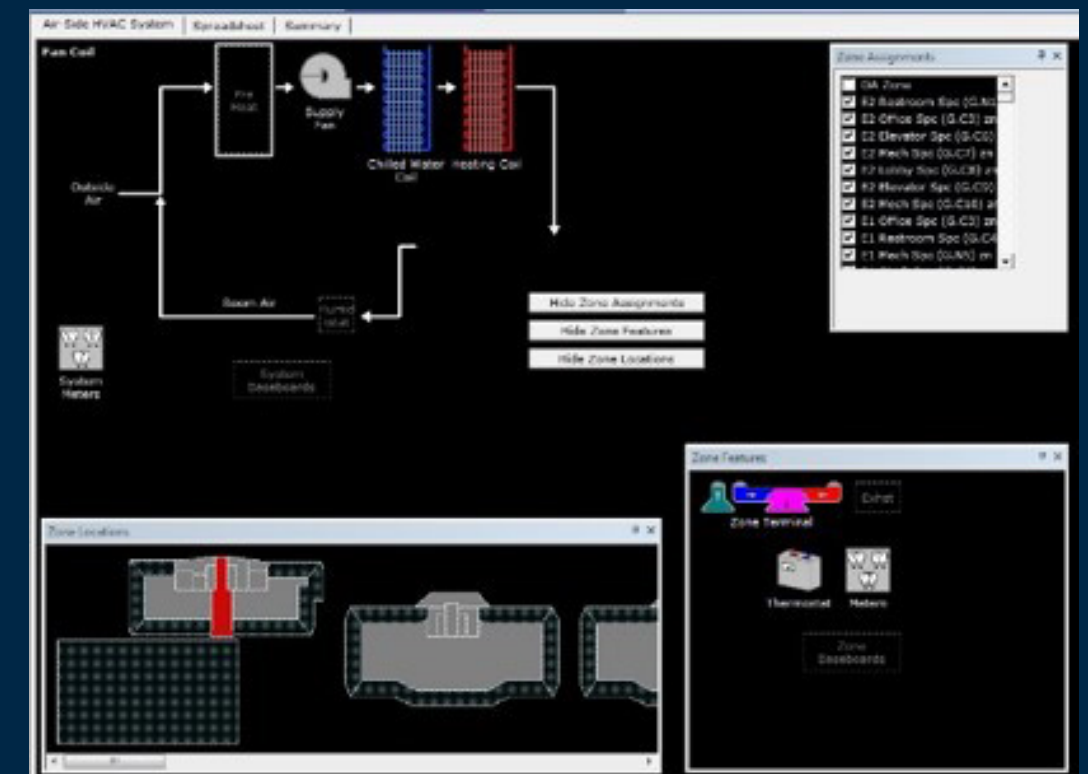
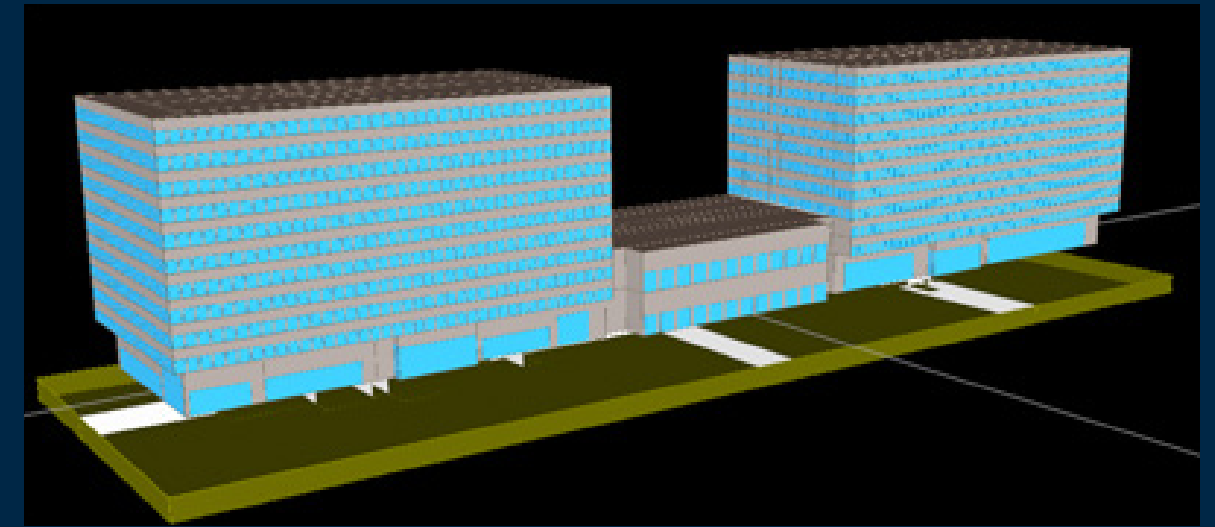
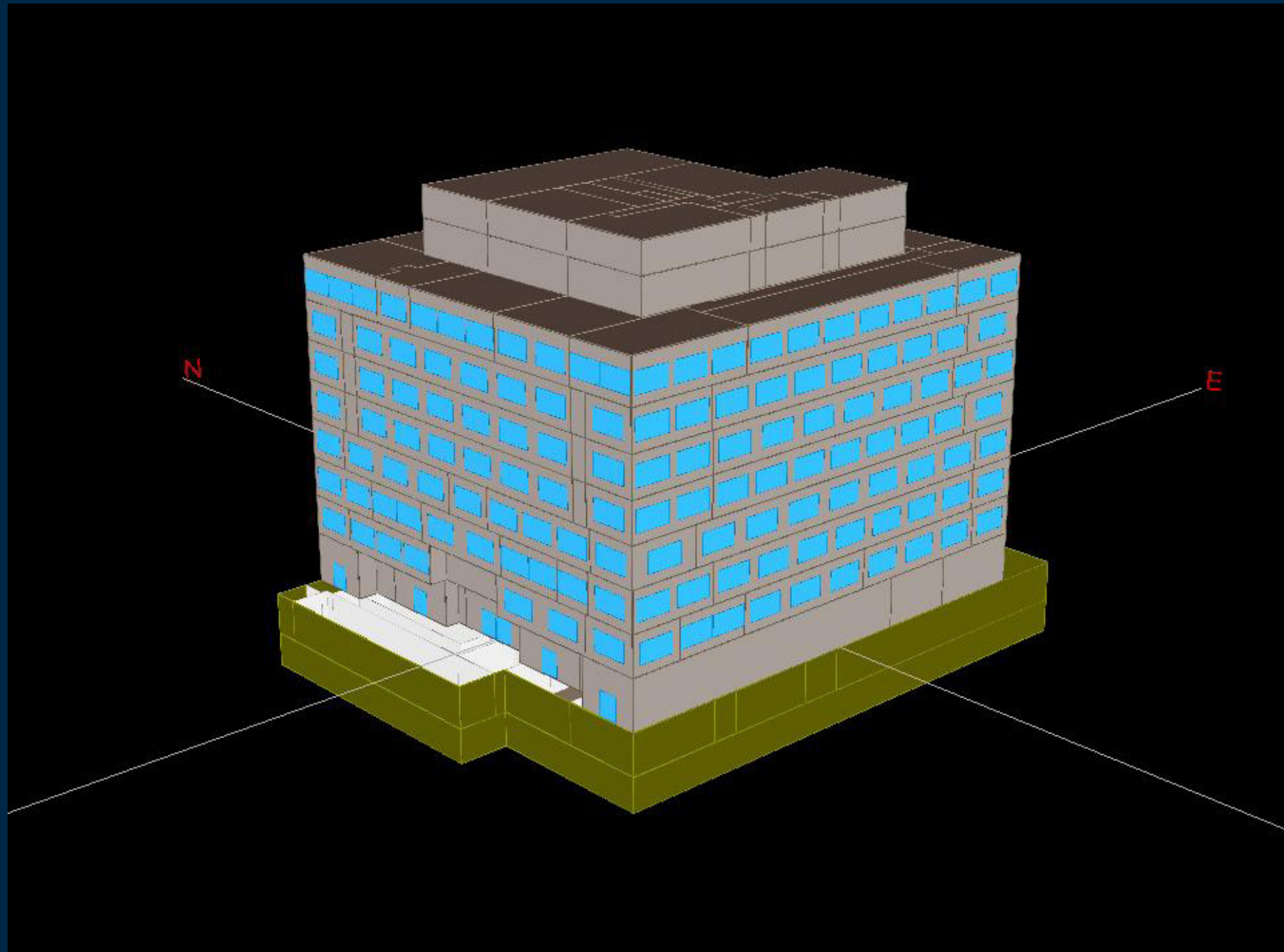
ANALYZING ENERGY CONSUMPTION BY END USE



Requires a physical review of existing drawings, interviews with building engineers and boots on the ground



THE ENERGY MODEL



- *Creates simulation of real building to allow “what if” calculations*
- *Requires existing plans & 2 years of utility data*



CREDIT CALCULATIONS – ACTIVITY



Activity – Simple Payback Calculation

Existing Water Source Heat Pump:

- Energy cost = \$2,000 annually
- Maintenance = \$1,500 annually

New Water Source Heat Pump:

- Unit cost = \$10,000
- Energy cost = \$1,000 annually
- Maintenance = \$200 annually

Activity – Simple Payback Calculation

Existing Water Source Heat Pump:

- Energy cost = \$2,000 annually
- Maintenance = \$1,500 annually

New Water Source Heat Pump:

- ***Unit cost = \$10,000***

- Energy cost = \$1,000 annually
- Maintenance = \$200 annually

Project Cost!





Activity – Simple Payback Calculation

Existing Water Source Heat Pump:


- Energy cost = \$2,000 annually
- Maintenance = \$1,500 annually

New Water Source Heat Pump:

- Unit cost = \$10,000
- Energy cost = \$1,000 annually
- Maintenance = \$200 annually

Operating Cost = difference between old & new

$$(2000+1500) - (1000+200) = \$2,300$$



Activity – Simple Payback Calculation

$$\text{Simple Payback (in years)} = \frac{\text{project costs}}{\text{annual operating savings}}$$

$$\text{\$10,000} / \text{\$2,300} = 4.35 \text{ years}$$

in 4.35 years, you will recover enough money in savings to fund your project!



Activity – Return on Investment Calculation

The Inverse of Simple Payback

Recall our scenario...

- Unit cost = \$10,000
- Annual savings = \$2,300

ROI = annual savings / project cost

$$\frac{\$2,300}{\$10,000} = 23\% \text{ ROI}$$



Activity – Cost-Benefit Ratio Calculation

Total Financial Return for Life of Investment

Recall our scenario...

- Unit cost = \$10,000
- Annual savings = \$2,300
- Assuming 20-year service life

**Total operating savings =
service life * annual savings**



Activity – Cost-Benefit Ratio Calculation

Recall our scenario...

- Unit cost = \$10,000
- Annual savings = \$2,300
- Assuming 20-year service life
- Total operational savings: $20 * \$2,300 = \$46,000$

$$\frac{\text{Total Operational Savings}}{\text{Project Cost}} = \text{Cost-Benefit Ratio}$$

Activity – Cost-Benefit Ratio Calculation

$$\frac{\$46,000}{\$10,000} = 4.6$$

*for every dollar spent, expect to save
4.6 dollars over 20-year period!*



OPTION 1 VS. OPTION 2 – ACTIVITY

PROJECT SCENARIO

- 200,000-SF DC office bldg.; chilled water floor-by-floor VAV systems
- 20-year-old controls system for HVAC
- ENERGY STAR score of 72
- Constructed in 60's; renovated 1995
- Sequence of operations same since '95
- Original + renovated plans available
- Multi-floor tenant lease expires soon



PROJECT SCENARIO

➤ Which would you choose?

➤ *Option 1 – Commissioning*

➤ *Option 2 – Energy Audit*

TABLE 1. Determining Appropriateness of ASHRAE Level 2 Audit

Evaluation criteria	Existing building Cx	ASHRAE Level 2 energy audit
Owner wishes to evaluate upgrades to building envelope		
Owner wishes to evaluate upgrades to mechanical, electrical or plumbing systems		
Owner wishes to evaluate upgrades to controls systems		
Energy consumption is higher than expected		
Owner wishes to improve energy efficiency		
Building equipment exhibits persistent failure		
Occupants' complaints are frequent		
Owner is planning capital investment		
Sequence of operations is up-to-date		
Sequence of operations is not up-to-date		
As-built drawings are available and up-to-date		
As-built drawings are not available and/or are not up-to-date		
Building or building retrofit is less than 5 years old		
Building or building retrofit is more than 5 years old		
Building function or use has changed since original design		



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ADDITIONAL CONSIDERATIONS

TABLE 1. Determining Appropriateness of ASHRAE Level 2 Audit

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PROJECT CASE STUDIES

NATIONAL GEOGRAPHIC SOCIETY HQ CAMPUS

- *Multi-building campus in downtown DC*
- *Engaged facility engineering team*
- *Efficiently operating systems*





GEORGETOWN UNIVERSITY CAR BARN – RETRO CX

- Repurposed as Classroom & Office space
- Multiple WSHP Units not operating at optimum levels
- Retro-Cx effort identified non-functioning units & controls needing repair
- Contractor involved in effort





REQUIRED DOCUMENTATION



REQUIRED DOCUMENTATION

Documentation		Option 1	Option 2
E	Existing building commissioning plan	X	
E	Level 2 energy audit plan		X
E	Updated CFR	X	
E	Team members, roles, responsibilities	X	X
E	Schedule	X	X
P	Energy use breakdown	X	X
P	List of issues found and planned resolution	X	
P	List of planned facility improvements	X	X
P	Confirmation that significant upgrades and revisions have been added to CFR and O&M plan		X



APPLYING FOR THE CREDIT ONLINE



SELECTING AN OPTION



LEED v4 O+M: Existing Buildings

EA Credit Existing Building Commissioning Analysis

Project # 1000102909 One Smith Place

Establishment

Select one of the following:

- ☐ Option 1. Existing building commissioning (2 points)
- ☐ Option 2. Energy audit (2 points)

Establishment Summary

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OPTION 1 – COMMISSIONING

Establishment

Select one of the following:

- ☒ Option 1. Existing building commissioning (2 points)
- ☐ Option 2. Energy audit (2 points)

Option 1. Existing Building Commissioning

Upload: Existing building commissioning plan

Provide the existing building commissioning plan for the project. Pricing and/or financial information may be omitted or redacted from the uploaded plan. The plan must include the following elements:

- Updated current facilities requirements
- The commissioning team members and their roles and responsibilities during the commissioning process
- A description of the approach for identifying and analyzing facility improvement opportunities
- The process for reviewing and prioritizing identified opportunities with the project owner and developing an implementation plan
- The format and content of the eventual deliverables from the commissioning process
- The commissioning schedule



OPTION 2 – ENERGY AUDIT

Establishment

Select one of the following:

- ☐ Option 1. Existing building commissioning (2 points)
- ☒ Option 2. Energy audit (2 points)

Option 2. Energy Audit

- ☐ The project team has developed an energy audit plan following the requirements of ASHRAE Level 2, Energy Survey and Analysis.

OPTION I – COMMISSIONING (*EBOM RECERT*)

Performance

Select one of the following:

- ☒ **Option 1.** Existing building commissioning (2 points)
- ☐ **Option 2.** Energy audit (2 points)

Option 1. Existing Building Commissioning

Upload: Existing building commissioning summary report

Provide a report or similar documentation summarizing the findings after completion of the investigation and analysis phase of the commissioning plan. The report must include the following elements:

- A summary of the energy use breakdown for the project and associated grounds associated with each major system and/or end use
- A table or similar documentation of the commissioning master list of findings, including any operating problems affecting either occupants' comfort or building energy use and proposed or potential operational changes that will solve these issues
- A table or similar documentation listing capital improvements expected to provide ongoing operational cost savings and the corresponding economic feasibility (payback time, rate of return, or cost/benefit ratio) of each improvement



OPTION 2 – ENERGY AUDIT (*EBOM RECERT*)

Select one of the following:

- ☐ Option 1. Existing building commissioning (2 points)
- ☒ Option 2. Energy audit (2 points)

Option 2. Energy Audit

☐ The project team has conducted an ASHRAE Level 2 energy analysis according to the energy audit developed during Establishment.

Date that the audit was performed

Upload: Energy audit summary report

Provide a report or similar documentation summarizing the findings of the Level 2 analysis. The report must include the following elements:

- A summary of the energy use breakdown for the project and associated grounds associated with each major system and/or end use. The total annual operating costs of each listed system must be included in the internal report, but providing the cost data to USGBC is optional.
- A list of capital improvement measures considered but felt to be impractical, with brief reasons for rejecting each
- A list of capital improvement measures deemed practical, with the following detail provided (as applicable) for each item on the list:
 - A description of the existing situation and why it contributes to excess energy consumption
 - An outline of the improvement measure, including its effect on occupant health, comfort, and safety
 - A description of any repairs required for the measure to be effective
 - The effect on occupant service capabilities, such as ventilation for late occupancy or year-round cooling
 - An outline of the effect on operating and maintenance procedures
 - The expected life of new equipment and the effect on the life of existing equipment
 - The financial attractiveness (payback time, rate of return, or cost/benefit ratio)

An ongoing commissioning plan may be provided in lieu of a summary report.

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INITIAL CERTIFICATION VS. RECERTIFICATION



Initial Certification vs. Recertification

- First 5 years = “grace period”
- If recert for EBOM is conducted within first 5 years after initial cert, this credit is not required
- 2nd recert or recert in >5 years, this credit must be repeated
- If owner intends to keep building EBOM certified, energy audit is most cost-effective long-term option

UNIQUE BUILDING TYPES & CREDIT OUTLIERS

- *Campuses*
- *Data Centers*
- *Group Approach (multiple buildings, not a campus)*



Next Steps & Credit Category Implications

0	0	0	Energy and Atmosphere		38
Y		Prereq	Energy Efficiency Best Management Practices		Required
Y		Prereq	Minimum Energy Performance		Required
Y		Prereq	Building-Level Energy Metering		Required
Y		Prereq	Fundamental Refrigerant Management		Required
		Credit	Existing Building Commissioning—Analysis		2
		Credit	Existing Building Commissioning—Implementation		2
		Credit	Ongoing Commissioning		3
		Credit	Optimize Energy Performance		20
		Credit	Advanced Energy Metering		2
		Credit	Demand Response		3
		Credit	Renewable Energy and Carbon Offsets		5
		Credit	Enhanced Refrigerant Management		1

QUESTIONS + ANSWERS

Thank you for attending
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