



Clean Buildings—Getting to Efficiency Webinar 3

Energy Management Plans for Clean Buildings

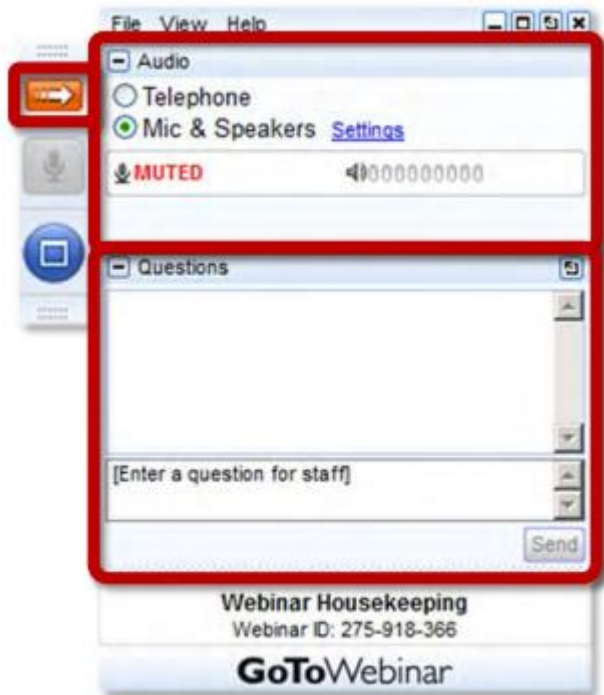
Katherine Morgan, Tune-up Specialist

Karen Janowitz, WSU Energy Program

WSU Energy Program

May 19, 2021

Audio and Questions



Join audio:

- Choose “Telephone” and dial using the information provided (ADD PIN NUMBER)
OR
- Choose “Mic & Speakers” to use Computer Audio

Questions/comments:

- Submit questions and comments via the Questions Panel throughout the webinar
- Q&A will be held after the presentation

Recording

- This webinar is being recorded and will appear within a few days at:

<http://www.energy.wsu.edu/PublicFacilitiesSupport/ResourceConservation>

Thank You

This project was supported in part by Grant No. DE-EE0008296 awarded by the U.S. Department of Energy, Energy Efficiency & Renewable Energy Office. Points of view in this document are those of the author and do not necessarily represent the official position or policies of the U.S. Department of Energy, Energy Efficiency & Renewable Energy Office.

Grant funds are administered by the Washington State Energy Office, Washington State Dept. of Commerce



Katherine Morgan

Instructor

Building Operator Certification Program

Project Manager, Tune-up Specialist

ArchEcology



Karen Janowitz

Program Manager

Washington State University

Energy Program



Thank you to Neil Bavins for developing the webinar series!



Clean Buildings – Getting to Efficiency Webinar Series

- Efficiency Through the Clean Buildings Performance Standard (CBPS)

- 3/30/21

- Tune-ups for Clean Buildings

- 4/21/21, 11:30 am

- **Energy Management Plans for Clean Buildings**

- **5/19/21, 11:30 am**

- Operations & Maintenance for Clean Buildings

- 6/9/21, 11:30 am

registration information:

<http://www.energy.wsu.edu/PublicFacilitiesSupport/ResourceConservation.aspx>



Poll 1

Have you attended any of the previous webinars in this series?

- Yes – both webinars
- Only the 1st webinar – Efficiency through the Clean Buildings Standard
- Only the 2nd webinar – Tune-Ups for Clean Buildings
- No



Terms & Abbreviations

- The Standard or CBPS = Washington State Clean Buildings Performance Standard
- ASHRAE = American Society of Heating, Refrigeration and Air-Conditioning Engineers
- ASHRAE Standard = ASHRAE 100-2018 Standard
- AHJ = Authority Having Jurisdiction = Commerce
- Commerce = Washington State Department of Commerce
- EMP = Energy Management Plan
- O&M = Operations and Maintenance
- EEMs = Energy Efficiency Measures (asset improvement measures)
- ECMs = Energy Conservation Measures (O&M measures)
- EUI = Energy Use Intensity as kBtu/gsf/yr
- EUI_t = Energy Use Intensity Target
- WNEUI = Weather Normalized EUI
- GSF = Gross Square Feet, also gross floor area, measured to exterior walls, excluding parking
- kBtu = kilo (thousand) British thermal units, a common energy unit used for different sources such as kWh (kilowatt hours) and therms



Requirements of the Clean Buildings Performance Standard

- Energy Management Plan (EMP)
- Operations & Maintenance (O&M) Program
- Compliance through one of these performance metrics:
 - Meet Energy Use Intensity Target (EUI_t)
 - Implement All Cost-effective Energy Efficiency Measures

**The O&M program must be implemented at least one year
prior to compliance date!**



WA Department of Commerce Clean Buildings Web Page

<https://www.commerce.wa.gov/growing-the-economy/energy/buildings/>

- Links to Legislation and Reference Standards
- Early Adopter Incentive Program
- Determining if your Building Must Comply
- Steps to Comply
- Personnel Roles
- Resource and Support Links
- Links to Trainings, ENERGY STAR Portfolio Manager Trainings
- Building Owner Portal (coming July)

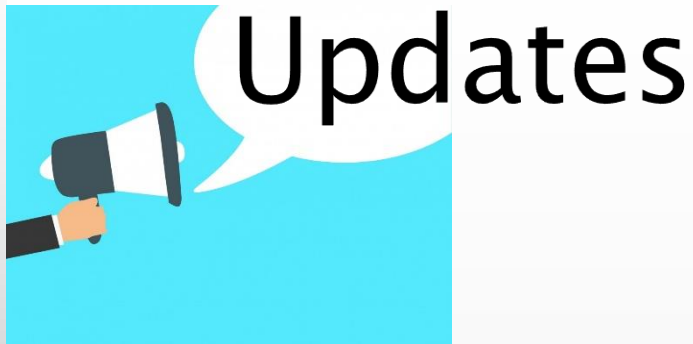
Contact your utility – they may have resources and incentives to help comply with the Standard



Poll 2

What is Your Experience with Energy Management Plans?

1. Have never worked with one
2. Have some efficiency goals, but not a formal plan
3. Have a detailed plan, but it may not be compliant with CBPS
4. Have a detailed plan that meets/exceeds CBPS requirements



- A single combined standard is being created
- Available free of charge by July 1, 2021 on the Commerce Clean Buildings website
- The ASHRAE Standard combined with Clean Buildings Performance Standard amendments

Yeah!



Learning Objectives

- Program compliance timing and roles
- Purpose and components of the CBPS Energy Management Plan (EMP)
- Energy monitoring and accounting
- EMP documentation requirements
- EMP: Implementing, updating and occupant engagement

*Please think about how you have engaged occupants to save energy,
we would love your feedback later in the webinar
Submit Questions and Tips to share in the Q&A box*



Energy Management Plan Timing

- Develop an initial plan and then make annual updates
- It includes the O&M program plan, which must have a year of implementation
- Can work on building it out to address full CBPS scope over a few years
 - Some elements don't change much (equipment lists)
 - Others are updated at least annually (accounting details and ECM/EEM planning and implementation)



CBPS Compliance Timeline

Start Now

Energy Accounting

Set up Portfolio Manager Profile and determine EUI, baseline WNEUI, and EUI_t

At a minimum you need

1. GSF
2. all energy use for a 'normal' occupancy year
3. 'normal' weekly occupancy hours (hours main shift is on site, not equipment schedule, not extended hours, may need to segment space)

Maintain at least annually

3 years before compliance deadline

Energy Management Plan

Draft baseline plan to include

1. Energy Accounting
2. Plan for steps to reach target or maintain compliant performance
3. Status of other required elements including O&M program plan, and
4. plan to add relevant missing elements in annual updates

Update annually with accounting and relevant activity

At least 1 year before

Operation & Maintenance Program

EMP will include requirements, current status and data tracking plan

Implement program and keep records

At least one year of records from a compliant program is required (tasks, training)



What's In the Energy Management Plan?

(sect. 5.1.2)

1. Name of Owner and Energy Manager (& Qualified Person)
2. Reporting of baseline and annual updates of WNEUI (Weather Normalized Energy Use Intensity) and EUI_t
3. Annual comparison of the WNEUI and EUI_t
4. Documentation of:
 - Occupant count: *baseline and ongoing updates*
 - Weekly operating hours: *baseline and updates*
 - Occupancy time of day scheduling: *baseline and updates*
 - Energy using equipment that would cause a measured change in EUI



What's In the Energy Management Plan?

(sect. 5.1)

5. Operations and maintenance (O&M) program plan
 - ECMs identified or implemented
 - More info in Webinar 4
6. Energy audit reports and list of recommended EEMs
 - Per Section 8
 - EEM reference in Informative Annex E
7. List of Energy Efficiency Measures (EEMs) implemented
8. Method to inform occupants of the benefits of efficient energy use



What's In the Energy Management Plan?

(sect. 5.1)

9. Occupant instruction on how to use certain energy features
 - Operable windows
 - Lighting controls
 - HVAC controls
10. Training plan for O&M personnel
 - More info in Webinar 4
11. A capital expenditure (CapEx) plan for replacing equipment
12. Suppliers and manufacturers representatives contacts list



What's In the Energy Management Plan?

(sect. 5.1)

- 13. Qualified energy auditor contacts list
- 14. Current lighting schedule (fixtures)
- 15. Calculated lighting power density (Watts/gross floor area)
- 16. Current occupant lighting satisfaction survey



Major EMP Components

- **People and contacts**
Owner, energy manager, service and supplier contacts including energy auditors (other stakeholders you want to track for your building)
- **Performance and activity data updated annually**
WNEUI, areas/activities/occupancy schedules and count
- **Energy using equipment (MEP schedules) and replacement plans (CapEx)**
HVAC, hot water, lighting and lighting power density (LPD), special loads



Major EMP Components

- **Overview of O&M program**
 - Maintenance tasks and operating guidelines for equipment
 - Tune Up actions
 - Training plan and record
- **EEMs proposed and implemented**
Energy audits and tune up findings and implementation
- **Occupant engagement**
Energy conservation/efficiency outreach, lighting satisfaction survey, operating instructions



Energy Management Plan – Updates

- Building owner to review and sign annually (ASHRAE 100)
- Owner, Energy Manager & Qualified Person must approve & sign for CBPS: Annex Z6.1 Form A
 - Initial reporting schedule per Z3.1 (every 5 years)
- How often should the plan be updated?
 - CBPS specifies some components be updated annually (EUI, WNEUI)
 - Recommend annual update, or with major changes to the building
- Energy Manager provides plan annually to:
 - Building occupants
 - Other stakeholders (Other stakeholders are not defined in the Standard. This could be property managers, contractors and vendors, or other AHJ's)

The Building Owner is Responsible for the EMP

- Develop and implement the Energy Management Plan
- Meeting building EUI
- Non-compliance penalties
- Owner designates Energy Manager (Annex Z6.1, line 4)
 - If different than the Qualified Person
 - Owner can also be the Energy Manager



What role do tenants play in energy use in your building?



The Energy Managers Role

(sect. 5.3)

1. Technical and policy planning
2. Energy purchasing
3. Implementing EEM's in EMP
4. Reviewing O&M Plan
5. Adhering to Energy Code
6. The EMP and reporting
7. Evaluating energy impact of facility changes
8. Public relations
9. Occupant info. and staff training

*Designated by the Building Owner
Consider Energy Manager qualifications
and support needed to fit responsibilities*

Items with no further definition in the Standard





Building Personnel: Roles can Overlap

- Owner
 - Holds ultimate responsibility to ensure building complies
- Energy Manager
- Building Manager
- Building Operator



Building Personnel: Roles can Overlap

Minimum credential requirements, see Definitions in Sect 3

Qualified Person

- *Verifies EUI calculation and EMP O&M compliance*
- Minimum 3 yrs experience and one of several credentials
 - WA licensed architect or engineer
 - BOC Level 2
 - certified commissioning agent
 - qualified energy auditor
 - certified energy manager

Qualified Energy Auditor

- *Performs audits*
- Minimum 3 yrs experience and one of a few credentials
 - WA licensed architect or engineer
 - energy auditor/ assessor/ analyst certified by ASHRAE or AEE for all building types



Energy Accounting

(sect. 5.2)

- CBPS specifies Energy Star Portfolio Manager (ESPM) as the energy accounting and reporting system
 - Sect. 5.2.4 & Annex Z6.3

Key Difference: CBPS vs. ASHRAE 100



Energy Accounting

(sect. 5.2)

- CBPS specifies Energy Star Portfolio Manager (ESPM) as the energy accounting and reporting system
 - Sect. 5.2.4

ESPM is also used for energy conversion factors, i.e.: wood, oil, steam, etc. (sect. 5.2.3)

Building Use Details can be used to track weekly hours and occupants

Energy Star has regular ongoing training to help you get the most out of it and is working with Commerce on custom reports.

The screenshot shows the 'Get Started' page of the Energy Star Portfolio Manager. The page title is 'Get Started Setting Up Meters for PSR Office and Warehouse'. Below the title, there is a paragraph explaining five ways to enter meter data: first, by hand; second, by spreadsheet; third, by hiring a company; fourth, by using a utility's service; and fifth, by using a utility's service to update data automatically. The main section is 'Sources of Your Property's Energy', which asks 'What kind of energy do you want to track? Please select all that apply.' and lists various energy sources with checkboxes: Electric, Natural Gas, Propane, Fuel Oil (No. 2), Diesel, District Steam, District Hot Water, District Chilled Water, Fuel Oil (No. 4), Fuel Oil (No. 5 and No. 6), Coal (anthracite), Coal (bituminous), Coke, Wood, Kerosene, Fuel Oil (No. 1), and Other. To the right, there are three informational sections: 'Tracking Energy' (explaining how to track energy from various sources), 'Two Meters Needed for Onsite Solar/Wind' (explaining the need for an electric grid meter), and 'Automate Your Meter Entries' (explaining how to integrate utility data). At the bottom right, there are 'Get Started!' and 'Cancel' buttons.



Energy Accounting

(sect. 5.2)

- Building EUI and WNEUI reporting
 - This will be done automatically by ESPM, make sure sharing is set up
- Per the Washington State Report in ESPM (Annex Z6.3-Form C)
 - Report does not exist yet (should be available by July 1, 2021)
 - Report will address the approximately 90 items listed in Z6.3
 - Note: EUI target (EUI_t) is not in this report
- Data for all energy imported to and exported from the building
 - Includes requirements for owner provided meters (Title 480 WAC)
 - Exported energy may be tracked as separate meters in ESPM but may need special calculations, see Technical Guide and Standard

<https://portfoliomanager.energystar.gov/pdf/reference/Negative%20Energy%20Consumption%20Reference.pdf>



Capital Management Plan

(sect. 5.1.2.10)

- ID systems for replacement with energy efficient equipment
 - Identify Energy Star rated equipment where appropriate
 - Includes HVAC, lighting, water heating, elevator, appliances & other building equip.

Capital Plan

Building Name Western Ave. Building
 Building Address 1234 Western Ave, Seattle, 98111
 Last Update 4/23/2021
 Updated by John Doe

Item #	Description	Location	Equip. ID/Tag	Manuf	Model	Serial	Capacity	Install year	Life Exp.	Expected Repl. Year	Est. Replacement Cost (incl. tax)	Energy Saving Options?	Possible Utility Rebate?	Notes
HVAC-1	Gas Pac	Roof	GP-1	Trane	YCD036	2345YSC23DF	3 tons	2004	20	2024	\$ 16,000	Y	Y	May be undersized for load
HVAC-2	Split AC	1st Fl Server	AC-2	Carrier	CSU024FFO	V234CK-3	2 tons	2015	15	2030	\$ 15,000	Y	N	Critical item, runs 24/7
HVAC-3	Gas Pac	Roof	GP-2	Trane	YCD036	2345YSC23D2	3 tons	2004	20	2024	\$ 16,000	Y	Y	Lower cost if all GP replaced together
HVAC-4	Gas Pac	Roof	GP-3	Trane	YCD120	2345YSC23D3	10 tons	2004	20	2024	\$ 45,000	Y	Y	Lower cost if all GP replaced together
HVAC-5	Gas Pac	Roof	GP-4	Trane	YCD060	2345YSC23D4	5 tons	2004	20	2024	\$ 21,000	Y	Y	Lower cost if all GP replaced together
HVAC-6	Gas Pac	Roof	GP-5	Trane	YCD024	2345YSC23D5	2 tons	2004	20	2024	\$ 13,000	Y	Y	Lower cost if all GP replaced together
HVAC-7	Gas Pac	Roof	GP-6	Trane	YCD048	2345YSC23D6	4 tons	2004	20	2024	\$ 19,000	Y	Y	Lower cost if all GP replaced together
HVAC-8	Gas Pac	Roof	GP-7	Trane	YCD036	2345YSC23DF	3 tons	2004	20	2024	\$ 16,000	Y	Y	Lower cost if all GP replaced together
HVAC-9	Gas Pac	Roof	GP-8	Trane	YCD036	2345YSC23DF	3 tons	2004	20	2024	\$ 16,000	Y	Y	Lower cost if all GP replaced together

Sample: HVAC on Excel spreadsheet



Operations and Maintenance Plan (5.1.2.14)

- Plan for O&M Program described in Section 6 including
 - Implementation plan and
 - Documentation
- Will review details in Webinar 4



Lighting Schedule & Power Density

(5.1.2.13)

- Include fixture type, wattage, count, and location
 - Listing total watts will aid in calculating total lighting power density

Lighting Schedule

Building Name Western Ave. Building
 Building Address 1234 Western Ave, Seattle, 98111
 Last Update 4/23/2021
 Updated by John Doe

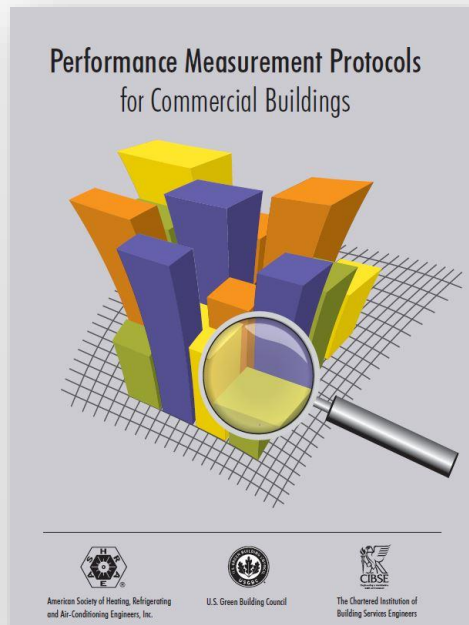
Item #	Description	Space	Manuf.	Type	Watts/ Fixture	# Fixtures	Total Watts	1st Install Date	Energy Saving Options?	Possible Utility Rebate?	Notes
L-1	Troffers	Classrooms	GE	4 bulb 32w flour.	128	20	2,560	2001	Y	Y	Color temp: 3000K. Survey 85% approval
L-2	Recessed Can	Hallways	Unknown	LED	8	35	280	2015	N	N	Add occupancy sensors to save energy
L-3	OH Parking	Parking-East	Unknown	HPS	400	12	4,800	1990	Y	Y	LED, add occ sensor to save energy
L-4	OH Parking	Parking-North	Unknown	HPS	400	8	3,200	1990	Y	Y	LED, add occ sensor to save energy
L-4	Landscape	Planters	Unknown	Halogen	45	28	1,260	1288	Y	Y	Existing is line voltage. Switch to low?

Sample: Lighting on Excel spreadsheet

Lighting Satisfaction Survey

(sect. 5.1.2.13)

- From ASHRAE Performance Measurement Protocols
 - Appendix D
 - 34 questions, covering 6 categories



Occupant Satisfaction - Lighting

1. INTRODUCTION

Thank you for taking this survey. Our goal is to determine your satisfaction with the lighting at this facility as part of a program to improve the overall at-work 'quality of life' for our employees.

1. Name (OPTIONAL) - You do NOT need to answer this question. We ask it for when we are able to do something about any of the issues you may bring up while taking this survey.

*** 2. In which building do you primarily work?**

*** 3. How long have you worked in this building?**

☐ Less than 1 year

☐ 1-4 years

☐ 4-7 years

☐ More than 7 years

*** 4. How long have you worked at your present work station?**

☐ Less than 3 months

☐ 3-6 months

☐ 6-12 months

☐ More than 1 year

*** 5. What percentage of your normal work week do you spend at your work station?**

☐ 0-25%

☐ 25-50%

☐ 50-75%

☐ 75-100%

6. Please indicate which age range you fall within?

☐ Under 30

☐ 30 to 50

☐ Over 50

Energy Efficiency Measures Proposed and Implemented (sect. 5.1.2.7)

- For each EEM, need:
 - Implementation plan: Scope of work, engineering and installation schedule, and initial commissioning plan
 - O&M plan
 - Operator training plan
 - **Ongoing commissioning** plan





Occupants Play a Critical Role in Energy Use

- Energy Management Plan must include:
 - Method to inform occupants of the benefits of efficient energy use (5.1.2.8)
 - Occupant instruction on how to use certain energy features (5.1.2.8)
- Can your building meet EUI without tenant/occupant support?
 - Do current lease agreements compel CBPS cooperation or compliance?
 - Tenant compliance is not mentioned in the CBPS



EMP Deliverables

- Form A (Z6.1) item 7 requires upload of your EMP to AHJ
 - And confirmation by Owner, Energy Manager and Qualified Person that EMP requirements have been met
- There is no EMP template or form to follow
 - Owners can use whatever format that works best for their operations
- Components of your plan could be in many different locations
 - Written documentation or spreadsheets
 - Vendor agreements
 - Work order software
 - Energy Star Portfolio Manager
 - Building automation system software
 - Mechanical, lighting or control system plans
 - Commissioning plans and reports
 - Other



EMP Deliverables

- Summary document
- Shows requirements have been met
- Describes documentation
 - Executive summary or checklist
 - Format is not specified in the Standard
 - Detailed documentation is not required for the upload

Energy Management Plan Summary

Sample Building
123 Main St
Seattle, WA 98000

Owner: John Smith. 206-555-1212. john@sample.com
Energy Manager: John Smith. 206-555-1212. John@sample.com
Qualified Person: Tim Brown, CEM. 425-555-1212. Timb@aaaenergy.com

Requirements:

1. Inventory of equipment, systems and controls:

- HVAC systems and equipment: Per AAA company service agreement, dated 5/1/21
- Lighting schedule: Per Excel worksheet: [samplelighting.xlsx](#), dated 5/1/21
- Controls schedule:
 - HVAC: Per Johnson Controls energy management control system plans, dated 3/9/15
 - Lighting: Per Lumen lighting control systems plans, dated 12/6/18

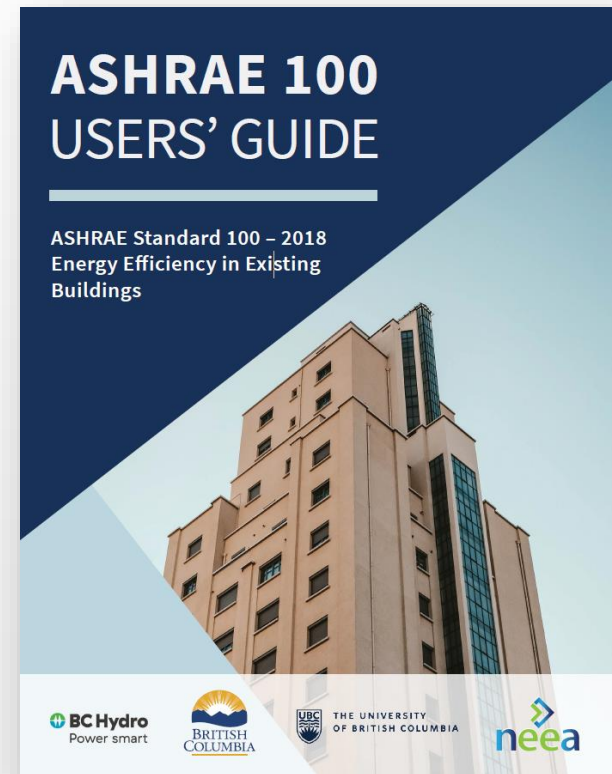
2. List of performance objectives

- HVAC: Per AAA company service agreement dated 5/1/21 and Mechanical plan page M-1, dated 8/17/12
- Lighting: Per Excel worksheet: [samplelighting.xlsx](#), dated 5/1/21

3. List of condition indicators

Additional Resource

- 96 page users guide, avail. 5/10/21
- Not an ASHRAE publication
- Supports ASHRAE 100
- May not reflect all CBPS amendments
- Explains core concepts
- Provides helpful process flow charts
- Organizes process by roles
 - Owner, Qualified Person, Energy Mgr., etc.



Available to download at NEEA website:

<https://neea.org/resources-reports/browse?q=ashrae+100>



Occupants Play a Critical Role in Energy Use

- Gaining cooperation is likely critical to EUI compliance
- Occupant programs are a great way to gain cooperation
- Programs break down into 3 broad areas:
 - Occupant input
 - Occupant feedback
 - Occupant engagement

Occupant Input

- Occupant accessible work order systems
- Surveys
- Interviews
- Polling
- Schedule and equipment updates

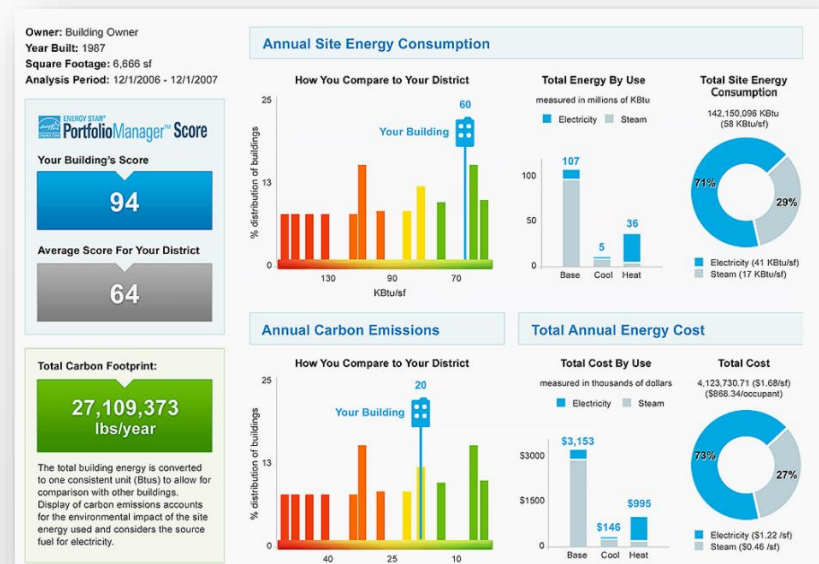


*Have you solicited input from occupants?
What input have you gained and how?
Please share your ideas on the webinar Q&A, we will discuss.*



Occupant Feedback

- Dashboards
- Signage
- Bulletin boards
- Recognition events
- Awards
 - Energy Star listing
 - LEED Certification



*How have you provided feedback to your occupants?
Please share your ideas on the webinar Q&A, we will discuss.*

Occupant Engagement

- Competitions, Games
- Training
- Social networks, Other group discussions
- Energy Star Commercial Buildings section has tools and tips for competitions, communications and education

https://www.energystar.gov/buildings/resources_topic



*How have you engaged your occupants?
Please share your ideas on the webinar Q&A, we will discuss.*



Review

- The EMP lists the owner, energy manager & other key contacts
- EMP includes annual updates to EUI and WNEUI and EUIt
- EMP documentation includes:
 - O&M program
 - Training plans for staff and occupants
 - Capital plans, lighting schedules and other documentation
 - Lighting satisfaction survey
 - Audit reports
 - List of implemented EEM's
- Occupant engagement is a key component of the EMP and energy efficiency in most buildings



30 minute Q&A starting now

Please submit your questions to the question box

Next webinar:

Operations and Maintenance for Clean Buildings

6/9/21, 11:30am



Thank you to Neil Bavins for helping develop the webinar series

Karen Janowitz
WSU Energy Program
janowitzk@energy.wsu.edu
www.energy.wsu.edu

Katherine Morgan
ArchEcology
katherinem@archecology.com



Energy Program

WASHINGTON STATE UNIVERSITY

www.energy.wsu.edu