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Sustainable Building Operations: Building walk-throughs, Assessments, and Retro-commissioning

ANGELA KORA

Pacific Northwest National Laboratory

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Overview

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- Show and tell – outcomes of last week's assessments
- Sustainability on a shoestring – doing more with less
- Federal drivers for assessments
- Overview of different types of assessments
  - What are they?
  - Why are they helpful?
  - How do I get started?

PORTS Building Assessment

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- What buildings were assessed?
- What did you learn?
- Are there any missing pieces?
- What are the next steps?

Sustainability on a Shoestring

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- Conservation versus efficiency

	Conservation	Efficiency
Definition	Use less by turning it off	Improve efficiency of equipment, or use existing systems more efficiently
Cost impact	Often no/low cost opportunities	May require more capital improvements
Examples	Turn off lights	Replace incandescent lights with CFLs
	Shut down HVAC systems during off hours	Increase duct system efficiency by sealing ducts

Federal Drivers

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- Energy Independence and Security Act (EISA) 432
  - "Comprehensive energy and water evaluations" for covered facilities once every four years
  - Identify and assess recommissioning measures for each facility
  - Prepare an audit report for each facility
  - Type and complexity of audit and audit report varies according to the size and complexity of the facility
- Guiding Principle Assessments
  - Assess candidate buildings for compliance with GPs

Assessment Types

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- Level I Assessment (Building walk through)
  - Basic data gathering, short building audit, basic data analysis
  - Identify re/retro-commissioning opportunities
- Level II Assessment
  - More detailed data gathering and data analysis
  - Identify re/retro-commissioning opportunities

EISA 432 Assessments (typically)

- Level III Assessment
  - Detailed energy model used to develop cost and savings analysis
- Continuous Commissioning/Ongoing operational tracking system
  - Continually track and measure performance

Level I Assessment

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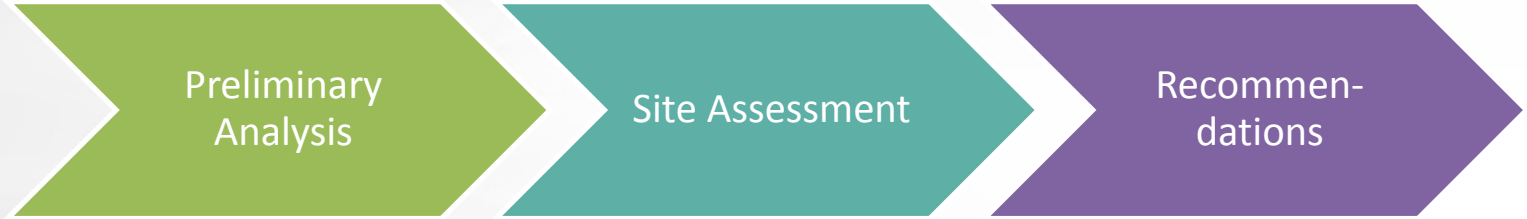
- Good option when:
  - Budgets are limited
  - Buildings have not been assessed at all
- Often first step in more comprehensive energy management plan
- Often completed by building managers or others familiar with the building, occupant, and systems
- Three general steps:



Level I Assessment: Preliminary Analysis

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- Get to know your building
  - Building type
  - Number of occupants
  - Regular operating hours
  - Use types in the building

The Uranium Management Center at the Portsmouth Site in Piketon, Ohio
http://www.pppo.energy.gov/Uranium_Management_Center.html

- Briefly evaluate historical energy bills to understand energy consumption trends

Level I Assessment: Site Assessment

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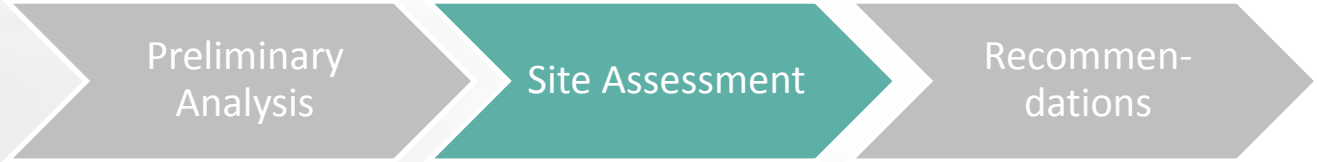
- Look around for the obvious:
  - Are there lights on after hours or when no one is in a space?
  - Is it always cold/hot?
  - Is there old kitchen or office equipment that isn't Energy Star?
  - Is there a lot of empty space in a building?
- Use checklists to help make sure key items are not missed



Level I Assessment: Recommendations

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- What changes can you implement as a result?
  - Install lighting controls
  - Increase/lower temperature setpoints
  - Balance loads
  - Replace aging equipment
  - Remove unneeded equipment
  - Maximize space

What's wrong with this picture?

Level II-III Assessment

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- May be more appropriate for buildings with higher energy consumption or more complex energy systems
- Same general approach as Level I assessment:
  - Preliminary analysis, site assessment, recommendations
- Collect more detailed data to generate more detailed analysis
- Complexity varies according to site and building-specific characteristics (e.g. size, existing systems)
- Items with high initial cost may require Level III audit
  - Level III audit: detailed energy savings and cost modeling

Level II-III Assessment
Example recommendations

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End Use	Strategy
HVAC	Cool roofs – white roofs
HVAC	Roof insulation
HVAC	Variable frequency drives
HVAC	High efficiency fans, motors, drives
Lighting	Parking lot lighting and control
Lighting	Higher efficiency lighting (CFLs, Super T8s, etc.)
Plug Load	Higher efficiency equipment and appliances

Re/retro-Commissioning

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- EISA 432 evaluations require recommissioning (RCx) or commissioning measures to be identified and assessed as part of the evaluation process
- RCx opportunities can be identified during Level I or II audits
- Building systems evaluated to determine if they are operating:
  - as designed to operate
  - according to building owner and occupant needs
- Four types:
  - Commissioning
  - Retro-commissioning
  - Re-commissioning
  - Continuous commissioning

Re/retro-Commissioning

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- Identifies conservation and efficiency opportunities, as well as potential for site-wide operational changes
- Opportunities identified can:
  - Often offer minimal cost, low risk, short paybacks
  - Vary according to impact and invasiveness (to employees)
  - Count towards USGBC LEED-EB:OM credits/Guiding Principle requirements
- Four step process:

Re/retro-Commissioning Process

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- Planning:
  - Assemble team
  - Agree on objectives and strategies
  - Assign roles and responsibilities
  - Compile existing documentation on building and equipment characteristics and performance
- Investigation:
  - Complete site assessment and compile master list of all observations
  - Develop list of recommendations based on observations
    - Include energy and cost savings

Re/retro-Commissioning Process

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- Implementation:
  - Select recommendations to implement
  - Consider available funding, ease of implementation
  - May need to revise energy and cost saving estimates based on actual energy consumption after implementation
- Hand-off and integration:
  - Document recommendations implemented and any results
  - Transfer information to building owners, operators, and occupants

Example Re/retro-Commissioning Conservation Strategies

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End Use	Strategy
HVAC	Re-tune demand control ventilation
HVAC	Re-tune ventilation system controls
Lighting	Calibrate daylighting controllers
Lighting	Calibrate lighting occupancy sensors
Lighting	Delamp
Operation	Maximize space re-arrangement and scheduling
Operation	Turn off systems during off hours
Operation	Set load management controls
Plug Load	Calibrate plug load occupancy sensors
Plug Load	Implement computer power management

Example Re/retro-Commissioning Efficiency Strategies

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End Use	Strategy
HVAC	Increase duct system efficiency
HVAC	Calibrate air sensors
HVAC	Reduce damper leakage
HVAC	Inspect chiller system and clean as needed
HVAC	Test and fix water coil valves
Service Hot Water	Replace/repair tank and/or line insulation
Envelope	Replace weather stripping
Envelope	Seal envelope leaks
Plug Load	Cloud computing and thin client systems

Re/retrocommissioning = Site-wide operational changes

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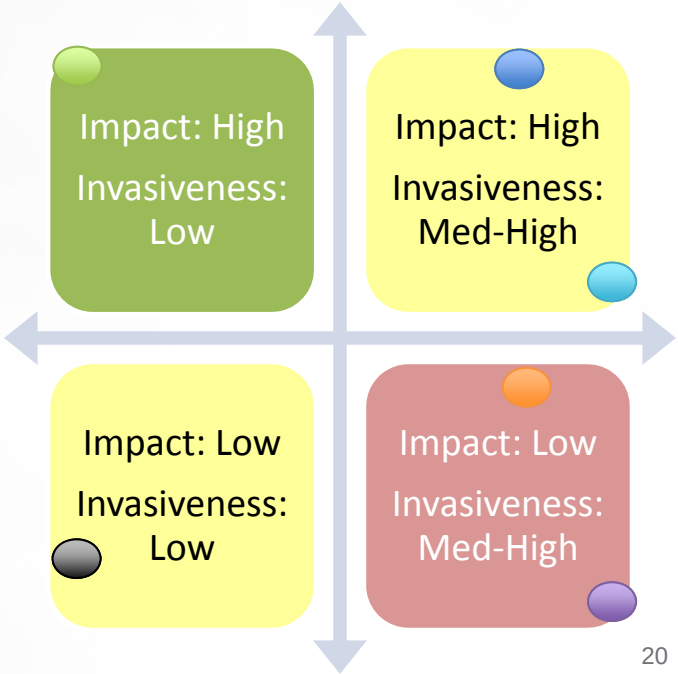
- Many of the identified RCx items can be institutionalized as site-wide operational changes
- Balance impact with invasiveness to employees
  - Remember the AMOEBA when introducing cultural change!

Institute maintenance protocols specifying cleaning coils, cooling towers, burners, radiators	
Implement daytime custodial services	
Set standard operating hours	
Seasonal temperature setbacks	
Close over holiday season	
Cloud computing/thin client computers	



RCx Success Story: Argonne National Lab

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- Five member team evaluated five buildings
  - Older, larger buildings, including labs and offices
  - High energy consumption
  - Total area evaluated ~1.4 million GSF
  - Total annual cost of utilities ~$5.7 million before assessment
- New set of eyes = new ideas
- Opportunity for calculations to be completed for some previously considered ideas
- 52 preliminary findings presented

RCx Success Story: Argonne National Lab

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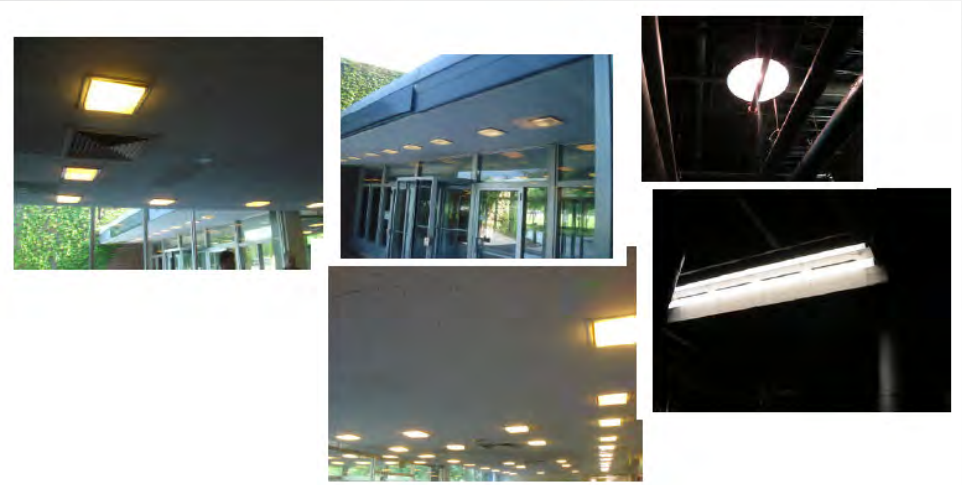
- 15 total recommended ECMs
  - Estimated savings:
    - 145,000 Mbtu/yr
    - 23 Mgal/yr potable water
    - $1.5 million/year
  - Estimated cost to implement:
    - $10 million+



- "In-depth assessment of 1.4 million GSF in five days was impossible to achieve."
  - Prioritized best opportunity areas

Continuous Commissioning: Ongoing Tracking System

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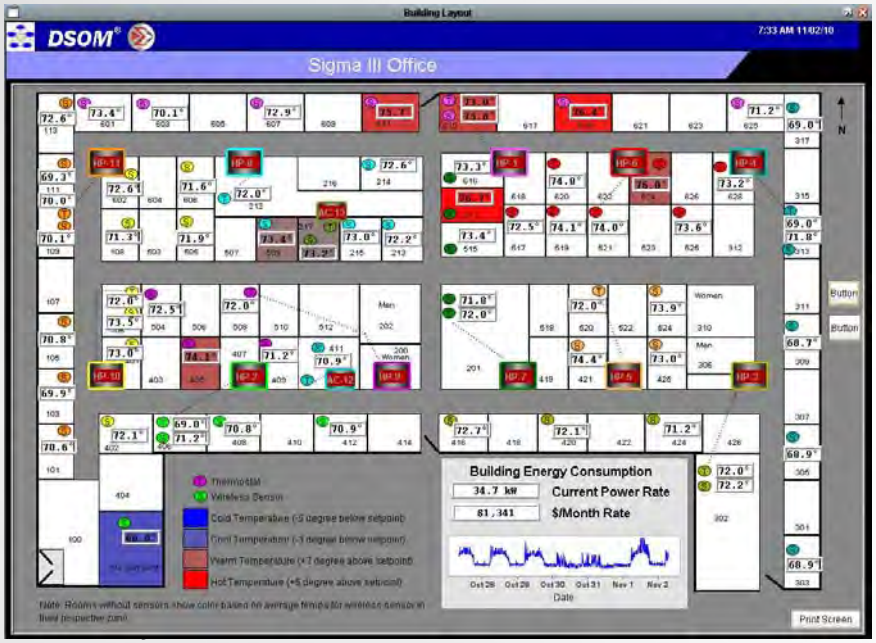
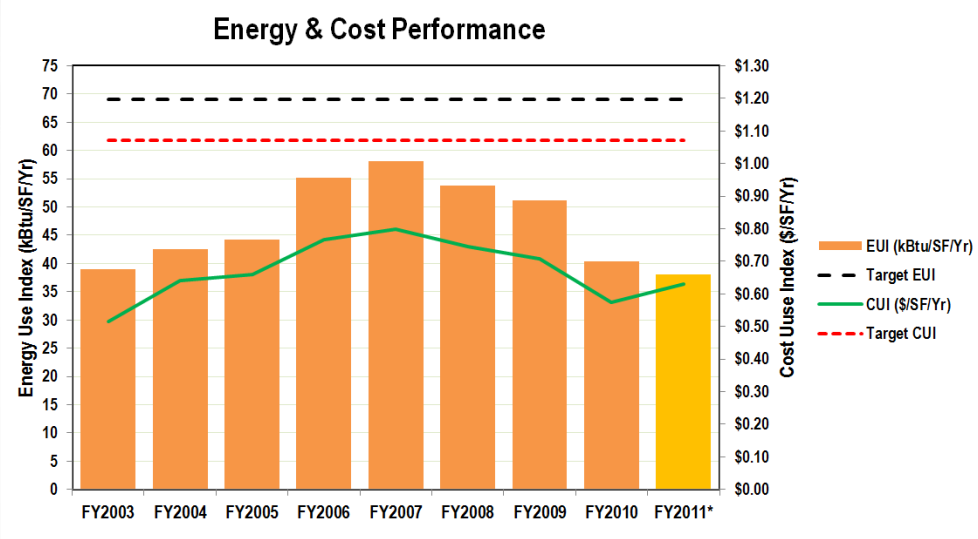
- Energy Performance Tracking
  - Ongoing tracking system for “real time” building operation
  - Energy Star Portfolio Manager





Prioritize Recommendations

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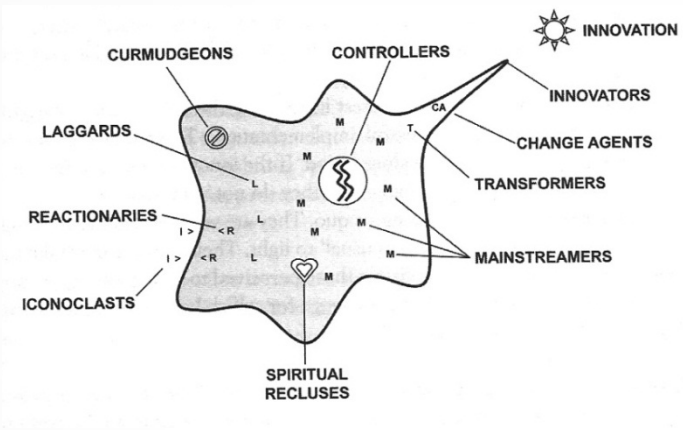
- Prioritize identified recommendations according to metrics of interest
- Determine the most cost-effective way to meet your goals

Measure	GHG Abatement Potential (MTCO2e/year)	Cost Effectiveness ($/MTCO2e)	Capital Cost ($)	Annual Cost Savings ($/year)	Simple Payback	GHG Percent Reduction from Baseline (%)

Conclusions

- Sustainability on a shoestring: conservation first, efficiency second
- Building assessments vary in complexity and scope
  - Match appropriate assessment level to building(s)
- During assessments, look for opportunities to introduce cultural change
  - Prioritize opportunities by balancing impact and invasiveness
  - Remember the AMOEBA!
- Prioritize all recommendations to determine the most cost-effective way to meet your goals



Thank you!

Angela Kora
Pacific Northwest National Laboratory
angela.kora@pnnl.gov
(509) 372-4191

Backup slides

How to get started with RCx

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- What level of retro/recommissioning are you interested in?
  - General, higher level (and lower cost) effort?
  - Enhanced commissioning (to meet LEED EB requirements and/or Guiding Principles)?
- Do you have commissioning provider skillset in house?
  - If not, you'll need to develop an RFP for a Commissioning provider
    - Provide guidance on how to write an RFP for RCx
    - Need to specify level of RCx desired in the RFP language

Do you need a RCx provider?

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- Qualifications to consider:
  - Experience with RCx: similar building types and/or similar building systems
  - Experience with O&M training
  - Certifications or other licenses
  - Specific skills
- If capability is not available in house, will need to find a third party commissioning provider
  - Include specific qualifications in request for proposals to assist in finding a reputable contractor

Financing for Retrofits

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- Sequentially plan retrofits
  - Reduce load in a space so when it is time to replace HVAC system (end of life), can replace with a smaller system (potentially)
- Re-invest savings from conservation activities and “easy” retrofits to help fund larger projects
- Look for UESC and ESPC opportunities