

A woman and a man, both wearing white hard hats and business attire, are standing in a modern industrial facility. The woman is pointing at a laptop held by the man. In the background, another worker in a yellow hard hat is visible near some industrial equipment.

Commercial RE Series 2: Existing Building Commissioning (EBCx) Best Practices Driving Persistent Savings

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Welcome

Today's Workshop Facilitator



Ed Rubinstein has been leading and developing energy management programs and teams for over 25 years including the University Health Network's award-winning Energy & Environment team and as a vice-president at a renewable energy company. Ed and his teams have been honoured with numerous awards, including recognition as a member of the Clean16.

Today's Agenda

1. Recap of EBCx Workshop 1
2. Moving From EBCx Findings to Implementation
3. Group Activity: Prioritize EBCx opportunities
4. Measurement and verification of savings
5. Group Activity: Develop a Measurement & Verification Plan
6. Sustaining EBCx Savings
7. Group Activity: Develop a Persistence Strategy
8. Save on Energy support for EBCx
9. Final takeaways

Workshop Learning Objectives

- To understand the different EBCx projects phases
- Describe how EBCx recommendations move from investigation findings to implementation actions.
- Identify the role of measurement and verification in EBCx.
- Recognize how EBCx savings can degrade over time. Recognize common causes of savings erosion.
- Describe how different stakeholders contribute to persistent EBCx outcomes.
- Develop a simple saving persistence strategy.

Where do you think savings are most often "lost" in your building?

Recap of EBCx Workshop #1

Best Practices – Planning and Engagement

Recap of EBCx Workshop #1: Best Practices – Planning and Engagement

- Many buildings have operational improvement opportunities.
- EBCx focuses on low/no cost operational opportunities instead of capital upgrades...and often have a stronger return on investment (ROI).
- Operational issues can often remain hidden for years...but there are often “clues” that a building is a good candidate for EBCx.
- EBCx benefits include
 - reduced energy use and costs
 - improved occupant comfort and safety
 - reduced maintenance requirements.

Recap of EBCx Workshop #1: Best Practices – Planning and Engagement

- Successful EBCx projects begin with planning, stakeholder alignment and readiness.
- A structured EBCx plan reduces risk and improves the likelihood of success.

Moving From EBCx Findings to Implementation

Typical Measures Identified During EBCx

- Low cost / no cost
- Operational
- Controls related
- Minor/small capital
- Training, awareness & engagement

Good EBCx findings only create value when they become practical actions!

Steps For Moving From Findings to Implementation

- Review the Findings Report
- Prioritize measures
- Develop implementation plan
- Engage and align implementation team; assign responsibilities
- Implement the measure(s)

Review the Findings Report

- Confirm feasibility
 - Clarify assumptions
 - Identify enablers
 - Identify constraints
 - Determine resource requirements

What are some potential enablers and constraints?

Prioritize Measures

- The investigation phase often identifies a mix of low-cost, no-cost, operational, control-related, and capital-related measures; not every finding can be implemented immediately, a clear process is needed to decide what gets done first.



Prioritize Measures

- What are your prioritization criteria?
 - Savings potential (cost, energy, carbon, etc.)
 - Operational risk
 - Implementation cost
 - Safety & comfort impact
 - Maintenance impact
 - Ease of implementation
 - Resiliency & reliability impact

What are some other potential implementation criteria?

Prioritize Measures

- Determining what information and data is needed to make informed decisions when prioritizing opportunities should be incorporated into the planning & investigation phase.



Develop Implementation Plan

- Determine which measures will be implemented
 - rationale for choosing measure
 - resource requirements
 - responsible parties
 - implementation team
 - expected impacts and results
- Determine sequence and timing of measures
 - Which measures will be implemented first...and when?
 - What are the requirements for potential incentives?

Develop Implementation Plan

- Determine “success criteria” of measures
 - How will you determine if implementation has gone according to plan?
- Develop your measurement & verification plan
 - What is the purpose of the M&V?
 - Which measurement method(s) will be used (e.g. IPMVP Option A)?
 - Which functional tests need to be performed?
 - What will be your baseline(s)?
 - What is required for potential incentives?

Develop Implementation Plan

- Determine documentation requirements
 - Before and after EBCx measure implementation
 - Setpoints, schedules, sequences, etc.
 - Energy use
 - Changes to operating & maintenance policy & procedures
 - Training requirements
- Develop processes for ongoing monitoring and, if needed, corrective actions.
 - Start development of re-commissioning plan.

Engage & Align Implementation Team

- Several groups will have unique roles during implementation and in helping ensure persistence.
 - Building Operators
 - BAS technicians
 - Service contractors (e.g. for equipment, etc.)
 - Facility Managers
 - EBCx Provider
 - Tenants
 - Energy Manager

Who else might be involved during implementation?

Engage & Align Implementation Team

- Clarify roles; who will...
 - implement the measure?
 - support implementation (and how)?
 - perform functional testing?
 - communicate with stakeholders and/or impacted areas?
 - record and document results?
 - write the report(s)?
 - provide measurement & verification?
 - update policies, procedures and other documents?

Implement Measure(s)

- Inform stakeholders and impacted parties.
- Monitor implementation to ensure it happens as expected.
 - Consider pilot implementations.
 - Perform functional testing.
- Ensure changes to as-built drawings and “as-operated” procedures are documented; maintain change logs!
- Ensure training is updated...and delivered
- Monitor, adjust as needed, recheck

Group Activity #1

Prioritize EBCx Opportunities

Group Activity #1: Prioritize EBCx Opportunities

The investigation phase of your EBCx project has identified several opportunities:

- AHU schedules are misaligned with occupancy
- Simultaneous heating and cooling in two large zones
- Economizer is not using free cooling due to incorrect outdoor air thresholds
- Multiple temperature sensors drifting
- Chiller short-cycling during mild weather
- Lighting left on overnight in storage areas

Group Activity #1: Prioritize EBCx Opportunities

- Using the prioritization criteria presented earlier, prioritize/rank the opportunities on the previous slide.
- Consider impact & effort
 - savings potential
 - operational risk
 - cost & complexity
 - safety & comfort impact
 - maintenance impact
 - ease of implementation

Group Activity #1: Prioritize EBCx Opportunities

EBCx Opportunities	Prioritization Criteria
• AHU schedules are misaligned with occupancy • Simultaneous heating and cooling in two large zones • Economizer is not using free cooling due to incorrect outdoor air thresholds • Multiple temperature sensors drifting • Chiller short-cycling during mild weather • Lighting left on overnight in storage areas	• Savings potential (cost, energy, carbon, etc.) • Operational risk • Implementation cost • Safety & comfort impact • Maintenance impact • Ease of implementation • Resiliency & reliability impact

Group Activity #1: Prioritize EBCx Opportunities

- Share-back
 - What were your highest/lowest ranked priorities...and why?
 - Did anyone prioritize measures on criteria other than savings?

Measurement & Verification of Savings

Measurement & Verification

- Measurement & verification (M&V) helps move EBCx from assumed savings to demonstrated performance
- Development of M&V is an essential part of the EBCx implementation plan.
- Development of the M&V plan should begin during the EBCx planning and investigation phases.

Savings Verification vs. Implementation Verification

- **Savings verification** confirms that the expected energy (and cost) savings have been achieved.
- **Implementation verification** confirms that the EBCx measure was implemented correctly.
- Don't forget to confirm that expected non-energy benefits have materialized
 - E.g. improved comfort, reduced maintenance, etc.

Building Automation System (BAS) Verification

- Schedules
- Setpoints
- Valve/damper positions
- Temperatures
- Equipment status
- Runtime
- Alarms
- “Normal” and “exception” scenarios

Utility Data Verification

- Before/after comparison
- Weather (and other) normalization
- Occupancy and/or production changes
- Seasonal patterns

Non-Energy Benefit Verification

- Comfort
- Safety
- Resilience
- Maintenance

What are some ways to measure non-energy benefits of EBCx measures?

Other Verifications

- Updated policies, procedures and drawings
- Updated equipment manuals
- Updated training, including delivery
- Updated awareness & engagement

External Factors Potentially Impacting Verified Savings

- Not achieving expected savings does not mean that implementation of EBCx measure was unsuccessful
- Factors impacting savings include
 - Weather
 - Occupancy & production
 - Operational changes
 - Equipment condition

Verification Summary

- Verification should answer the following questions:
 - Was the measure implemented?
 - Is the system operating correctly?
 - Are we able to confirm the savings/results?

Which verification method do you rely on most today?

Group Activity #2

Develop a Measurement & Verification Plan

Group Activity #2: Develop a Measurement & Verification Plan

You are planning to implement a set-back schedule for an air handling unit (AHU) serving a large, open-concept office space. Currently, while regular occupancy is Monday to Friday from 8AM until 5PM, the fan is running 24/7 with a constant supply air temperature. There is an economizer on the AHU used take-advantage of free-cooling, when available, through modulation of outside-air and mixed air dampers. Staff working on in the area often complain that it is too hot or too cold.

Group Activity #2: Develop a Measurement & Verification Plan

- Based on this scenario, develop a measurement & verification plan.
 - What are you going to measure & verify?
 - How will you collect the data?

Group Activity #2: Develop a Measurement & Verification Plan

- Share-back
 - What are you going to measure & verify – and why?
 - How did you plan to collect the data?
 - How did your M&V plan impact implementation of the measure?
 - How did your M&V plan impact the EBCx planning and investigation phases?

Sustaining EBCx Savings

Sustaining EBCx Savings

- Because a majority of EBCx savings are related to building operations, they are susceptible to being eroded over time.
- Embedding EBCx improvements into becoming part of everyday building operations can help ensure that savings persist over time.
- Building Operators must be supported when dealing with (inevitable) complaints related to EBCx measures.

What are some potential causes of savings erosion?

Sustaining EBCx Savings: Common Causes of Performance Drift

- BAS overrides
 - reaction to complaints or other issues
 - training or knowledge gaps in BAS operations
- Equipment issues
 - sensors, actuators, etc.
- Improper implementation that was not apparent at time of implementation.

Root causes of performance drift should be investigated.

Sustaining EBCx Savings: Steps for Maintaining Savings

- Confirm measures are still operating and savings are being achieved
- Identify non-conformances, drift and gaps
- Implement corrective measures
- Plan your next persistence check
- Repeat



An Energy Management System (EnMS) can help ensure savings persist.

Sustaining EBCx Savings: Tools to Help Confirm Persistence

- BAS trends, alarms and dashboards
- Utility data and trends
- Advanced fault detection & diagnostics (FDD)
- Change logs
- Spot audits
- Surveys

Data integrity is essential!

Sustaining EBCx Savings: Build Persistence into Daily Operations

- Define the “new normal” for building operations by updating:
 - Building Operator routines
 - BAS sequences and settings
 - BAS preventative maintenance programs
 - As-built drawings and as-operated procedures
- Ensure Implementation Team is still aligned
- Develop programs to monitor persistence of updated operations
- Address non-conformances as soon as possible
 - Prevent “bad habits” from taking root

Sustaining EBCx Savings: Document, Document, Document

- Control changes...especially overrides!
- Maintenance records...preventative and reactive
- Policies & procedures
- As-builts and as-operated details
- Equipment manual updates
- Training records
- Audit and survey results

Ensure documentation best practices are followed!

Sustaining EBCx Savings: Training and Knowledge Transfer

- Train Operators and other key staff regularly
 - Changes in routine...not just the “what?”, but also the “why?”
 - Share the impact of their actions
 - Ensure easy two-way communication
 - Maintain continuity during staff turnover; written policies and procedures as part of new staff orientation
 - Celebrate successes
- Ensure outside and third-party service providers are also trained.

Group Activity #3

Develop a Persistence Strategy

Group Activity #3: Develop a Persistence Strategy

You are confirming the set-back schedule for the AHU in the previous Group Exercise is still in-place and performing as intended.

Prioritize and provide rationale for tools will you use as part of your persistence strategy.

Group Activity #3: Develop a Persistence Strategy

- Share-back
 - What tools did you decide to use?
 - How did you prioritize the tools?
 - What are some of the pros and cons of the tools?

Save on Energy support for EBCx

Save on Energy EBCx program: Overview

- EBCx process delivered by an accredited Commissioning Agent
 - identify potential energy conservation measures
 - work with participants to implement recommended improvements
- Financial support
 - investigation phase: up to \$0.06/ft² building area, to a maximum of \$50,000 per application or 75% of costs paid to Commissioning Agent (whichever is less)
 - implementation phase: \$0.03/kWh confirmed energy savings to a maximum of \$50,000 or 30% of facility's annual energy consumption (whichever is lower)
 - persistence phase: \$0.03/kWh confirmed energy savings persisting after 12 months, to a maximum of \$50,000 or 30% of facility's annual energy consumption (whichever is lower)

Save on Energy EBCx program: Eligibility Requirements

- Minimum of 12 months of consecutive energy data required with baseline model meeting IESO Measurement & Verification (M&V) guidelines.
- Minimum annual electricity consumption of 750,000 kWh/year (excluding energy consumed by industrial and manufacturing processes) .
- Must be connected to the IESO controlled grid or distribution system.
- Cannot
 - have undertaken a commissioning exercise in the last two years
 - be participating in building certification that requires EBCx

Save on Energy EBCx program: Project Requirements

- EBCx project must include one of the following:
 - occupant behaviour measures
 - air and water balancing
 - other operational and maintenance changes
 - equipment repairs and minor replacements

Case study: University of Toronto Scarborough (UTSC)

Optimizing existing systems to improve building performance

Save on Energy's **Existing Building Commissioning program** provided UTSC with financial incentives, technical support and expert training to identify and implement improvements at its Environmental Science and Chemistry Building. Upgrades to HVAC scheduling, chilled water systems, hot water systems and other operational controls helped reduce energy use and cut utility bills by 40%.



~\$25,300 in incentives

40% reduction in utility bills

588,600 kWh in energy savings

Final takeaways

Final Takeaways

- Good EBCx findings only create value when they become practical actions!
- Not every EBCx finding can be implemented immediately, a clear process is needed to decide what gets done first.
- Determining what information and data is needed to prioritize EBCx opportunities should be incorporated into the planning & investigation phase.
- Development of a measurement & verification plan is an essential part of the overall EBCx implementation plan.
- Root causes of performance drift should be investigated.
- An Energy Management System (EnMS) can help ensure savings persist.

What will your next steps be?

Thank You!

Questions?

Stay connected with tools and resource

- Virtual one-on-one coaching: [post-webinar support intake form](#) for tailored support for organizations to manage energy resources effectively
- Monthly bulletin: [sign up](#) to receive monthly training updates on all Save on Energy training and support new tools and resources
- [Live training calendar](#): visit this page to easily register for upcoming events and workshops
- [Training and support webpage](#): visit this page to access all training and support materials

Post-Webinar Support

One-on-one coaching: tailored support for managing energy resources effectively

[Post-webinar support intake form](#)

Coaching sessions conducted virtually: phone, video calls, and email

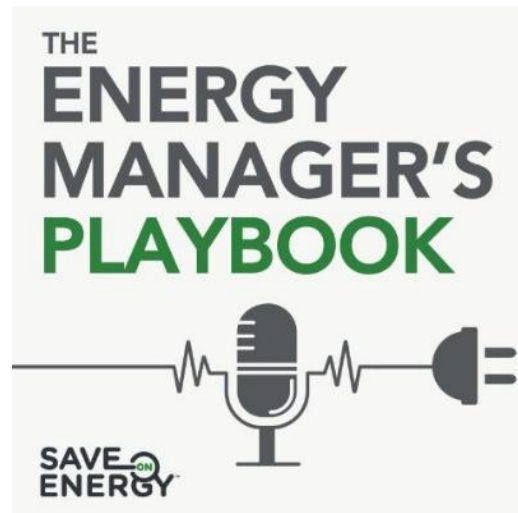
Designed for organizations, new or old, seeking guidance.

Mentorship and technical support



- Participants of the Community Energy Specialist training have access to one year of free mentorship.
- To schedule a session, send an email to one of our experts with a description of the support you are looking for:
- Shayne Hill s.hill@indigenousandaware.com
- Brooklyn Glass b.glass@keepersofthecircle.com

A Podcast by Save on Energy: The Energy Manager's Playbook



Tune in on your preferred platform:
saveonenergy.ca/training-and-support/podcast



Presented by IESO's Save on Energy training and support team:

- Real-world stories from Ontario's energy management community
- Industrial, institutional, commercial and municipal sectors
- Challenges, successes and practical insights
- Bite-sized, high-impact episodes.

Thank you

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