



SEPTEMBER 28, 2022

Save on Energy Webinar: Learn How to Get the Most From Your Recommissioning Projects

Presented by the Save on Energy Team

Today's Presenters

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Agenda

1. Introduction
2. Save on Energy programs and resources
3. How to get the most value from your next EBCx project
 - Overview
 - Six key actions for your next EBCx project
 - The most important questions for your Commissioning provider
4. Questions and discussion

About the IESO



Reliably operate Ontario's Province-wide system 24/7



Plan for Ontario's future energy needs



Enable competition and create efficient electricity markets



Enable province-wide energy efficiency



Purposefully engage to enable informed decisions



Support innovation



Cybersecurity leadership



Smart Metering Entity

Save on Energy Programs

Ontario businesses, large and small, have access to incentives for retrofits and other energy-efficiency projects to lower energy costs

- Retrofit Program
- Small Business Program
- Energy Performance Program
- Industrial Energy Efficiency Program
- First Nations Community Retrofit Building Program
- Training and Financial Support



Launching in 2023:

- Existing Building Commissioning Program (targeting launch in Q1 2023)
- Strategic Energy Management Program (targeting launch in January 2023)

Retrofit Program

- Commercial, industrial, institutional, multi-residential and agricultural businesses can participate
- Offers financial incentives for equipment upgrades that reduce facility electricity consumption
- Designed to help Ontario businesses save energy, reduce costs and increase productivity



Retrofit Program – Resources

Key Documents and Guides

- Visit saveonenergy.ca to download the user guide, worksheets and find key program documents: <https://saveonenergy.ca/For-Business-and-Industry/Programs-and-incentives/Retrofit-Program>
- Retrofit portal resources and how to videos are also available <https://saveonenergy.ca/For-Business-and-Industry/Programs-and-incentives/Retrofit-Program/Resources-and-Support>



Find answers to the most commonly asked Retrofit questions

<https://saveonenergy.ca/For-Business-and-Industry/Programs-and-incentives/Retrofit-Program/FAQs>

Energy Performance Program

- Holistic approach to energy savings: operational + behaviour + capital
- Savings determined by comparing annual metered consumption to the baseline energy model
- **Incentive of \$0.04/kWh** paid each year for three years + **\$50/kW adder** for summer peak demand savings (June - August, weekdays)
- **Facilities need to save at least 5%** energy savings (check in after year 2)



Training and Financial Support

Receive incentives up to 50% of training and certification fees for courses, including:

- Energy Efficient Building Operators (EEBO) 101
- HVAC Optimization for High Performance Sustainable Buildings
- Building Automation System Essentials
- Advanced Building Automation Systems
- Pump System Optimization



To learn more and register, visit
<https://saveonenergy.ca/For-Business-and-Industry/Training-and-support>

Strategic Energy Management

The Strategic Energy Management (SEM) model will provide enhanced technical support and resources to companies with dedicated energy managers

- SEM will offer organizations greater flexibility and empower them to achieve additional cost savings through increased training opportunities, as well as access to industry tools and resources to support their energy-efficiency projects
- Launching early in 2023



Existing Building Commissioning (EBCx)

- Designed to build capability for energy management organizations by training building owners/managers to enhance their facility management practices
- Also provides incentives to building owners to undertake recommissioning services; provides pay-for-performance incentives for savings achieved
- Launching in Q1 2023



Existing Building Commissioning (EBCx)

Three Phases

- **Investigation Phase:** incentive of **\$0.06/sq ft**, capped at \$50,000 or 75% of the cost
- **Implementation Phase:** incentive of **\$0.03/kWh** of savings, to a maximum of 30% savings relative to baseline or \$50,000
- **Persistence Phase:** at the end of 12 months, incentive of **\$0.03/kWh** of confirmed savings to a maximum of 30% savings relative to baseline or \$50,000

EBCx - Eligibility

Facility Eligibility

- 12 months of consecutive energy data
- Have consumed a minimum of **750,000 kWh** per annum

Project and Measures Eligibility

- Occupant behavioural measures
- Set point and scheduling optimization
- Air and water balancing
- Other operational and maintenance changes
- Equipment repair and minor replacements

Save on Energy Updates

To stay up to date with the latest news and insights about Save on Energy programs, subscribe to the quarterly Save on Energy business newsletter at <https://www.saveonenergy.ca/en/Manage-your-subscriptions>

EBCx Overview

What You Will Learn Today

- A set of key actions to undertake during and after the existing building commissioning process
- The most important questions to ask your consultant
- Strategies on how to lead and manage the process for the best results



What is EBCx?

EBCx is a **systematic process** to improve an existing building's performance.

Most measures involve:

- Recalibrating existing equipment to match current requirements
- Identifying “low cost/no cost” operational improvements to increase comfort and promote energy savings

The process follows a four-step methodology

The EBCx Process

Step 1: Planning

Step 2: Investigation

Step 3: Implementation

Step 4: Hand-Off and Integration



If You Need EBCx, Make Sure You Get EBCx!

Projects that are not EBCx:

- Building automation system troubleshooting or upgrades
- Testing and Balancing (TAB)
- Level 2 or 3 energy audits

The following sections will allow you to easily identify a true EBCx!

Summary of Essential EBCx Project Deliverables

- EBCx plan
- Master findings list
- Investigation report
 - Must include documentation of investigation methodology
- Implementation plan and report
- Final EBCx report
- Persistence and ongoing EBCx plan, training plan
- Critical sensors calibration plan (depending on scope)
- Annual performance report - optional

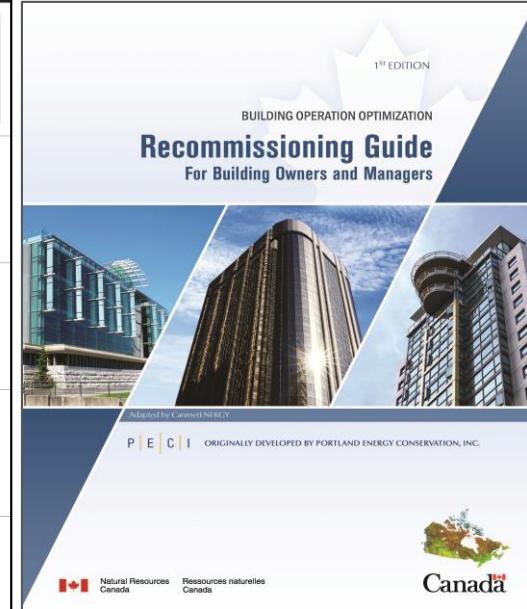
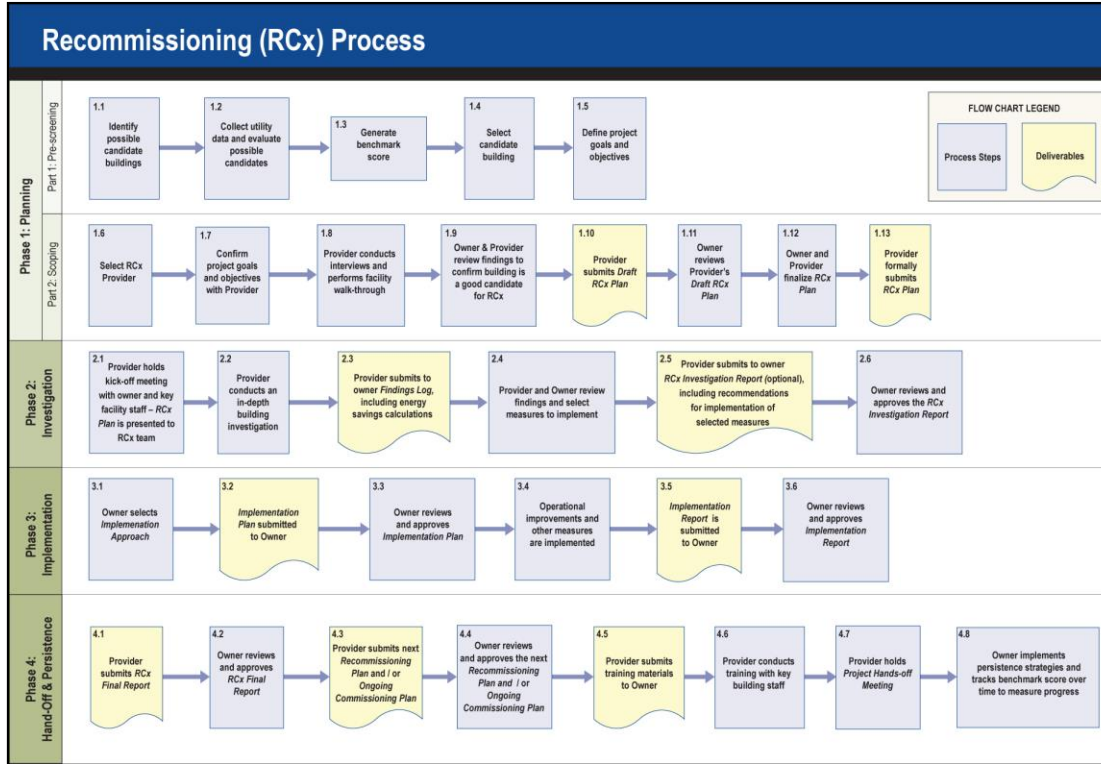
EBCx Final Report

The EBCx final report should include:

- Executive summary
- Findings log with descriptions of the implemented measures
- Updated savings estimates and actual improvement costs
- Trending plan
- Recommended frequency for EBCx
- Recommended persistence strategies



A Good Reference



Six Key Actions for Your Next EBCx Project

1. **Be Involved:** Manage the process and build expertise
2. **Establish the Current Facility Requirements (CFR):** Provide clearly defined CFR and objectives – *don't take this step lightly!*
3. **Plan for Implementation:** Make sure you receive a detailed implementation plan
4. **Budget for Implementation:** Ensure you have budget for implementation to maximize savings
5. **Verify Results:** Monitor and verify savings to ensure outcomes are achieved
6. **Train Staff:** Take a proactive approach to ensure savings persist over time

Be Involved

Manage the process: have key in-house personnel involved to build expertise

Selecting a Commissioning Provider

Required skillset:

- Knowledge of the four-phase EBCx process
- Appropriate experience and technical knowledge
- Excellent communication skills

Selection process:

- By proposal (RFP)
- By qualifications (RFQ)
- By referral or reputation
 - Building Commissioning Association: resources for owners
<https://www.bcxa.org/resources/?filter=owners-resources#results>

Typical Commissioning Provider Responsibilities

- Oversee all phases of the EBCx process
- Develop scope of work and EBCx plan
- Lead investigation of building operations
- Identify, prioritize and calculate savings of recommended improvements
- Prepare the implementation plan
- Assist/oversee implementation of improvements
- Verify implementation and proper operation
- Perform or verify staff training

Assemble the EBCx Team

- In-house champion
- Building owner or owner's representative
- Commissioning provider
- Building operators
- Contractor or manufacturer representatives as needed:
 - Controls contractors
 - Design professionals
 - Testing specialists
 - Energy monitoring provider
 - Optional: LEED® Accredited Professional (AP) for Existing Building O&M

Assign Roles to Facility Staff

Why involve facility staff in the EBCx process?

- Leverage their knowledge and experience
- Reduce EBCx project costs
- Increase staff buy-in and participation
- Enhance in-house expertise and job satisfaction
- Extend the impact of improvements
- Ensure persistence of benefits

Establish the Current Facility Requirements (CFR)

Provide clearly defined CFR and objectives

Current Facility Requirements

CFR is based on how the building is used today – it's not about returning to design specs

The CFR serves as a target for all EBCx actions and typically includes:

- Requirements for comfort
- Requirements for temperature and humidity
- Requirements for air quality
- Operational requirements (e.g., schedules)

The CFR must be prepared by the commissioning provider and approved by the building owner



Items in a CFR Impacting Energy Efficiency

- Filtration
- Ventilation
- Temperature set points
- Humidity set points
- Disinfection
- Pressure (building, specific spaces)
- Occupancy schedule
- Others: building specific

CFR Template

Current Facility Requirements – Sample Document

The following information was obtained from interviews with the Facility Manager and Operation's Staff:

Requirement	Typical for Building	Offices	Lobby	Conference Rooms	Computer or Data Storage	Other: Cafe	Notes
Temperature requirements for cooling and heating seasons	Occupied: 72°F +/- 2°F Unocc. Summer: 78-80°F Unocc. Winter: 70°F	Same	Same	Same	67 degrees at all times		
Humidity requirements	No direct humidity control by building systems, possible of tenant systems				50 percent		
Dehumidification requirements	None				50 percent		
Pressure relationship requirements	(+) 0.04 diff. pres. Between building interior and outside environment					(-) 0.02 diff. pres. Between print shop and corridor	
Filtration Requirements	2" 30% pleated pre-filter – changed as needed. 20" 90-95% bag – changed once per year.						
Ventilation requirements	25% outdoor air	Same	Same	Same	Same	Separate MUA system	
Air change requirements	N/A						
Sound and noise level requirements	N/A	N/A	N/A	N/A	N/A		

Normal operating schedule for occupancy	M-F = 6am-6pm		24 hours, 7 days a week				Equipment is operating 1 hour prior to occupancy
Weekend schedule	Sat = 8am-1pm Sun = N/A						
Holiday schedule	Same as Sunday						
Process and office equipment status during evening/night time hours	100-300 tons of FC units with chiller water coils serving equipment loads	Same	Same	Same	Same		
Process and office equipment status during holiday hours	Same as evening and night time hours	Same	Same	Same	Same		
Process and office equipment status during scheduled maintenance shutdowns	Same as evening and night time hours	Same	Same	Same	Same		
Cleaning schedules	M-F = 6am-2:30pm						
Lighting Levels	50 fc		40 fc				70 fc
Other Requirements: Parking Garage Lighting	All week days and Sat: 5am to 9pm Sundays and Holidays the lights are off and the Garage is locked						

Plan for Implementation

Key Deliverables

Investigation Report

- Description of investigation
- Master list of findings
 - List of issues identified
 - Recommended resolution method
 - Savings calculations
 - Cost estimates

Draft Implementation Plan

- General approach
- Implementation plan outline
- Expected time frame



Selecting an Implementation Approach

Approach

- Turn-key
- Commissioning provider led/assisted
- Owner-led

Timetable

- Implement immediately
- Staged to meet budget constraints



EBCx Implementation Plan

- Defines and organizes approved recommendations for implementation
- Describes required results
- Specifies roles and responsibilities
- Identifies timeline for implementation
- Includes verification and monitoring requirements
- Outlines training and ongoing activities for operators



Budget for Implementation

Ensure you have budget for implementation – maximize savings

Activity: Select Measures from EBCx Findings

#	Finding	Measure	Estimated Annual Electric Use Savings (kWh)	Estimated Annual Electric Use Savings (\$)	Estimated Annual Electric Demand Savings (\$)	Estimated Annual Gas Savings (GJ)	Estimated Annual Gas Savings (\$)	Total Annual Savings (\$)	Estimated Impl Cost	Simple Payback	Benefits	My Ranking 1-10
1	Chilled supply water temperature setpoint is reset by outdoor air temperature	Reset the chilled water supply temperature setpoint based on air handling unit cooling valve positions.	9,260	\$425	\$680	0	\$0	\$1,105	\$1,800	1.6	Reduced chiller load and operating hours. Longer life.	
2	Chilled supply water temperature lower reset range is below the required.	Increase the lower range of the chiller reset setpoint from 5 Deg C to 6.7 Deg C.	2,700	\$125	\$0	0	\$0	\$125	\$175	1.4	Reduced chiller load and operating hours. Longer life.	
3	Cooling Tower VSD speed is controlled by the leaving condenser water temperature from the chiller.	Change the DDC program code to control the condenser water supply temperature instead of return water temperature.	26,000	\$1,190	\$1,030	0	\$0	\$2,220	\$2,100	0.9	Reduced energy use for the condenser fan. Longer life.	
4	Make-up air unit is starting before building occupancy	Start the make-up air unit accordingly with floor occupancy.	56,000	\$2,590	\$0	55	\$675	\$3,265	\$175	0.1	Faster recovery from NSB.	
5	Exhaust fan is constant volume and MUA unit is VAV	Add VFD to exhaust fan and interlock with MUA unit	44,800	\$2,070	\$0	83	\$1,015	\$3,085	\$9,500	3.1	Better pressurization, improved comfort.	
6	Floor air handling units are starting and running during unoccupied period	Interlock the booster fan with the make-up air unit.	14,400	\$660	\$0	0	\$0	\$660	\$5,000	7.6	Reduced operating hours. Longer life.	
7	Condenser Water Pumps are throttled down	Install a Variable Speed Drive to control both condensing water pumps	24,400	\$1,120	\$0	0	\$0	\$1,120	\$12,100	10.8	Reduced load on pump. Longer life.	
8	Lighting control system turns on lights in the morning according to a fixed schedule	Automatic lighting control not optimized; modify to incorporate mandatory manual turn-on by occupants as they arrive to work	17,200	\$790	\$0	0	\$0	\$790	\$700	0.9	Visible energy management for occupants. Longer lamp life.	
9	Parking lighting operates continuously	Install motion sensors for parking stalls to restrict parking lighting when unoccupied	25,800	\$1,185	\$0	0	\$0	\$1,185	\$8,600	7.3	Visible energy management for occupants. Longer lamp life	
10	Washroom and General Exhaust Fans are on hand and running continuously	Reset to automatic control and optimize schedule	24,000	\$1,100	\$0	580	\$9,300	\$10,400	\$350	0.0	Reduced operating hours. Longer life.	
			244,560	11,255	1,710	718	10,990	23,955	40,500	1.7	0.0	0.0

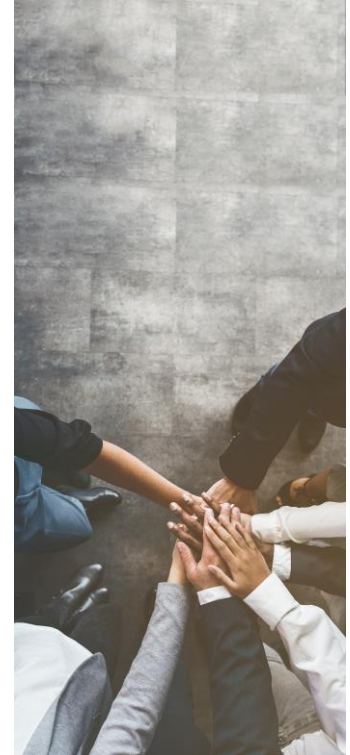


Target Persistence

Take a proactive approach to ensuring savings persist

Transfer and Persistence

- Hand-off meeting
- Maintain effective building documentation
- Offer ongoing training and coaching to building staff
- Maintain efficient operating performance
- Track performance
- Plan for ongoing commissioning and periodic EBCx
- Celebrate success!



The EBCx Persistence Plan

- Target the measures most likely to degrade over time
- Be relevant to operators and management (e.g., CUSUM)
- Simple and realistic → implemented and followed
- Critical sensor calibration plan is a key element when a BAS is present
- Do NOT rely on BAS alarms as a means of ensuring persistence
- Automated Fault Detection and Diagnostic (AFDD or FDD) is a strong base for ongoing commissioning or a persistence strategy, but should not be the only element of a persistence plan!

Persistence – Case Study of Three Buildings

BUILDING (Year Commissioned)		DOCUMENTS			CENTRAL PLANT			AIR HANDLING AND DISTRIBUTION							PREFUNCTIONAL TESTS				OTHER					
		Commissioning report on site	Commissioning report used	Control sequence available	Chiller control	Cooling tower control	Boiler control	Hydronic control	Economizer control algorithm	Discharge air temperature reset	Simultaneous heating and cooling	VFD modulation	Dessicant cooling	Duct static pressure	Space temperature control	Terminal units	Piping and fitting problems	Valve modification	Wiring and instrumentation	Sensor placement or addition	Sensor error or failure	Scheduling	Skylight louver operation	Occupancy sensor
California	Lab and Office 1 (1996)	N	-	Y																				
	Office Building 1 (1996)	N	-	Y																				
	Office Building 2 (1996)	N	-	N																				
	Office Building 3 (1996)	Y	Y	N																				
	Office Building 4 (1994)	N	-	-																				
Pacific Northwest	Office Building 5 (1997)	N	-	Y																				
	Medical Facility 1 (1998)	Y	Y	Y																				
	Medical Facility 2 (1997)	Y	Y	Y																				
	Lab and Office 2 (1997)	N	-	Y																				
	Lab and Office (2000)	N	-	N																				

Red = Did not persist Black = Persisted

What Does/Does Not Persist

Persisted:

- 70% of measures studied
- Important programming code changes
- Hardware/physical changes



Did Not Persist:

- Occupancy schedules
- CHW reset schedule
- VAV box programming
- VFD minimum speed setting
- Humidity sensor calibration
- Daylighting controls
- Demand control ventilation
- Evaporative cooling
- Desiccant wheel

Must Have: Facility Staff Training

- Verifies understanding of EBCx measures implemented
- Offers opportunity to improve O&M practices
- Confirms staff roles and responsibilities going forward
- Helps ensure benefits of EBCx last



Verify Results

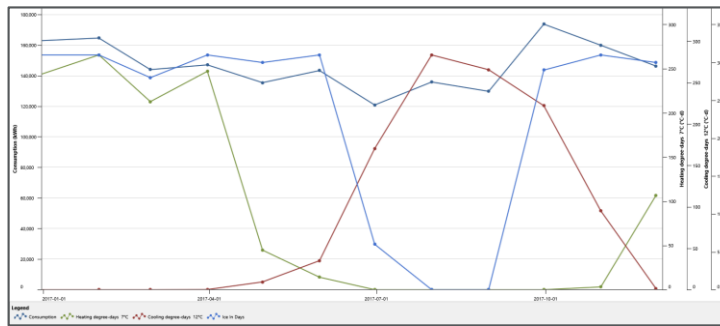
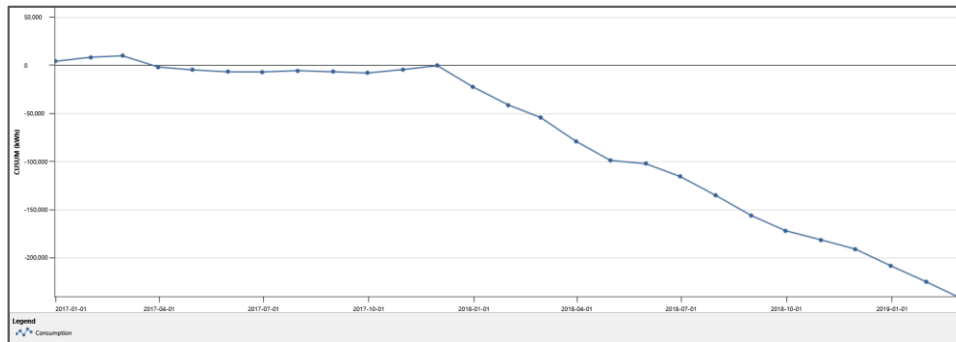
Monitor and verify savings to ensure outcomes are achieved and persist

Tracking Persistence with RETScreen Expert Performance Analysis

- Schedule four out of 10 RTUs to shut off overnight, currently running 24/7
- Optimize VFDs on RTUs
- Reduce static pressure set point based on feedback from space.
- Automate overridden economizers
- Increase pool air temp setpoint to reduce evaporation
- Set back pool water temperature by 3.5C/6F at night to reduce dehumidification

Tracking Persistence with RETScreen Expert

- Track energy savings over time with a CUSUM chart
- Overlay multiple parameters to identify issues and opportunities



Webinar Follow-Up

The materials will be available on the [Save on Energy website](#) following the session:

- Slides
- Recording
- CFR template

Please help us by taking two minutes to complete a survey about this session! See the link to the survey in the Chat now.

Thank you



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