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Existing Building Commissioning (EBCx) in a Nutshell

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Agenda

- The Save on Energy Existing Building Commissioning (EBCx) Program
- What is EBCx?
- Typical measures and examples
- EBCx vs. energy audit
- Costs and benefits
- Good candidates for EBCx
- Roles and responsibilities
- Technical skills required
- EBCx process, roles and deliverables





Save on Energy Program Updates

Save on Energy Program Updates

- Existing Building Commissioning (EBCx)
- Retrofit
- Instant Discount Program
- Energy Performance Program (EPP)
- Strategic Energy Management (SEM)

Existing Building Commissioning

Three Phases:

- **Investigation Phase:** Investigation Report: incentive up to **\$0.06/sq. ft., capped at \$50,000**
- **Implementation Phase:** Incentive of **\$0.03/kWh** of claimed savings
- **Persistence Phase:** At the end of 12 months, incentive of **\$0.03/kWh** of confirmed savings

Retrofit Program – Eligible Projects

- Projects eligible for the Retrofit Program are generally those that provide sustainable, measurable and verifiable reductions in peak electricity demand and electricity consumption
- Incentive offerings include custom rates and predefined rates for prescriptive equipment upgrades. These are based on the amount of energy or demand savings of the new equipment

What types of projects are eligible?

- Lighting retrofits
- Lighting controls
- HVAC equipment replacement, redesign
- Industrial process upgrades
- Variable-speed drive installations
- Refer to SaveOnEnergy.ca/Retrofit for a complete list

Retrofit Program – Updates

- **Custom track** introduced in May 2023
 - Incentives are (**\$1,200/kW** or **\$0.13/kWh**, whichever is higher)
 - \$1 million incentive cap for Retrofit projects has been removed, incentives will continue to be capped at 50% of project costs
- Changes to **networked lighting control** incentives
 - Incentives now calculated on \$/kWh (moving away from \$/sq. ft.)
 - An incentive offering for networked lighting controls; from \$0.15/sq. ft. to \$0.35/kWh

Instant Discount Program – coming soon

- Save on Energy's new **Instant Discount Program** is shifting the way incentives are offered for energy-efficient lighting.
- Incentives are paid directly to distributors "midstream", enabling them to offer instant **point-of-sale discounts** on energy-efficient lighting to end users and other purchasers.
- Incentives for lighting will **transition** from the **Retrofit program to Instant Discount Program**.
- **Lighting controls** will continue to be incented through the Retrofit Prescriptive track.

Instant Discount Program – Benefits

- **Instant point-of-sale discount**
 - No pre-approvals
 - No lag time between purchase of equipment and receiving incentives
- **No paperwork** to apply on the part of contractors, consultants, or end users, resulting in efficiencies to the program

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 (weekdays from June to August)
- Facilities need to save at least 5% energy savings (check in after year 2)



Strategic Energy Management Program (SEM)



**Improve your Organization's
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Coach
or email sem@ieso.ca.



Strategic Energy Management Program (SEM)

Through the SEM Program you will gain access to:



Training



Coaching



Peer
Learning



Incentives

- No-cost cohort-based learning
- Energy savings incentives: participants will receive incentives of \$0.02/kWh of electricity savings
- Program milestone incentives: additional incentives for energy management tools such as meters and testing kits up to a value of \$5,000

Applying for the SEM Program



Eligibility Criteria

- ☐ Be a commercial, institutional, or industrial customer
- ☐ Have a minimum annual consumption of at least 3,000,000 kWh
- ☐ Up to 5 facilities connected to the IESO controlled electrical grid can be combined to meet this requirement
- ☐ See additional program rules at www.saveonenergy.ca



EBCx In A Nutshell

What is Existing Building Commissioning?

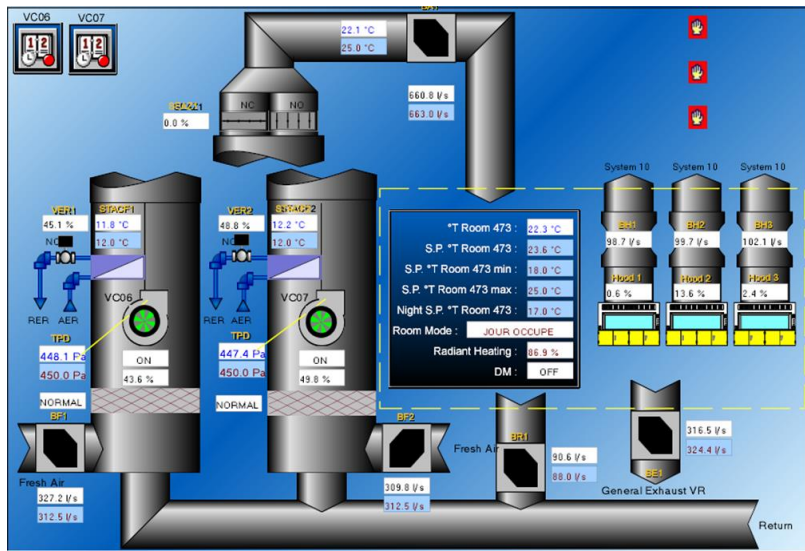


- An optimization process that includes: inspection, diagnosis and repair for existing buildings and systems
- Objective: energy-optimized operation of the building to meet current facility requirements
- Cost-effective: low-cost actions, generally short payback period

Typical EBCx Measures

- Reduced HVAC/lighting/other equipment operating hours
- Setpoint optimization (fresh air intake, supply air temperature, humidity levels airflow setpoints, etc.)
- Readjustment of static pressure
- Recalibration of sensors
- Repair of faulty equipment
- Elimination of simultaneous heating and cooling
- Verification of terminal units, adjustment and calibration of valves and dampers
- Operating sequence update for chillers and boilers
- Controls updates for HVAC equipment and economizers
- Cleaning fouled heat transfer elements

Example 1: Reduce HVAC and Lighting Operating Hours



University research building: variable air flow fan-coils serving each lab; occupancy detection to control lighting levels and total air change per hour.

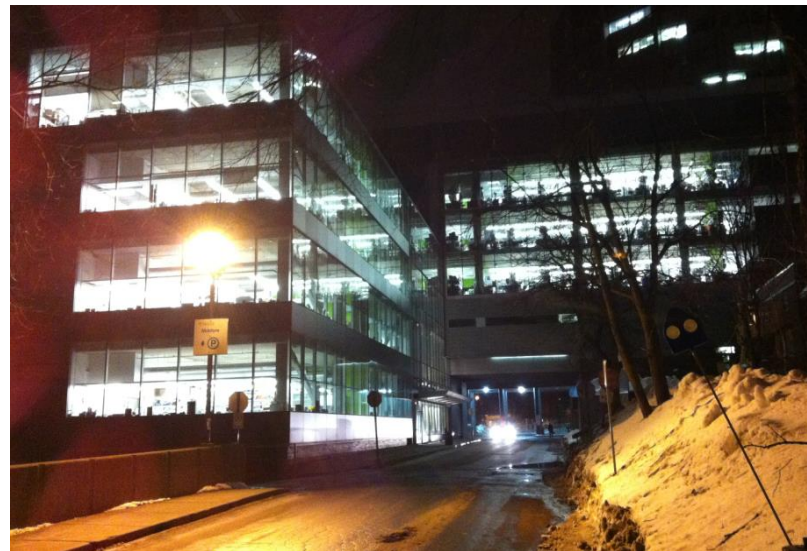
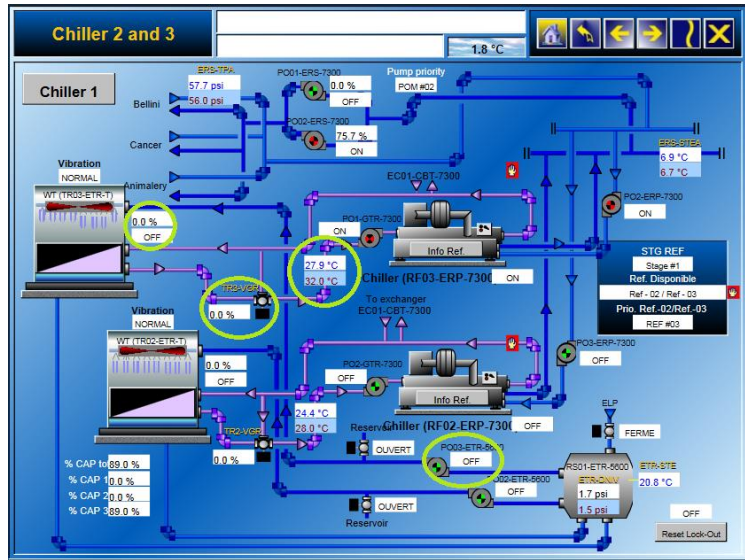
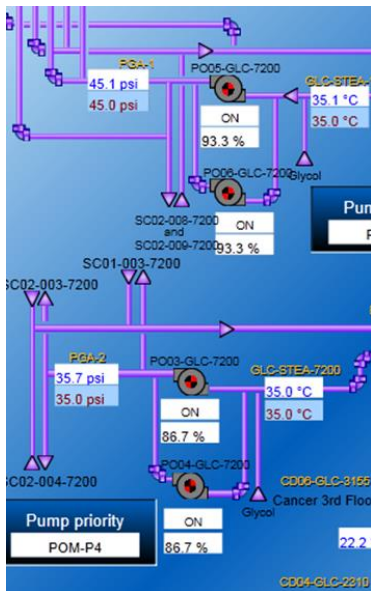


Photo taken at 10:30 p.m. on a Tuesday: over 60% of occupancy detection is non-functional or incorrectly configured! Obvious EBCx measure!

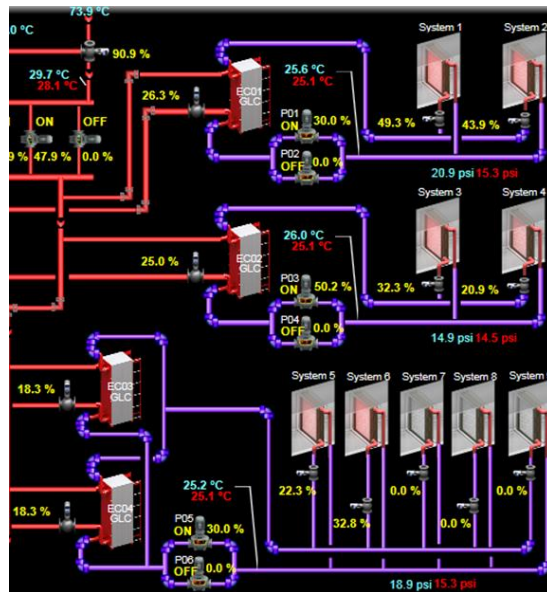


After setpoint optimization: the cooling tower no longer operates and the heat is recovered!

Example 3: Control Sequence Improvement



Before EBCx: Pump speed was controlled to maintain a static pressure of 35 to 45 PSI (depending on the system). This forced the operation of two pumps most of the time, at high speed.



After EBCx: the setpoint pressure varies according to the opening of the valves on the heating coils. The new pressure is usually much lower, allowing a single pump to operate at lower speed.

Energy Audit vs. EBCx

	ENERGY AUDIT	EBCx
Service definition	Provides a snapshot of the building and mechanical equipment and proposes measures to improve energy efficiency	Provides an understanding of how the building operates under different conditions e.g., heating/cooling seasons
Purpose	To replace existing equipment	To improve the operation of existing equipment
Level of investment	Long-term capital investment plan	Low-cost, short-term investment
Payback period	Greater than 3 years	Less than 2 years
External party involvement	Engineering consultant investigates the building, develops the energy-efficiency improvement plan External vendors replace key equipment	EBCx provider investigates the building, develops EBCx plan and supports operator to implement it, and trains building staff in energy-efficient operations External contractors perform EBCx work

Typical EBCx Costs

COST OF EBCx

\$0.86 to \$4.95/m²

\$0.08 to \$0.46/ft²

Average \$2.58/m² or \$0.24/ft²

Source: BC Hydro Power Smart

TYPICAL COST ALLOCATION

Planning and investigation	70%
Implementation	25%
Hand-off and persistence	5%

Source: Lawrence Berkley National Laboratory

EBCx PROVIDER'S FEES

35% to 75% of total project cost

Source: Lawrence Berkley National Laboratory

Factors that influence costs:

- Availability of existing building documentation
- Control system features: ease of access to programming, possibility of implementing trend curves
- Building area: generally, the cost per sq. ft. decreases as the building gets larger
- Number and complexity of HVAC systems
- Level of involvement of in-house personnel

EBCx Benefits

ENERGY SAVINGS

2% to 14%

Average 7%

Source: BC Hydro Continuous Optimization Program Results

ANNUAL UTILITY COST SAVINGS

\$0.51 to \$2.91/m²

\$0.05 to \$0.27/ft²

Median \$2.58/m² or \$0.24/ft²

Source: BC Hydro Continuous Optimization Program Results

NON-ENERGY SAVINGS¹

\$1.08 to \$4.84/m²

\$0.10 to \$0.45/ft²

Median \$1.94/m² or \$0.18/ft²

Source: Lawrence Berkley National Laboratory

Factors that influence savings:

- Depth of investigation by EBCx provider
- Optimized operation in all modes: summer, winter, shoulder season
- Building performance before EBCx
- Building complexity: more complex buildings often offer greater potential
- Quality of operation and maintenance

EBCx Payback

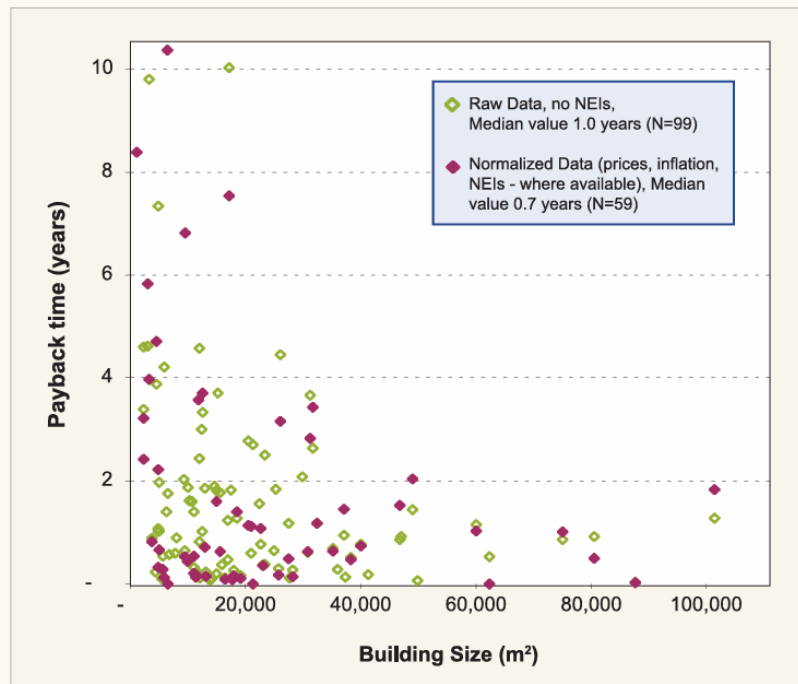
PAYBACK PERIOD

1.4 to 2.6 years

Average 1.7 years

Source: BC Hydro Power Smart

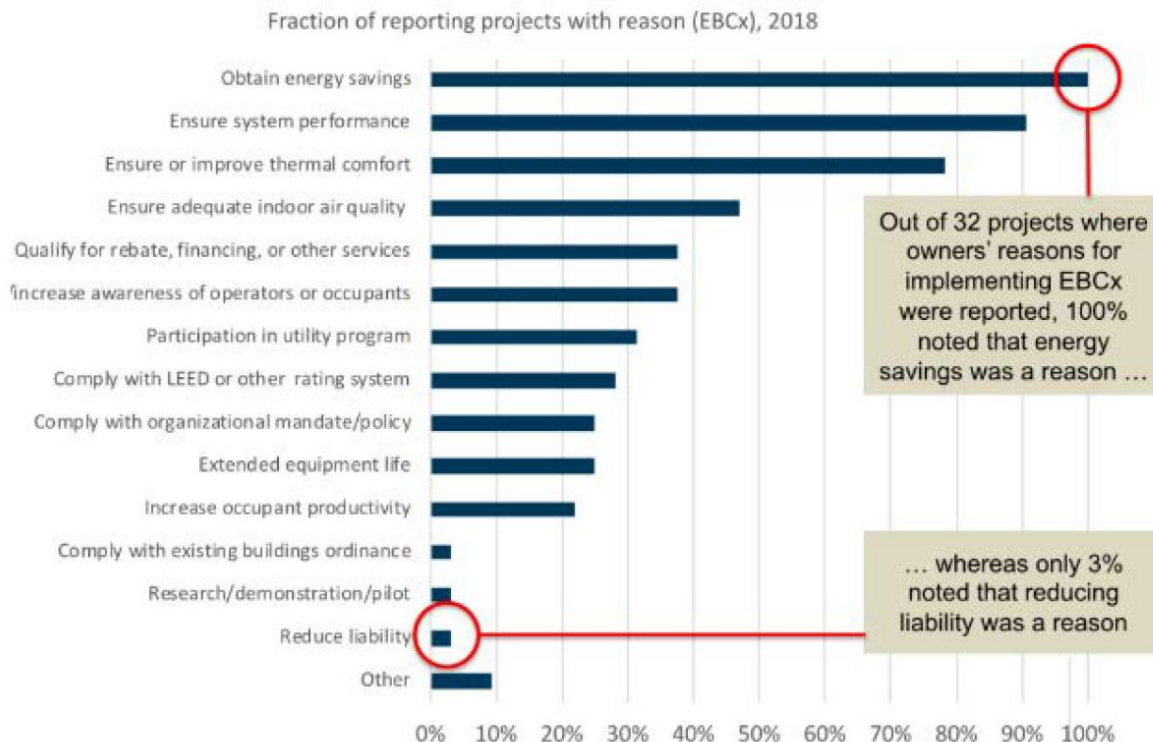
Figure 2: Commissioning payback time vs. building size (existing buildings)



NEIs = Non-Energy Impacts

Adapted from: Lawrence Berkeley National Laboratory, "The Cost Effectiveness of Commercial-Buildings Commissioning," December 2004.

EBCx – Other Benefits



Source : "VALUE OF COMMISSIONING - 2018 MARKET SURVEY".

Good Candidates for EBCx

Buildings

- Commercial or institutional building 50,000 ft² or larger
- Changed function without any major renovations
- Occupancy rate > 75%
- No major renovations are planned in the next five years
- Energy use has increased over time, or is higher than similar buildings

Equipment

- Has complex direct digital control or an energy management control down to the zone level
- Has complex HVAC equipment (e.g., laboratories)
- Mechanical equipment is in good condition and is not at the end of useful life

Roles and Responsibilities

OWNER

- Creates and supports team
- Provides information and documentation
- Clearly communicates goals
- Coordinates EBCx work
- Commits financial resources
- Commits human resources
(minimum 20 hours over the EBCx process)

FACILITY MANAGER

- Provides documentation
- Prepares a list of known problems and opportunities
- Works with EBCx provider to perform testing and to verify system operation

EBCx PROVIDER

- Supports development of scope of work
- Performs investigation and carries out assessment of building (energy analysis, documentation review, functional testing)
- Establishes the current facility requirements
- Identifies EBCx measures and prepares EBCx plan
- Works with facility management to perform tests and to verify system operation
- Supports client in developing scope of work for contractors implementing the measures

CONTRACTORS

- Assist the EBCx provider with investigation and functional testing
- Implement upgrades and measures identified in the investigation phase for the operation and maintenance (O&M) of HVAC, controls and electrical systems

Skills of the EBCx Agent or Team

Technical skills

- Experience in building mechanical design: an asset
- Knowledge of the limits of mechanical equipment
- Understanding of building controls
- Ability to perform energy savings calculations
- Knowledge of applicable building standards – ASHRAE 55, ASHRAE 62.1, market standard (e.g., CSA Z317 for healthcare buildings), etc.



Skills of the EBCx Agent or Team cont'd

Essential non-technical skills

- Good communicator: ability to talk to operators and people to understand issues, ability to explain proposed changes
- Curiosity and interest in challenging established practices
- Negotiation skills

EBCx Process and Deliverables Overview

1	PLANNING <ul style="list-style-type: none">• Owner selects a building and generates benchmarking score¹• Owner selects EBCx provider and identifies team• Owner and provider define project objectives• Provider conducts interviews and performs walk through	EBCx Plan
2	INVESTIGATION <ul style="list-style-type: none">• Provider reviews facility documentation• Provider performs diagnostic monitoring and testing• Provider and owner prioritize and select EBCx improvements	Findings Log Investigation Report
3	IMPLEMENTATION <ul style="list-style-type: none">• Provider, building staff, or contractors implement selected operational improvements• Provider verifies results	Implementation Plan Implementation Report
4	HAND-OFF <ul style="list-style-type: none">• Provider recommends persistence strategies• Provider conducts staff training• Provider holds hand-off meeting	EBCx Final Report

¹ The EnergyStar Portfolio Manager Program is a free benchmarking tool: <https://portfoliomanager.energystar.gov/pm/login.html>

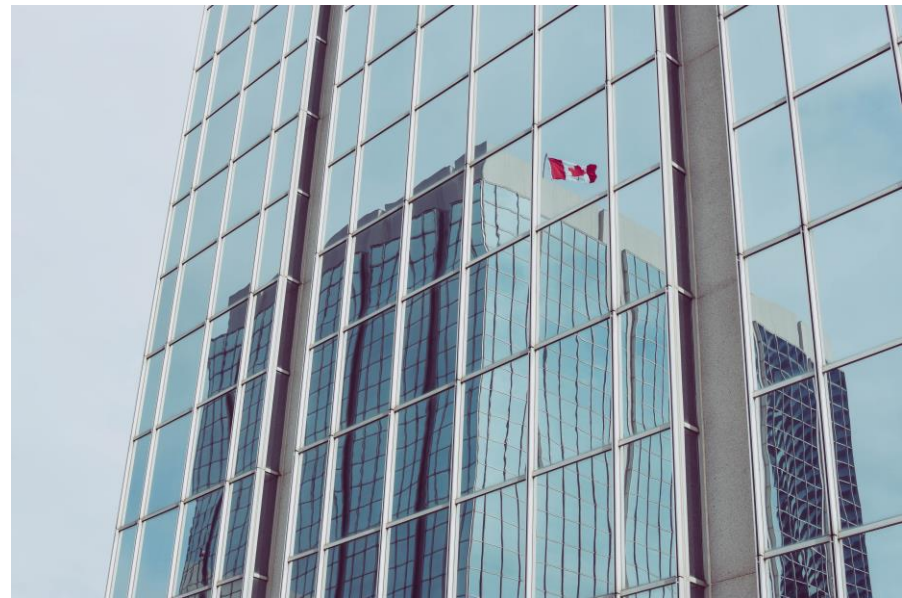


Navigating The EBCx Process

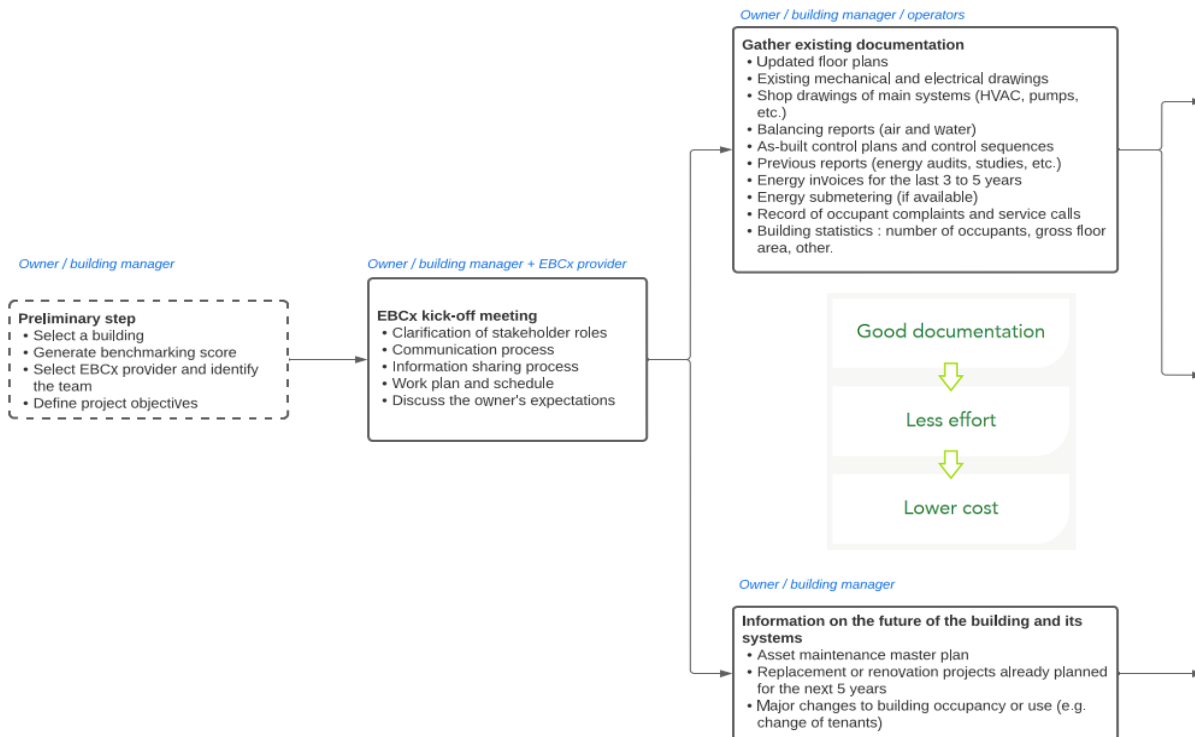
Phase 1: Planning

This phase defines the project objectives, scope and process, as well as the current facility requirements (CFR) that inform all subsequent EBCx activities.

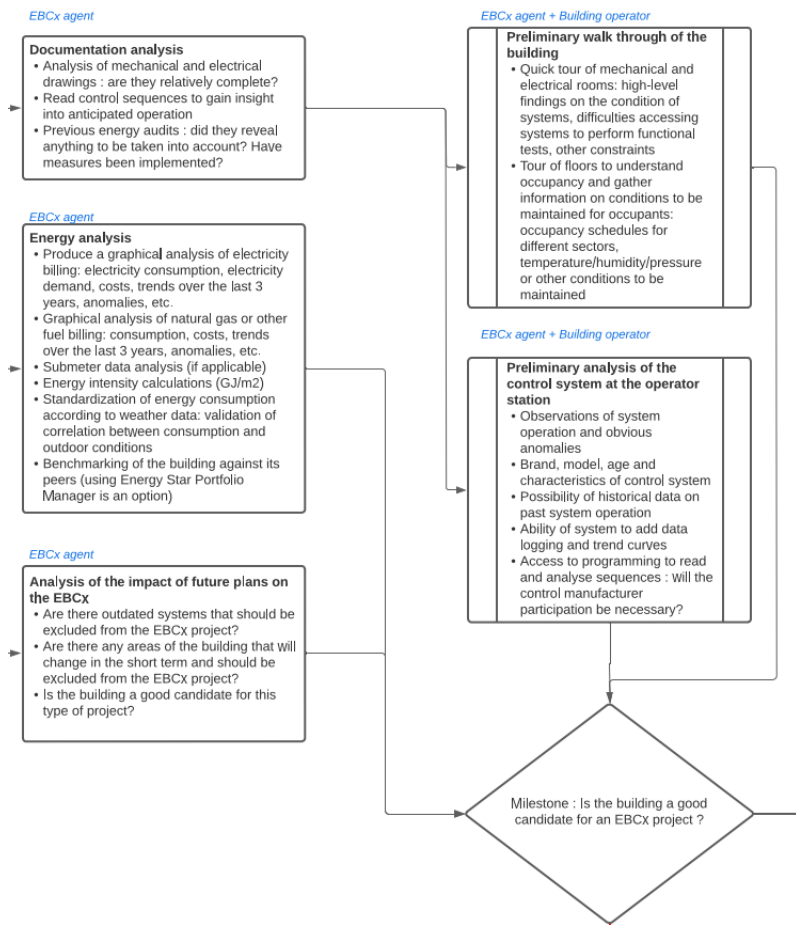
For the building owner, the EBCx plan supports the decision process to proceed with the EBCx project or not and provides a roadmap of the entire process.



Phase 1: Planning Activities (1 of 4)



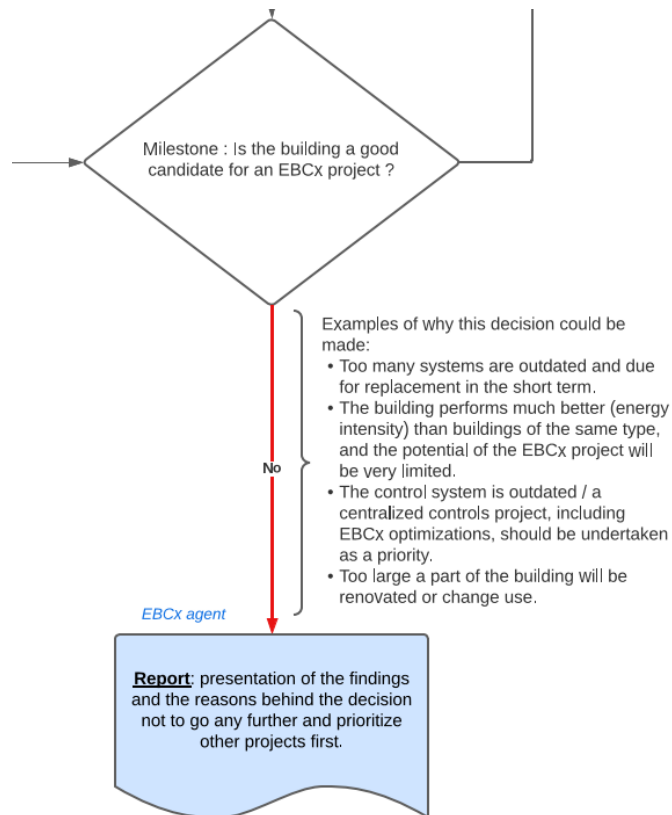
Phase 1: Planning Activities (2 of 4)



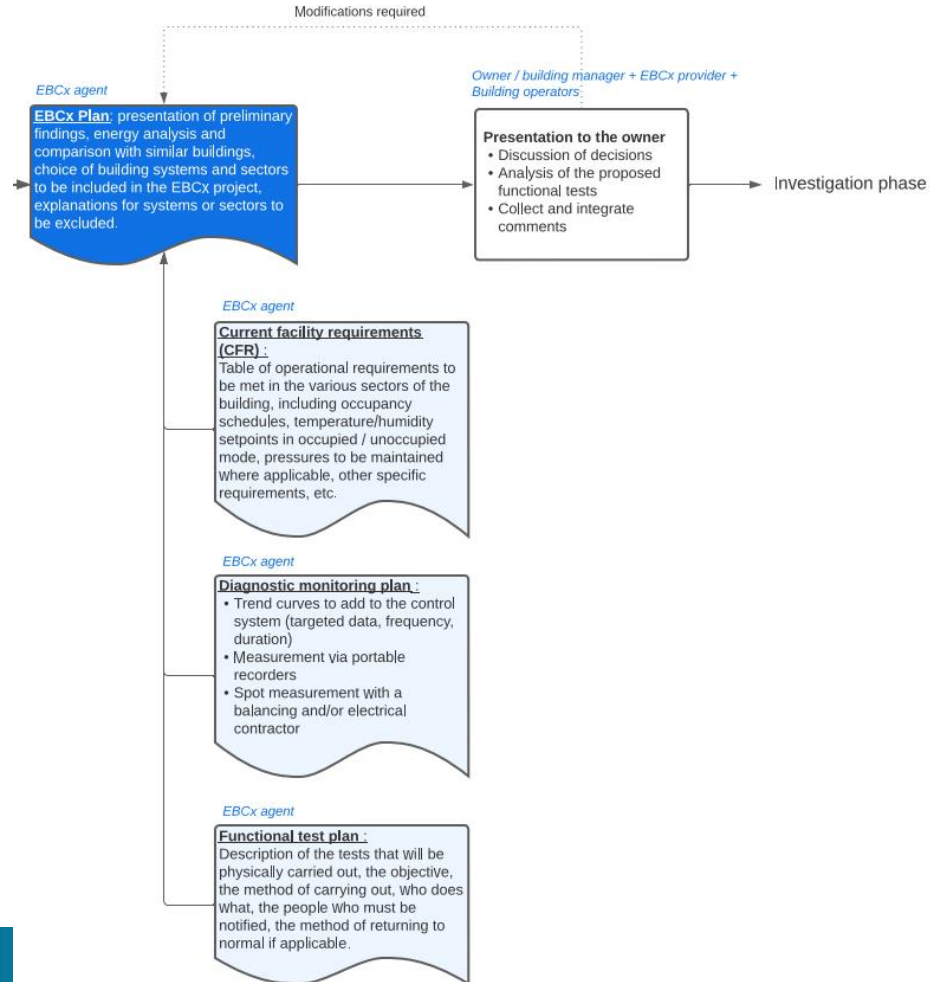
Phase 1: Planning

Activities (3 of 4):

Poor Candidate for EBCx



Phase 1: Planning Activities (4 of 4) : Good Candidate for EBCx

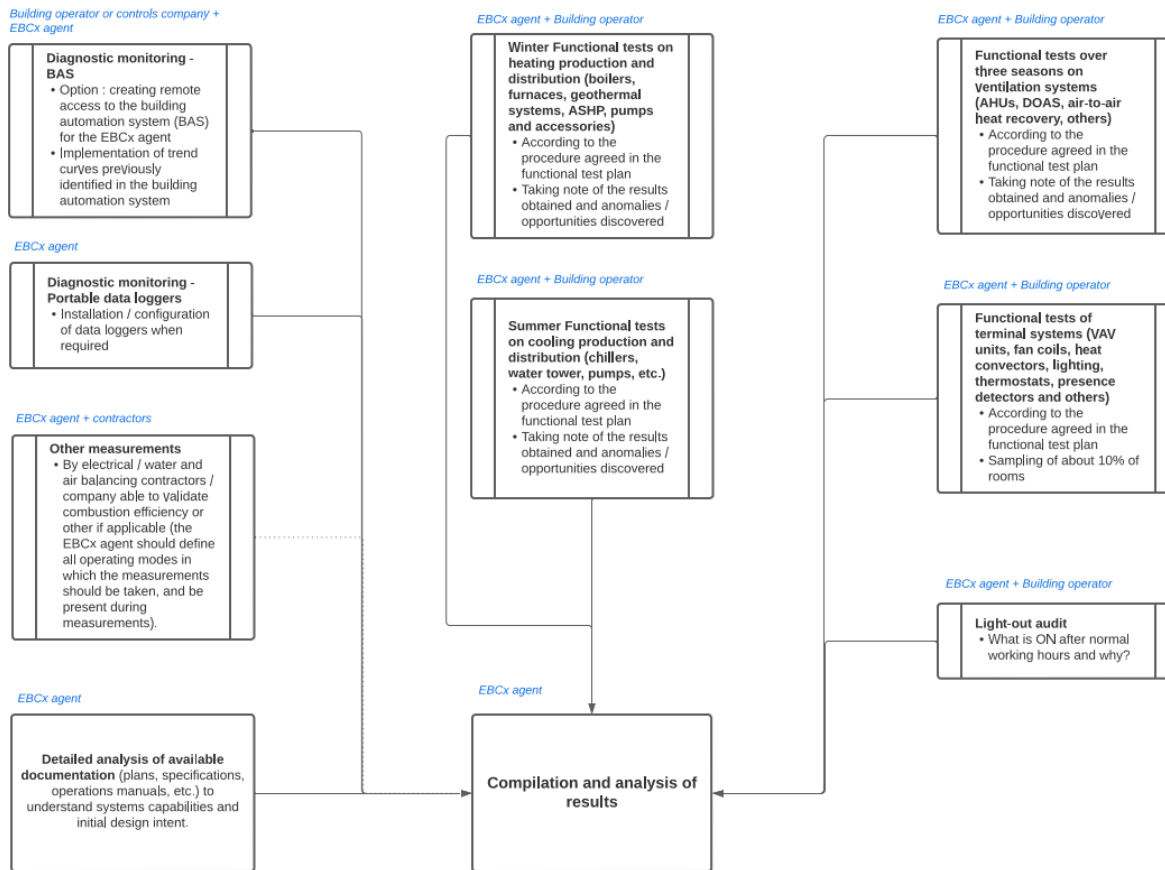


Phase 2: Investigation

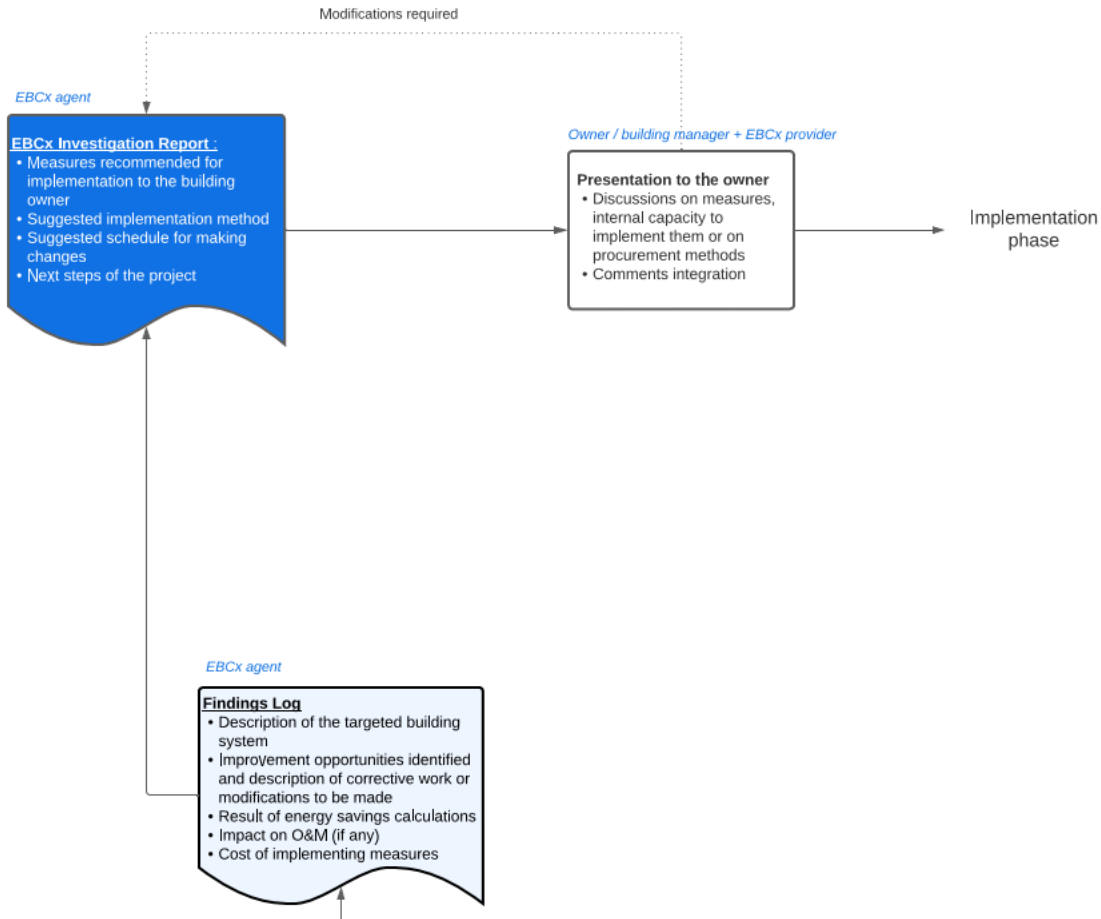
The investigation phase enables the EBCx team to analyse system operation in detail, carry out diagnostic tests and propose measures to optimize system operation. These measures are presented in the Findings Log, an integral part of the Investigation report.



Phase 2: Investigation Activities (1 of 2)

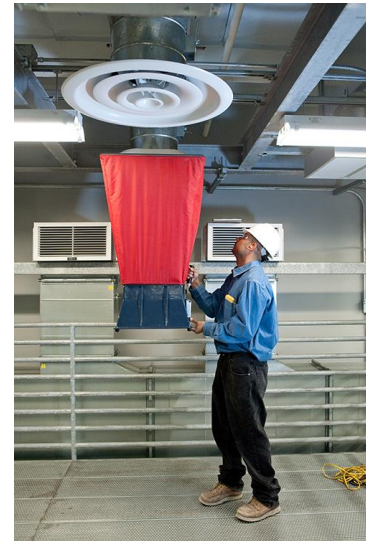
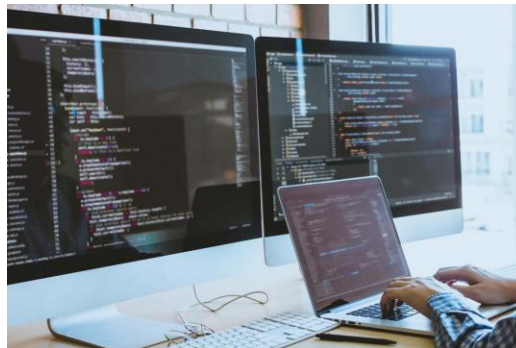


Phase 2: Investigation Activities (2 of 2)

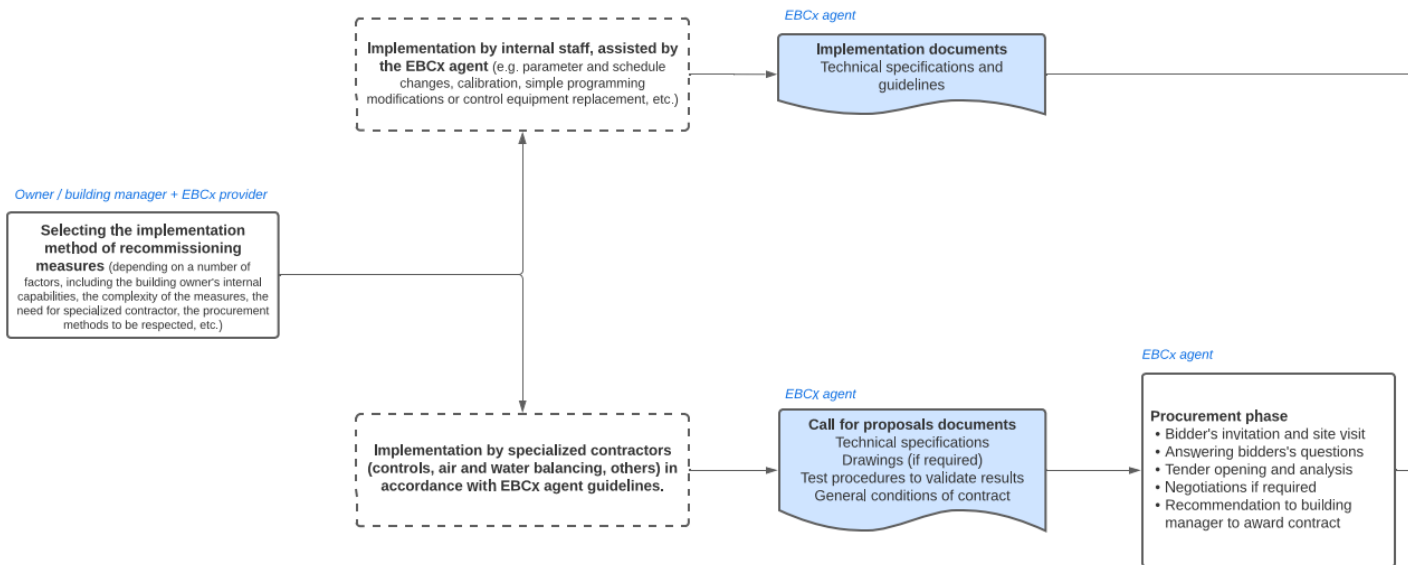


Phase 3: Implementation

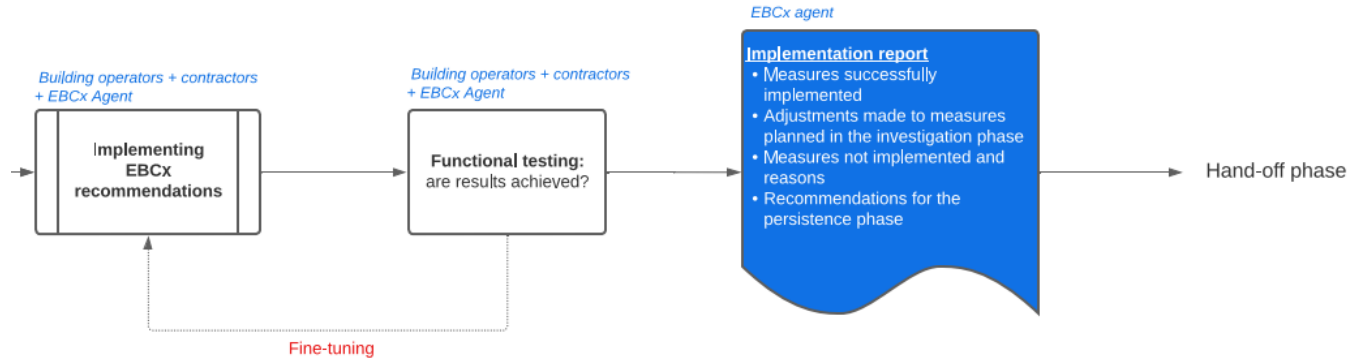
The implementation phase consists of choosing the best method for carrying out the system optimizations, then supervising their implementation by in-house staff or specialized contractors.



Phase 3: Implementation Activities (1 of 2)



Phase 3: Implementation Activities (2 of 2)

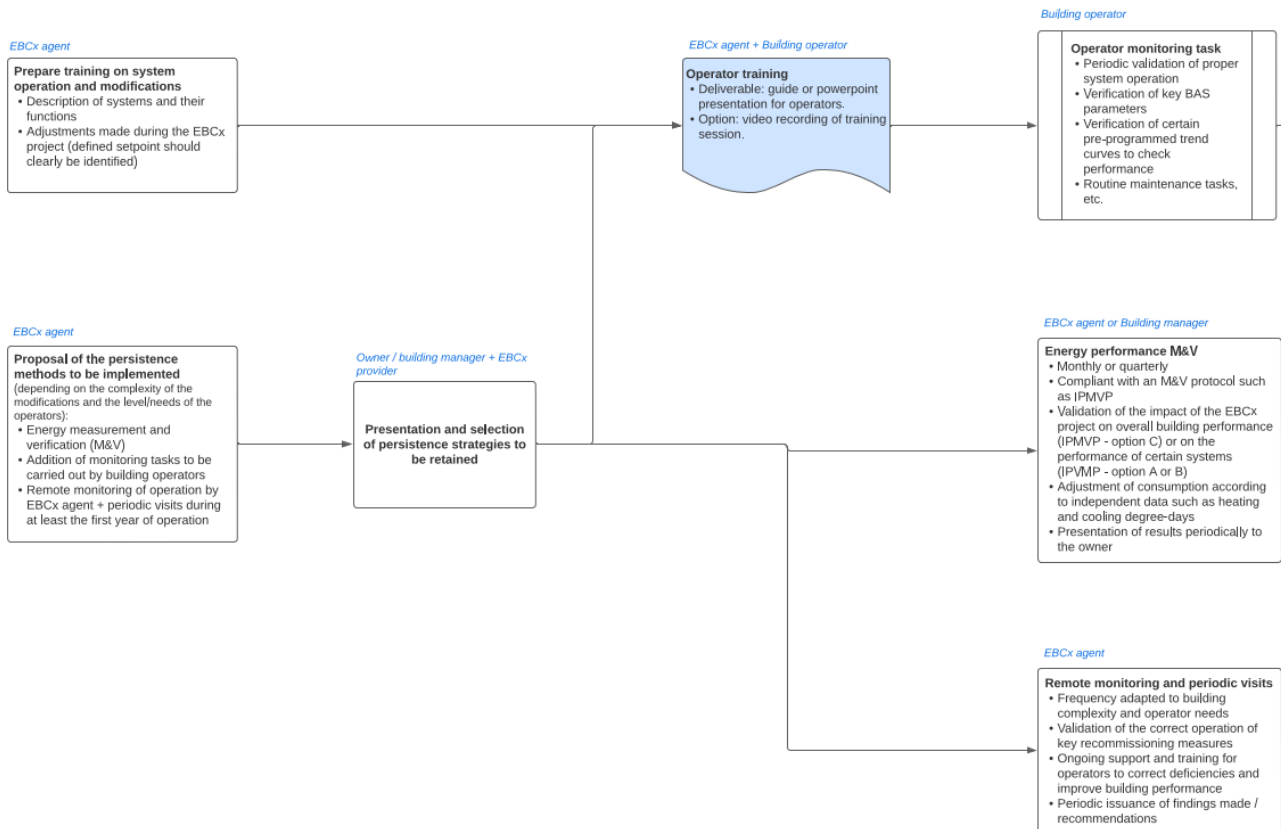


Phase 4: Hand-Off Phase

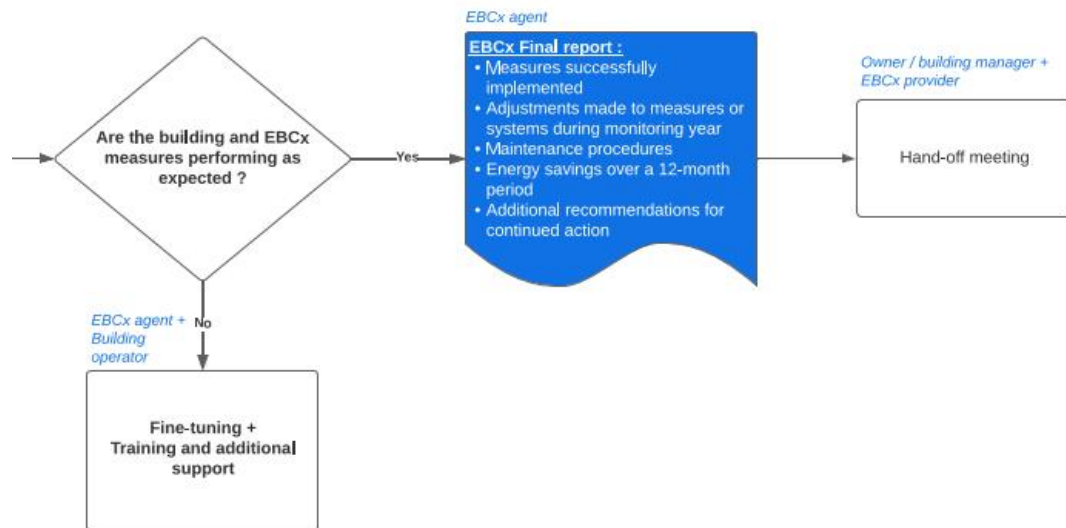
The objective of the hand-off phase is to ensure that the knowledge acquired during the EBCx project is preserved to inform O&M staff and maintain improvements.



Phase 4: Hand-Off Activities (1 of 2)



Phase 4: Hand-Off Activities (2 of 2)





Questions and Answers



Thank you for participating!

Questions: trainingandsupport@ieso.ca

Information, events, courses: <https://saveonenergy.ca/For-Business-and-Industry/Training-and-support>

Thank you!

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