BEYOND SMART CITIES

LEARN.BEYONDSMARTCITIES.IN



# WELCOME TO
# ADVANCED EXISTING BUILDING COMMISSIONING

**ONLINE TRAINING**

KRISHNAJI PAWAR - CEO & FOUNDER

COMMISSIONING SPECIALIST
BEYOND SMART CITIES

GREEN BUILDING COMMISSIONING



# 4.INVESTIGATION PHASE EBCX

KRISHNAJI PAWAR,LEED AP BD+C,GSAS CGP,ISO 14001:2015,GCP

COMMISSIONING SPECIALIST CURRICULUM

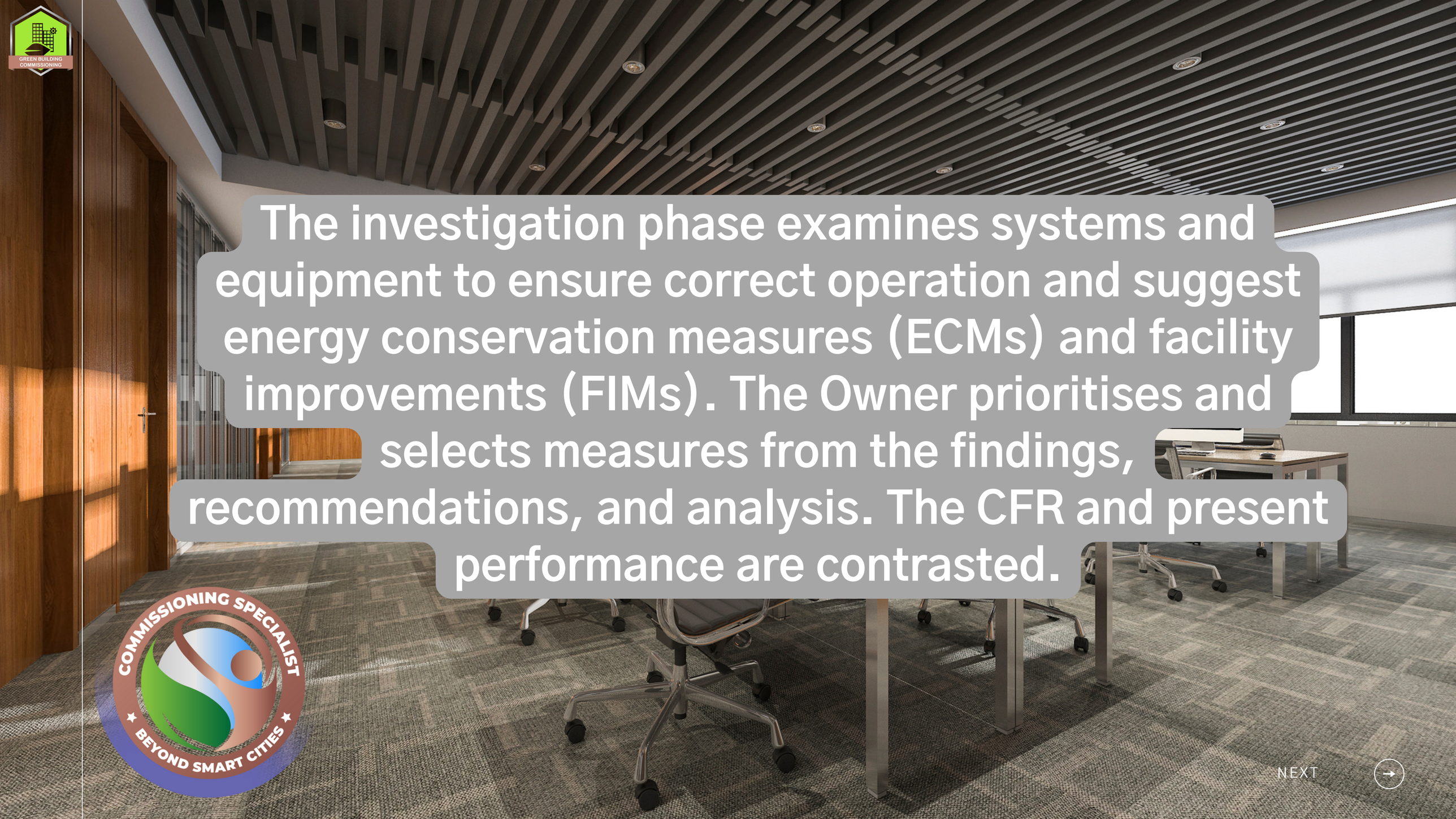
BEYOND SMART CITIES

NEXT

# Learning Objectives

- Introduction
- Update EBCx Tasks
- Conduct Investigation Phase Kickoff Meeting
- Conduct Additional Detailed Documentation Review
- Gather Data for Energy Calculations and Implementation
- Master List of Findings
- Finalize Measurement and Verification Plan
- Deliverables

BEYOND SMART CITIES


The investigation phase examines systems and equipment to ensure correct operation and suggest energy conservation measures (ECMs) and facility improvements (FIMs). The Owner prioritises and selects measures from the findings, recommendations, and analysis. The CFR and present performance are contrasted.




# Introduction

Investigation Phase tasks include these activities:

- Update EBCx Tasks
- Update EBCx Team
- Conduct Investigation Phase Kickoff Meeting
- Conduct Additional Detailed Documentation Review
- Conduct Detailed Site Survey
- Check Calibrations of BAS-Trended Points
- Analyze Facility and System Performance and Establish Performance Baseline
- Conduct Additional Building Personnel and Occupant Interviews
- Review Building Automation Controls System
- Develop Test Procedures
- Conduct and Evaluate System Functional Testing
- Gather Data for Energy Calculations and Implementation
- Identify sources of performance problems
- Perform Energy Savings and Cost Calculations
- Perform Simple Repairs
- Master List of Findings (Perform Issues and Opportunities Analysis)
- Update EBCx Report with Investigation Report
- Finalize Measurement and Verification Plan
- Complete Scope of Work for Implementation and Hand-off Phases
- Obtain Owner Acceptance and Decision to Proceed

NEXT →

# Update EBCx Tasks  & Update EBCx Team

It should:

1. Specifically define the testing and trending that will be implemented during this phase
2. Identify baseline energy measurements or sub-metering that needs to be performed for energy savings calculations, ongoing tracking or fault detection
3. Identify:

- scope and intent of testing procedures
- Scheduling of and support required to execute testing
- Monitoring and trends that may need to be set up in advance
- Anticipated changes to the system that may affect occupant comfort or daily workflows o Occupant or operator interviews or additional surveys that need to take place

# Conduct Investigation Phase Kickoff Meeting

Discuss results of Planning and Initial Assessment Phases and the updated EBCx Plan. Specifically cover:

- Investigation Phase scope
- Roles and responsibilities
- Scheduling of testing and facility access
- Training requirements
- Concerns

Additional meetings are scheduled to coordinate testing, subcontractor support, project schedule, identify issues, and gain feedback on early-identified FIMs.



# Conduct Additional Detailed Documentation Review

- Examine the building's blueprints and paperwork in order to comprehend the building's energy consumption and basic design basis, as well as to assess the system's integration.
- The review process involves evaluating all old and new drawings, specifications, test and balance reports, applicable construction equipment submittals and operations & maintenance manuals, as well as any past commissioning or energy reports and service or test records. Existing written sequences of operation and control drawings are reviewed with particular care.
- In addition to learning the building systems and performance criteria from the building documentation, the purpose of this step is to attempt to comprehend how and why the building was originally designed as it was, what modifications have been made, and the current understanding of how the building is being utilised.
- Having a historical understanding of how and why a building was originally developed will facilitate and drive the implementation of energy-saving measures.

NEXT

# Perform Initial Site Walk–Through and BAS Review

- The CxP and facility staff assigned to the project conduct a walkthrough of all major spaces to gain an understanding of the building's layout, types and condition of spaces, occupancy levels, lighting and controls, location of equipment rooms, location of documentation, building automation system, its age, and what it controls, as well as the general condition of equipment.
- Components of the initial site walk through pertaining to equipment observation include a broad appraisal of the systems and equipment to be included in the EBCx project's scope and condition.
- Also, document any components that have beyond their service life and must be replaced with capital expenditures instead of being included in the EBCx project.

BEYOND SMART CITIES

NEXT

# Conduct Detailed Site Survey

- The site survey is based on a comprehensive evaluation that focuses on initial points of concern and things uncovered during tenant interviews, analysis of drawings, and review of further building data.
- The comprehensive site evaluation involves a study of physical condition and system functioning. The condition review assesses the equipment's appearance, physical damage, need for maintenance, new features, and changes in usage. Performance-based evaluation entails comparing how a system and its components are operated to CFR requirements or industry standards.
- If not already conducted during the first examination, conduct a night stroll. This helps identify equipment that may not be required to operate based on the time of day or probable temperature fluctuations. Equipment that cannot be totally switched off should be considered for restricted speed or set point operation.

# Analyze Facility Performance and Establish Performance Baseline

- Continuous energy performance monitoring establish performance benchmarks:
- Start the EBCx project with an energy baseline and track progress as things are identified and implemented. The baseline comparison and future savings calculations will be more accurate if it includes chiller or pump power from the building level down.
- Building-level energy baselines should comprise kWh and therms per day, per month, and eventually per year, coupled to outdoor air temperature and translated to EUI per square foot and compared to peer buildings. Large energy-using equipment including chillers, cooling towers, pumps, and air handlers should have baselines connected to outside air temperature.
-




## Review Building Automation Controls System

Analyze the building automation system. Establishing current sequences of operation, recognising accurate graphics, and analysing unit alarms is one of the most time-consuming yet crucial activities during the inquiry phase.Examine equipment-specific building automation system graphic screens, alarm records, and schedules. Reset parameters and set points are reviewed. Verify override and "in-hand" reports are needed. Find solutions to eliminate all overrides and equipment in use while still managing the situation that required them. Find energy waste.

NEXT

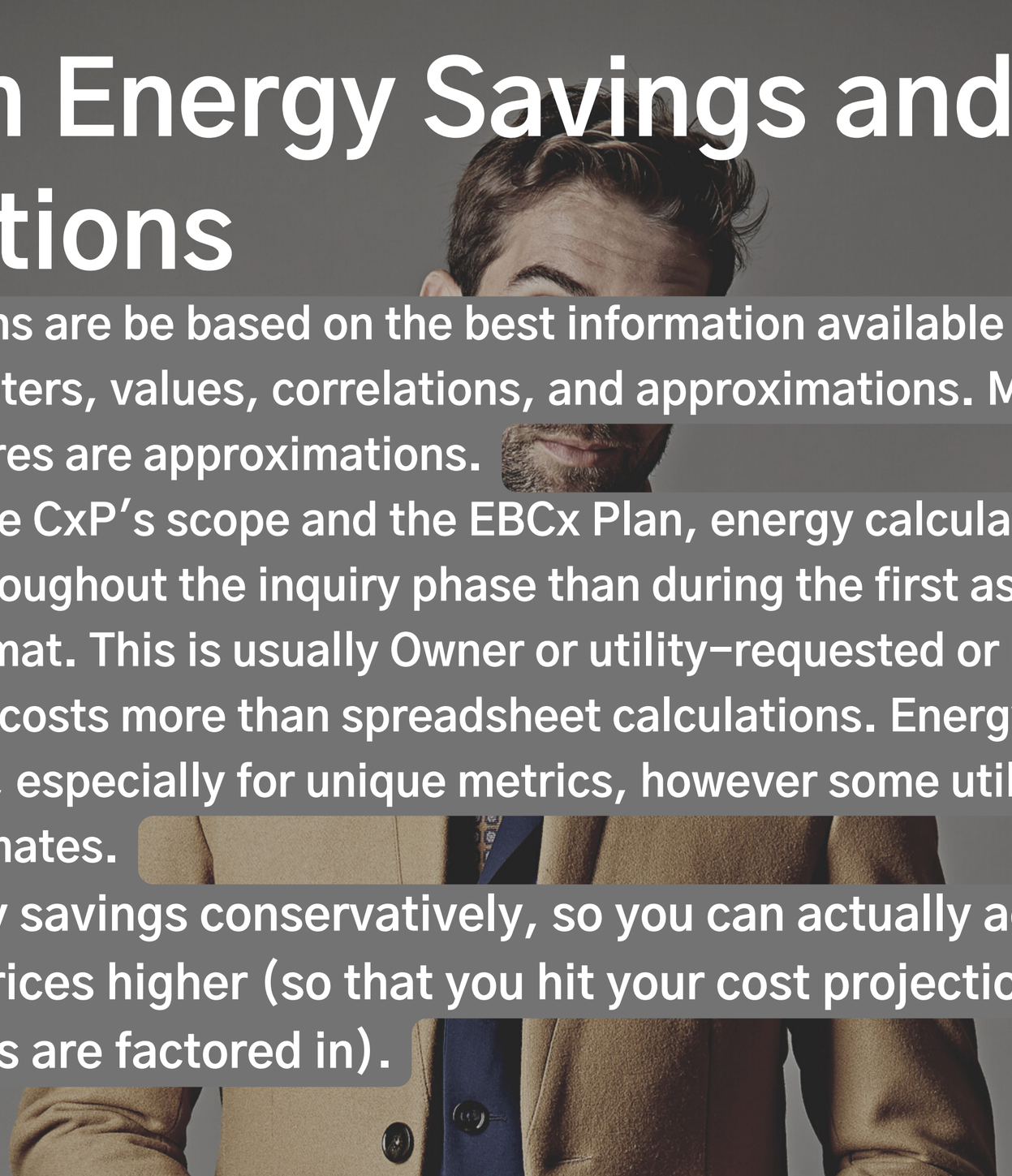


# Develop Functional Test Procedures

- Create FPT procedures for project-scoped systems. Test strategies for energy efficiency initiatives should verify system operation to find improvements and validate ideas.
- Projects that require adequate operation should test non-energy efficiency features such temperature and humidity management, alarms, failure and standby modes, and other CFR-mandated Owner performance requirements.
- The test methods' written detail and repeatability should meet the Owner's, utility program's, or regulatory authority's criteria without wasting resources on more in-depth inquiry.

NEXT

# Perform Energy Savings and Cost Calculations



Energy calculations are be based on the best information available and cover:

1. Explain parameters, values, correlations, and approximations. Measure most data now. Even measures are approximations.
2. According to the CxP's scope and the EBCx Plan, energy calculations should be more accurate throughout the inquiry phase than during the first assessment phase.
3. Calculation format. This is usually Owner or utility-requested or M&V-driven. Energy modelling costs more than spreadsheet calculations. Energy modelling may be more accurate, especially for unique metrics, however some utilities require spreadsheet estimates.
4. Project energy savings conservatively, so you can actually achieve them. Also, estimate prices higher (so that you hit your cost projections when unexpected costs are factored in).

NEXT

# Master List of Findings



- Based on CFR/team owner’s discussions and revisions, update and prioritise Master List of Findings and Recommendations to include possible ECMs and FIMs.
- The CxP reviews the Master List of Results with the Owner and answers questions. The Owner corrects results data and raises issues about measures.
- The Owner chooses and prioritises measures at that meeting or later. In this meeting, the Owner decides who will manage implementation and if it will be done in-house or by contractors and vendors.

NEXT

# Finalize Measurement and Verification Plan

- To show ECM success, examine methods of monitoring system performance and confirming appropriate implementation. A measurement and verification (M&V) Plan must include a verification methodology suitable for the measure's size and complexity and the Owner's interests.
- The M&V plan verifies the measure/performance system's and confirms the expected energy savings after installation.
- Before and post-implementation M&V may include BAS trending, portable data recorders, spot measurements, and functional testing. The Owner's accuracy needs and utility programme requirements determine M&V rigour, not best practise.
- Some Owners spend more on energy savings than on measuring them after the initial assessment phase.

NEXT



# Investigation Phase Deliverables

- Updated EBCx Plan
- Owner-reviewed/approved/finalized Master List of Findings
- Updated CFR (based on information/requirements resulting from findings)
- Scopes of Work for Implementation
- Implementation Plan (best practice is to have a plan ready to go at the end of the Investigation Phase)

NEXT


GREEN BUILDING COMMISSIONING
COMMISSIONING SPECIALIST
BEYOND SMART CITIES
Thanks
Learn From Beyond Smart Cities
Online professional courses led by
the world's top specialists
RISHNAJI PAWA
SUSTAINABILITY SPECIALIST
LEARN.BEYONDSMARTCITIES.IN