



MEASUREMENT AND VERIFICATION FUNDAMENTALS

ONLINE PROFESSIONAL COURSES LED BY THE WORLD'S TOP SPECIALISTS

ONLINE TRAINING BY KRISHNAJI PAWAR

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MODULE

01

Measurement and Verification Overview

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WELCOME TO LEARN FROM BEYOND SMART CITIES

Beyond Smart Cities is the first green technology marketplace. It connects millions of sustainability, green building, energy, commissioning, health and safety, fire safety, climate change, and green product and technology manufacturers with global independent talent.

Our mission is to build and support a global community of experts with the highest professional standards in sustainability, green building, energy, commissioning, environment, health & safety, fire safety, climate change, GHG accounting, carbon auditing, and GHG emissions management.

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BRIEF ABOUT ME

Krishnaji PAWAR

CEO & FOUNDER

Krishnaji Pawar is founder and CEO of Beyond Smart Cities. Before being named CEO in January 2020, Krishnaji held leadership roles at Beyond Smart Cities in both Sustainability ,Energy & Environmental Consultancy.

Specialized in developing sustainable design strategies for Green Building Certification Systems (LEED, GSAS, etc.), Energy & Water Conservation, Commissioning, Environmental Impact Assessment & Environmental Management Systems.

Currently responsible for 3,767 million square feet Green Building /Energy modeling Consulting since January 2007 in UAE, India and Qatar.





WORKFLOW

MEASUREMENT & VERIFICATION OVERVIEW

Measurement and Verification (M&V) is the process of planning, measuring, collecting and analyzing data for the purpose of verifying and reporting energy savings within an individual facility resulting from the implementation of Energy Conservation Measures (ECMs).

Learning Objectives

- **Introduction to Measurement and Verification**
- **What is Measurement and Verification?**
- **Understand the circumstances in which M&V protocols are used.**
- **Energy Efficiency Performance Measurement and Verification Certification Programs**
- **Certified Measurement & Verification Professional - CMVP by Association of Energy Engineers**
- **Who are certified measurement and verification professionals?**
- **What does a CMVP do?**
- **Benefits of Measurement and Verification**

LEARNING OBJECTIVES

- General practitioners, experts, and managers can take the Measurement & Verification Overview course to learn about energy savings M&V. Evaluating energy conservation measures for energy efficiency projects, regional efficiency programs, or internal projects shows project success, improves installation operations, obtains financial assistance, and raises user awareness.
- This 1.5-hour training introduces M&V and its effects and roles. Course participants learn through practical examples.
- This introductory M&V course provides the foundational knowledge needed to apply M&V principles to energy efficiency projects, whether you are an experienced professional or an informed manager.



DEFINITION AND PURPOSES OF M&V

"Measurement and Verification" (M&V) is the process of planning, measuring, collecting, and analyzing data to verify and report energy savings within a facility or facilities resulting from the implementation of EEMs or ECMs.

Define key terms: M&V, ECM, baseline, adjusted baseline model, avoided energy use, statistical model, physical model, and ESCO.





M&V: measurement and verification A process that includes a wide range of measurement, verification, and analysis techniques for quantifying the results of resource efficiency and resource management activities

Statistical models are probability models, and **physical models** are causal, deterministic, or mixed causal-deterministic-probability models applied to observable propositions. It is observations that turn probability into statistics. Statistical and physical models are thus verifiable, and all use statistics in their verification. All models should be verified, but most aren't.

ECM:Energy Conservation Measure

Baseline: A characterization of the energy use and operating conditions during a specified period of time prior to implementation

Adjusted baseline model: A model developed using data from the baseline period and incorporating routine and non-routine adjustments against which an energy conservation measure's actual performance is compared.



Avoided energy use: Avoided energy use means the reduction in electricity use that occurred in the performance period, relative to what would have occurred if the facility had been equipped and operated as it was in the baseline period but under performance period conditions.

A statistical model is a model that attempts to identify correlations and other patterns in actual measured data.

Physical model: Energy systems models are the mathematical models that are developed in order to represent as reliably as possible various energy-related problems. Lately, these models have become a common means to identify and solve such problems.

ESCO: Energy savings performance contracting

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