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ENERGY MODELING SPECIALIST
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BUILDING ENERGY MODELING
STEP-BY-STEP PROCEDURES FOR LEED
CERTIFICATION
ONLINE PROFESSIONAL COURSES LED BY
THE WORLD'S TOP SPECIALISTS
ONLINE TRAINING BY KRISHNAJI PAWAR
LEED AP(BD+C),GSAS CGP,GCP,ISO 14001
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MODULE L1

Introduction and Course Outline

KRISHNAJI PAWAR - CEO & FOUNDER

LEED AP(BD+C),GSAS CGP,GCP,ISO 14001

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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 3,787 million square feet Green Building /Energy modeling Consulting since January 2008 in UAE, India and Qatar.

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BUILDING ENERGY MODELING : STEP-BY-STEP PROCEDURES FOR LEED CERTIFICATION

The Building Energy Modeling: Step-by-step procedures for the LEED Certification training program cover building energy modeling steps, energy charrette, and BEM software importation. It covers ASHRAE standards, BEM inputs, and simulation setup and running. The program also includes BEMP practice exam questions and emphasizes the importance of integrating all energy-efficient components in design.

Learning Objectives

- Introduction and Course Outline
- Energy Charrette or Workshop
- AutoCAD to BEM Software Importation
- ASHRAE Standards and Guidelines
- BEM software inputs for the project section, facade, systems, and zones
- Setup and Running the Building Energy Modeling Simulation
- Review BEM Software Output Reports.
- Sample Energy Modeling Report
- Summary and Resources
- BEMP Practice Test V.4.1

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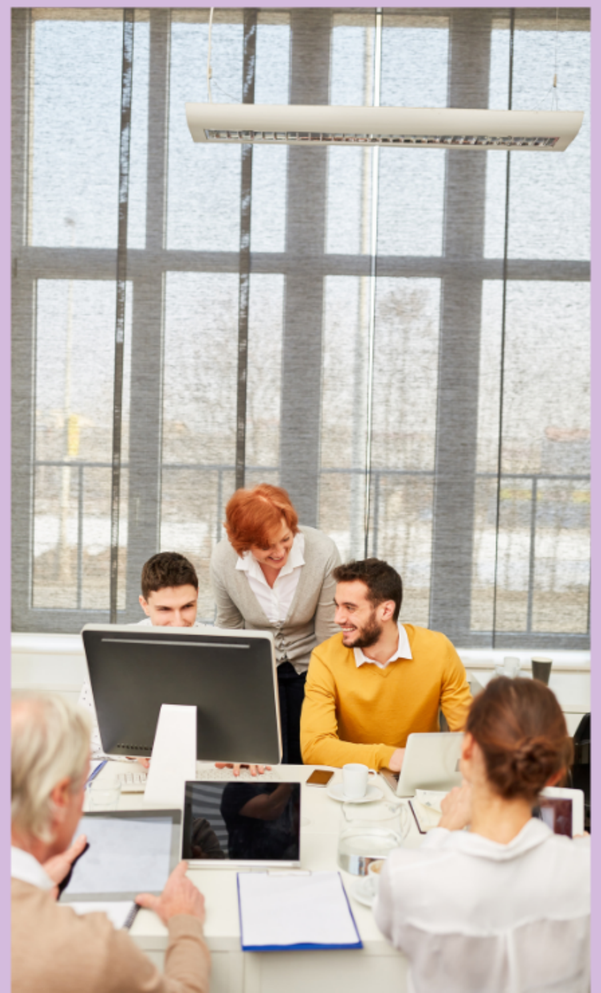
INTRODUCTION

- BEM is crucial for designing and evaluating energy-efficient buildings, especially for achieving LEED certification.
- The process involves defining project scope, conducting energy charrettes, data collection, model creation, input specification, simulation execution, output analysis, and LEED documentation.
- Transitioning from AutoCAD to BEM software involves exporting data, cleaning files, and importing them into BEM software.
- Understanding ASHRAE standards and guidelines is essential for ensuring models meet regulatory requirements and contribute to LEED certification.
- Setting up BEM simulations involves defining settings, incorporating weather data, running the simulation, and iterating.
- Output reports provide insights into energy consumption, thermal comfort, and potential LEED credits.

BUILDING ENERGY MODELING FOR LEED CERTIFICATION



- Defining the Project Scope: Establishing energy model goals and constraints.
- Conducting Energy Charrettes: Engaging stakeholders in workshops to refine energy-saving strategies.
- Data Collection: Gathering relevant information about building geometry, systems, materials, and local climate.
- Model Creation: Developing a digital representation of the building using BEM software.
- Input Specification: Assigning values for various model inputs.
- Simulation Execution: Running simulations to analyze energy consumption patterns and assess compliance with LEED prerequisites.
- Output Analysis: Reviewing and interpreting simulation results to inform design decisions and identify areas for improvement.
- Documentation for LEED: Compiling necessary documentation to demonstrate compliance with LEED energy performance criteria.

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BUILDING ENERGY MODELING FOR LEED CERTIFICATION +

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Energy Charrette or Workshop

- A focused workshop where architects, engineers, and stakeholders collaboratively discuss and design energy-efficient building strategies.
- Fosters interdisciplinary dialogue and leads to innovative solutions.

ASHRAE Standards and Guidelines

- Establishes minimum energy efficiency requirements for buildings.
- Focuses on high-performance green building design.
- Sets forth thermal environmental conditions for human occupancy.
- Provides guidelines for the testing and verification of BEM software.

BEM SOFTWARE INPUTS

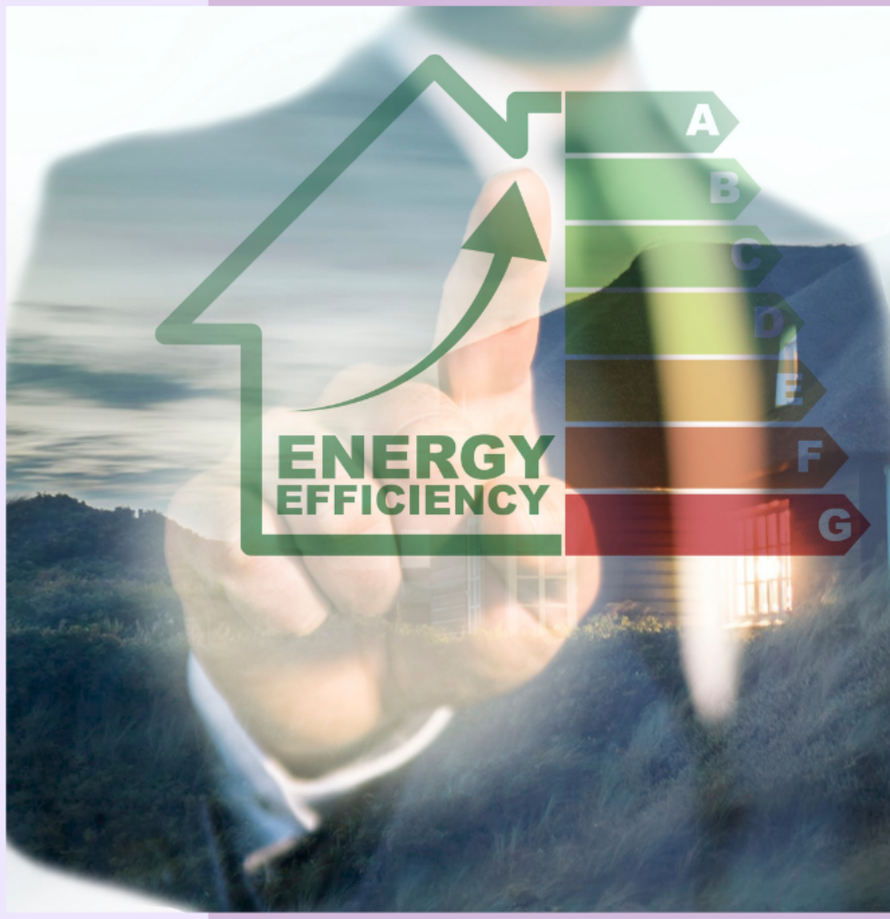
- Project Section: Details about the overall project scope.
- Facade: Information on building envelope materials, orientation, and thermal properties.
- Systems: Specifications of HVAC systems, lighting, and renewable energy systems.
- Zones: Definition of distinct areas within the building.

Setting Up and Running the BEM Simulation

- Defining Simulation Settings: Specifying parameters such as simulation duration, time step, and reporting intervals.
- Incorporating Weather Data: Integrating local climate data for accurate performance predictions.
- Running the Simulation: Executing the model, allowing the software to calculate energy consumption based on the defined inputs.

TYPES OF INPUT DATA REQUIRED BY USER

Category	Inputs
Geometry	Building plan and elevation Internal space layout Window sizes, locations, and shades Shading by neighbouring buildings and objects
Materials	Properties of structural and insulating materials Radiative properties of glazings
HVAC	Energy conversion and distribution systems Ventilation systems Component and supervisory controls
Airflow	Window and other intentional openings Cracks, holes, and defects in air barrier Airflow paths between internal spaces
Internal gains	Electrical appliances and lighting Moisture sources, such as cooking and plants
Occupants	Occupant density and schedule Activities that generate heat and moisture Control of appliances and lighting Interactions with windows and thermostats
Weather	Solar radiation Air temperature and humidity Wind speed and direction Sky conditions Ground snow cover Microclimate effects



BUILDING ENERGY MODELING (BEM) EVOLUTION

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Early Foundations (1970s - 1980s)

- BEM emerged in the 1970s due to the oil crisis and growing awareness of energy consumption in buildings.
- The first computational models predicting energy use were developed, including BLAST, a component-based energy simulation software developed by the U.S. Department of Energy.

Advancements in Methodology (1980s - 1990s)

- The 1980s and 1990s saw significant advancements in BEM methodologies and tools.
- The introduction of more sophisticated algorithms allowed for dynamic simulation, allowing for detailed analysis of building energy performance.
- The DOE-2 software emerged in 1989, providing a more user-friendly interface and enhanced capabilities.

BUILDING ENERGY MODELING (BEM) EVOLUTION +

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Integration with Building Information Modeling (2000s)

- The early 2000s saw a significant shift in BEM integration with BIM.
- Tools like EnergyPlus, released in 2001, combines the capabilities of previous modeling tools with BIM principles.

Growth of Standards and Certification (2010s - Present)

- The 2010s saw the emergence of standardized methodologies for BEM.
- Organizations like ASHRAE and the International Organization for Standardization developed guidelines to promote consistency and reliability in energy modeling practices.
- The introduction of the Building Performance Institute (BPI) standards and the Leadership in Energy and Environmental Design (LEED) certification further incentivized the adoption of BEM.

LEED V5: A COMPREHENSIVE FRAMEWORK FOR SUSTAINABLE BUILDING PRACTICES

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LEED v5 Core Principles

- Addresses the need to reduce greenhouse gas emissions.
- Emphasizes ecosystem conservation and restoration.
- Prioritizes equity and social justice in sustainable development.
- Promotes health through designs that enhance air quality and community connections.
- Prepares buildings to withstand and adapt to climate-related disruptions.

Enhanced Energy Efficiency

- Focuses on minimizing environmental degradation.
- Buildings account for a significant percentage of global energy consumption and emissions.

BIM TOOLS AND USERS

BEM tools include:

- EnergyPlus: A comprehensive simulation program that models energy consumption, water usage, and HVAC performance.
- eQUEST: A user-friendly software based on the DOE-2 engine.
- TRACE 700: Developed by Trane, specifically designed for HVAC system design and energy analysis.
- OpenStudio: An open-source software platform that facilitates the creation and simulation of building energy models.
- DesignBuilder: Offers a range of modeling capabilities, including energy performance simulation, daylighting analysis, and airflow modeling.

BUILDING ENERGY MODELING PROFESSIONAL CERTIFICATION

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- Building Energy Modeling (BEM) is an analytical process using computer simulation tools to predict energy consumption.
- BEM is crucial for architects, engineers, and energy consultants to optimize energy efficiency, reduce costs, and minimize environmental impact.
- ASHRAE, founded in 1894, promotes sustainable building design, energy efficiency, and standards development.
- BEMP Certification assesses an individual's ability to apply energy modeling software and interpret results for informed building design and operation decisions.
- Eligibility criteria include a bachelor's degree in engineering, relevant work experience, and understanding of building systems, energy performance metrics, and energy modeling tools.
- BEMP certification establishes professional credibility in BEM, promotes standardization, and enhances energy efficiency.
- The BEMP certification evaluates candidates on Modeling Fundamentals, Software Applications, Data Analysis and Interpretation, and Building Systems Knowledge.

THE ECONOMIC ADVANTAGES OF BEM

- Reduction in Construction Costs: BEM can reduce construction costs through informed design decisions. It can evaluate the upfront costs and operating efficiencies of each system under various conditions.
- Enhanced Operational Efficiency: BEM provides a detailed analysis of how different systems and design features affect energy consumption throughout a building's lifecycle. This predictive capability allows for the optimization of energy use, increasing operational efficiency.
- Decreased Energy Costs: BEM can significantly lower energy costs by accurately modeling energy consumption patterns. It can lead to substantial cost savings on energy bills.
- Compliance with Regulations and Incentives: BEM assists in ensuring compliance with energy codes and regulations, leading to financial incentives such as tax credits, rebates, and grants.
- Lifecycle Cost Analysis: BEM facilitates comprehensive lifecycle cost analysis (LCCA), which assesses the total cost of ownership over a building's life span.

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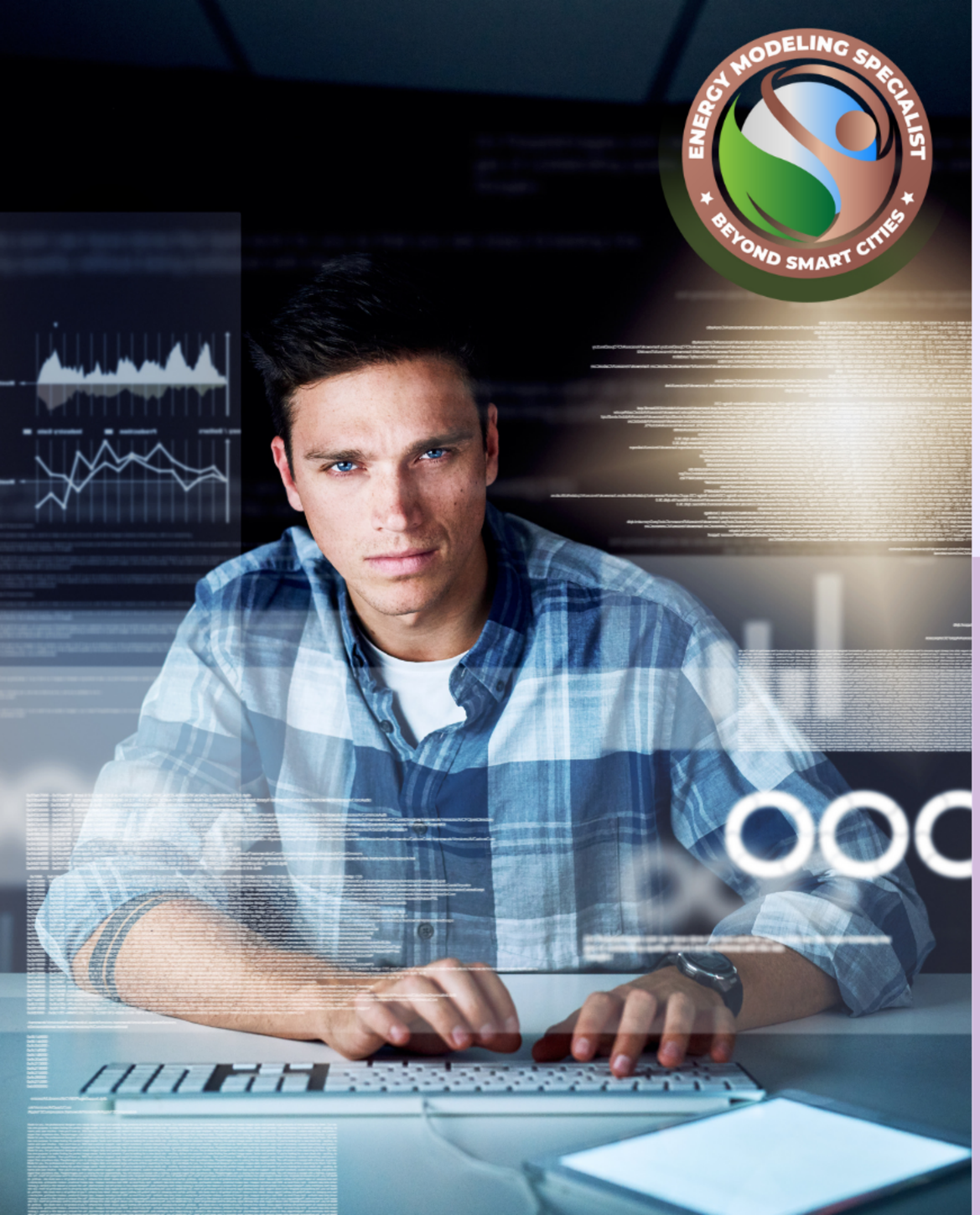

WELCOME TO BEYOND SMART CITIES

Beyond Smart Cities is the world's 1st Green Technology Marketplace, connecting millions of Sustainability Specialists, Green Building Specialists, Energy Specialists, Commissioning Specialists, Environment Specialists, Health & Safety Specialists, Fire Safety Specialists, Climate Change Specialists & Green Products/Technology Manufacturers with independent talent around the globe.

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.

KEY TERMINOLOGIES

Building Energy Modeling: A method used to simulate how buildings use energy, helping to predict energy needs and improve efficiency.

Energy Consumption: The amount of energy used by a building, which can be predicted using modeling tools based on various factors.

Design Optimization: The process of improving building designs to use less energy while keeping occupants comfortable.

Compliance: Meeting specific energy performance standards set by local building codes.

Retrofitting: Updating older buildings with new technology or systems to improve energy efficiency.

Renewable Energy: Energy from sources that are naturally replenished, like solar or wind power, which can be integrated into buildings.

Lifecycle Cost Analysis: A method to evaluate the total costs of a building's energy use over its lifetime, helping in decision-making.

Calibration: The process of adjusting a model to match actual energy use data, improving its accuracy.

LEED: Leadership in Energy and Environmental Design, a certification program for green buildings that promotes sustainable practices.

Energy Charrette: A collaborative workshop where stakeholders discuss and design strategies for energy efficiency in buildings.

ASHRAE: The American Society of Heating, Refrigerating, and Air-Conditioning Engineers, which sets standards for building energy efficiency.

Energy Use Intensity (EUI): A metric that measures a building's energy consumption relative to its size, useful for comparisons.

Peak Load Analysis: An assessment of the maximum energy demand for heating and cooling in a building.

Sensitivity Analysis: A technique used to see how changes in input data affect energy predictions in a model.

Peer Review: A process where experts evaluate a model's predictions against established standards to ensure its credibility.

Energy Efficiency: Energy efficiency means using less energy to provide the same service, which helps save money and reduce environmental impact.

Sustainable: Sustainable refers to practices that meet current needs without harming future generations, especially in building design and energy use.

Simulation: Simulation is a method of creating a model to study how a system behaves under different conditions, often used in energy modeling.

Energy Audit: An energy audit is a detailed examination of a building's energy use to find ways to save energy and improve efficiency.

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