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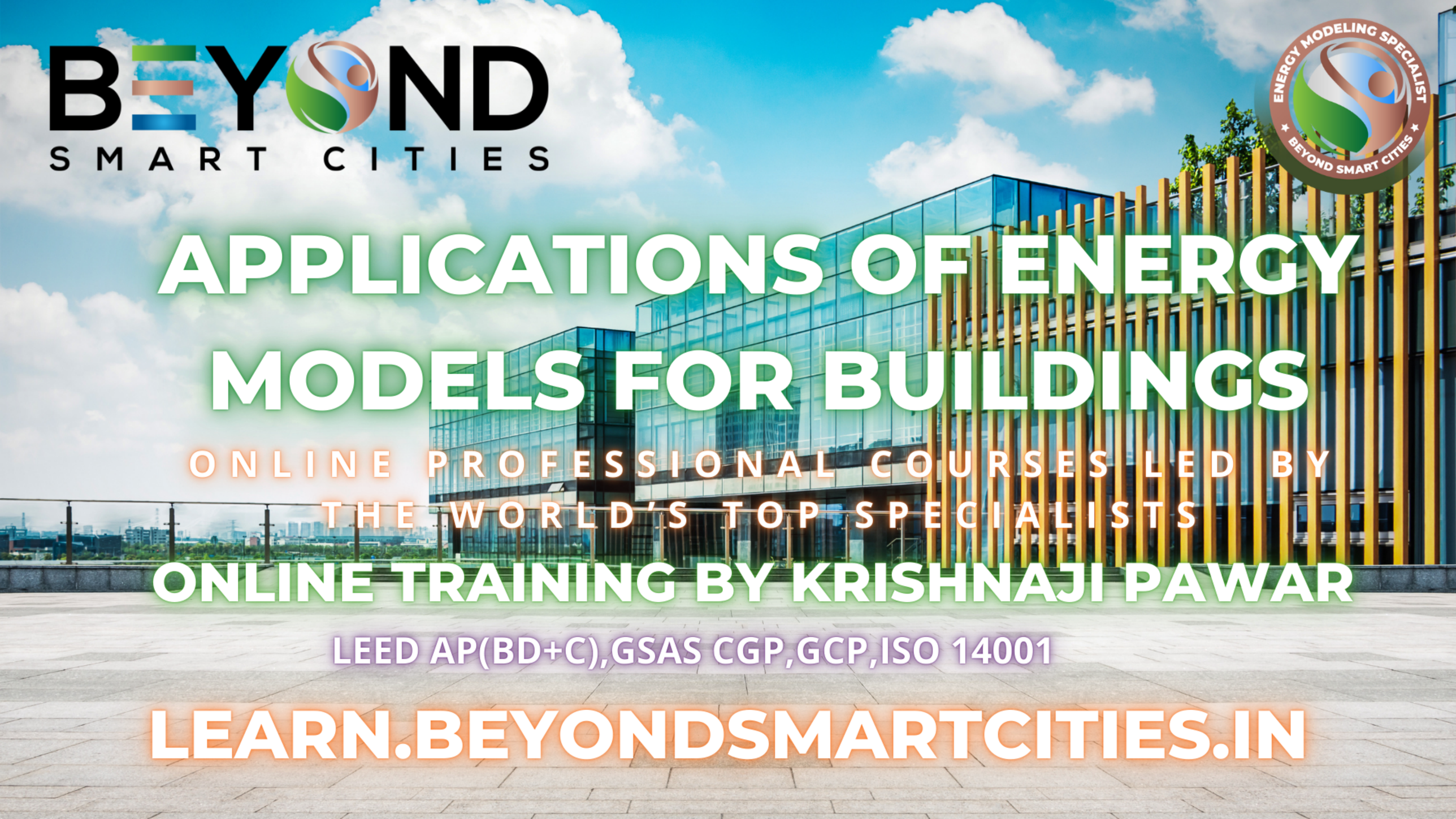
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ENERGY MODELING SPECIALIST
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APPLICATIONS OF ENERGY MODELS FOR BUILDINGS
ONLINE PROFESSIONAL COURSES LED BY THE WORLD'S TOP SPECIALISTS
ONLINE TRAINING BY KRISHNAJI PAWAR
LEED AP(BD+C),GSAS CGP,GCP,ISO 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.

APPLICATIONS OF ENERGY MODELS FOR BUILDINGS

The "Applications of Energy Models for Buildings" training program aims to equip professionals with the knowledge and tools necessary to leverage energy modeling effectively, contributing to a more sustainable built environment. Resources such as textbooks, research articles, and case studies will be provided to support further study and exploration of energy modeling applications.

Learning Objectives

- Introduction and Course Outline
- Simulation Comparisons
- Modeling Energy Performance
- Evolution of Simulation Techniques
- Baseline Building Models
- Communicate Analysis Results
- Collaborate Within Project Teams
- Applications of Energy Models for Building
- Case Study: Application of BEM
- Summary and Resources
- BEMP Practice Test V.5.1

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INTRODUCTION

- Energy modeling is a key tool for optimizing building energy performance.
- It aids in designing energy-efficient structures and evaluating existing buildings' performance.
- Applications include architectural design, HVAC design and operation, building performance rating, building stock analysis, and whole-building energy modeling (BEM).
- Architectural design involves simulating energy performance early in the design phase.
- HVAC design and operation simulate energy demands for accurate equipment size and control strategies.
- Building performance rating evaluates compliance with local codes and green certification programs.
- Building stock analysis informs energy codes and standards development.
- Whole-building energy modeling evaluates new and existing structures, facilitating tax credits and utility incentives.
- The "Applications of Energy Models for Buildings" training program equips professionals with knowledge and tools for energy modeling.

ENERGY MODELS FOR BUILDINGS: APPLICATIONS AND EVOLUTION

- Energy modeling is a crucial tool for understanding and optimizing building energy performance.
- It provides architects, engineers, and policymakers with the methodology to design energy-efficient structures and evaluate existing buildings' performance.

Evolution of Energy Modeling

- Energy modeling in architecture and engineering has undergone significant transformations.
- In the mid-20th century, architects began to rely more on engineers for decisions about building comfort and lighting.
- As environmental impact awareness grew, the industry recognized the importance of energy modeling.

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CORE APPLICATIONS OF BUILDING ENERGY MODELING

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- Architectural Design: Energy modeling helps architects evaluate design alternatives and their potential impact on energy consumption.
- HVAC Design and Operation: Energy modeling helps engineers design and optimize HVAC systems.
- Building Performance Rating: Energy models assess a building's inherent performance, influencing regulatory and financial processes.
- Building Stock Analysis: Energy modeling aids in the development of energy codes and standards.
- Whole-Building Energy Modeling (BEM): BEM offers a holistic approach to evaluating both new and existing structures.

LEARNING OBJECTIVES

- Comparing Simulation Results to Measured Data: Trainees learn to validate energy models by comparing simulated outcomes with actual building performance data.
- Choosing Performance Metrics: Participants explore various environmental performance metrics.
- Identifying Analysis Objectives: Understanding how to identify analysis objectives, customize simulations, and adapt methodologies to different project phases is fundamental to effective energy modeling.
- Differentiating Energy Use: Participants learn to distinguish between regulated and non-regulated energy use.
- Communicating Analysis Results: Effective communication of analysis results to stakeholders is key for gaining buy-in and ensuring informed decision-making.
- Collaboration within Project Teams: The program addresses strategies for effective collaboration among architects, engineers, and other project stakeholders.
- Case Studies: Detailed case studies provide practical insights into the application of energy modeling in real-world scenarios.

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HOW SIMULATION OR BEM SOFTWARE WORKS

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- Simulated interaction of geometric model with outdoor conditions, occupancy, and building system usage.
- Predicts various loads arising in the building on an hourly basis.
- Uses basic physics laws and energy balance equations for calculations.
- Calculates energy consumption for systems corresponding to heat and other loads.
- Results are passed to calculations of the next slice and supplied to the output file.
- Process continues for the entire simulation duration, with final output seen as aggregated or on the same time slice.
- Considers various effects of thermophysical properties of materials and performance of systems under varying environmental conditions.
- Requires no special computing power, can be run on commercially available desktop computers or laptops.

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.

USERS OF BEM TOOLS

- **Architects:** Utilize BEM to inform design decisions that enhance energy efficiency and occupant comfort.
- **Mechanical Engineers:** Use BEM to size and select HVAC systems based on the energy demands of the building.
- **Energy Consultants:** Analyze energy models to provide recommendations for energy conservation measures and compliance with energy codes.
- **Facility Managers:** Employ BEM to monitor energy performance and identify opportunities for operational improvements in existing buildings.

WHY DOES ENERGY MODELING MATTER?

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- Engineers and architects alike can set specific energy-efficiency goals for their clients.
- It can be used to help projects obtain LEED certification
- It’s possible to measure specific HVAC and lighting usage which, in turn, can satisfy LEED requirements in those fields
- Design professionals will be able to estimate a building’s future energy usage and cost
- There is a business case for the use of BEM in architectural design.
- There are three different financial areas where savings can occur for existing building owners and operators, making buildings more resilient in terms of fuel source availability, and making affordable housing more affordable.

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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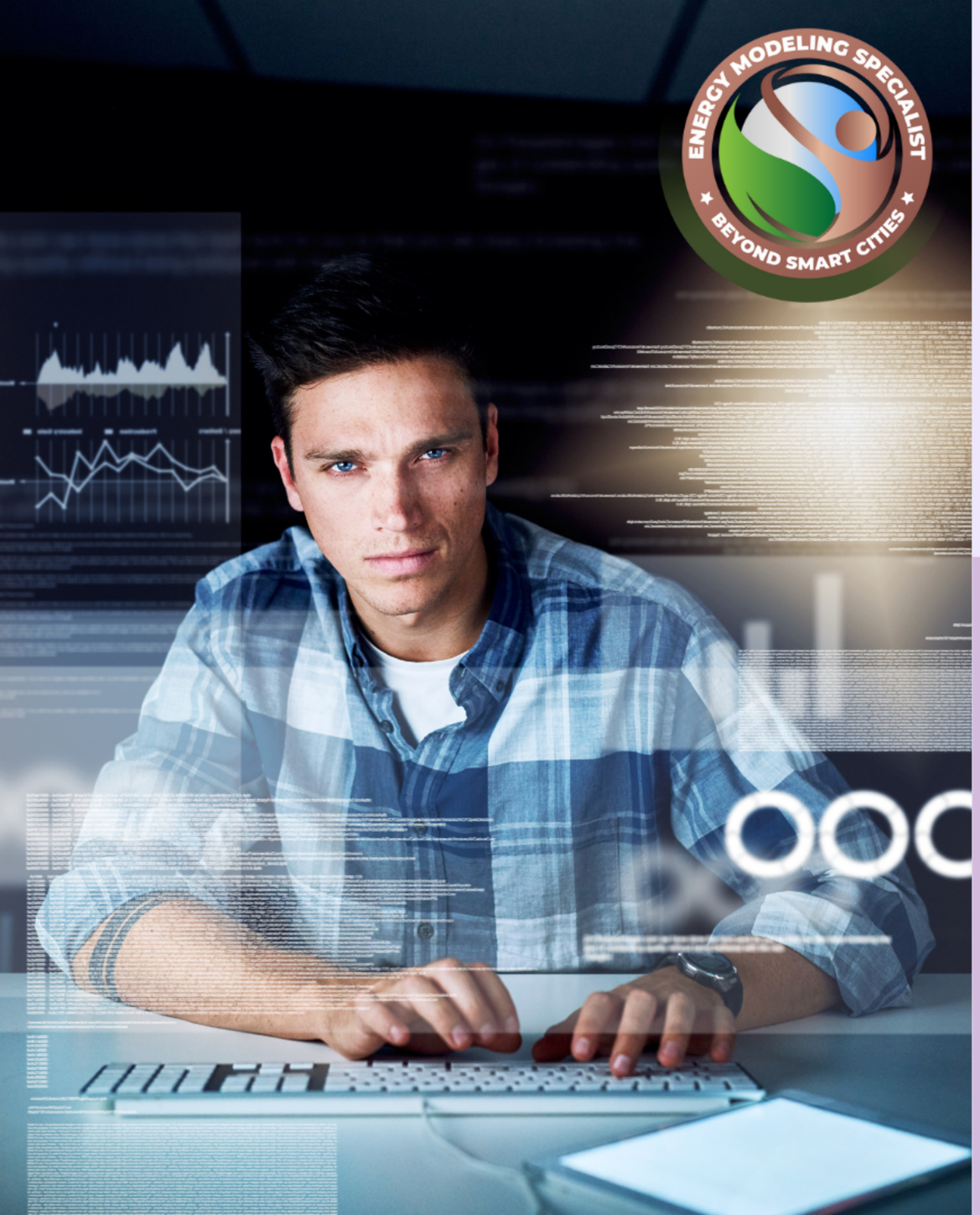

WELCOME TO BEYOND SMART CITIES

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.

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CONTACT US

+91 6363032722

info@beyondsmartcities.in

learn.beyondsmartcities.in

#55,HMR Layout ,Bengaluru ,India

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