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BUILDING ENERGY SIMULATION ANALYST - BESA OVERVIEW

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WORLD'S TOP SPECIALISTS

ONLINE TRAINING BY KRISHNAJI PAWAR

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

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MODULE

5

LEED, Commissioning, and Energy Conservation

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BUILDING ENERGY SIMULATION ANALYST - BESA OVERVIEW

Commissioning and energy modeling collaborate to conserve energy and improve building performance. Energy models discover energy savings, assess system performance, and evaluate performance post-commissioning, helping owners maximize efficiency.

Learning Objectives

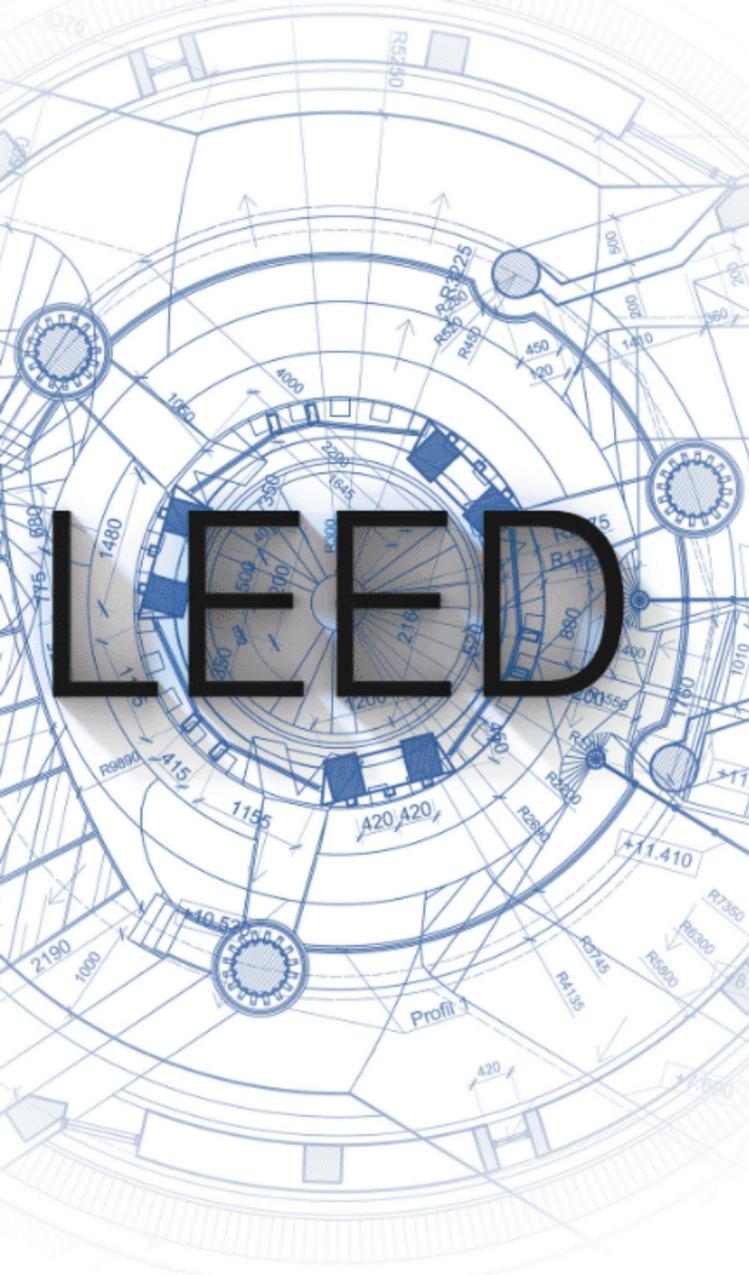
- Introduction
- Getting Started with BEM
- Establishing the Model Scope
- Building Energy Modeling Tools
- **LEED, Commissioning, & Energy Conservation**
- Benefits of Building Energy Modeling
- Certification for energy modeling specialists
- Summary and Resources
- Building Energy Simulation Analyst - BESA Practice Test V.4.1



INTRODUCTION

- The USGBC's LEED® rating system lacks a clear link between minimum energy performance and commissioning.
- The energy model of a building and its systems is crucial for achieving the minimum energy performance requirement.
- The design team should prepare the energy model during the design phase, but back-checks against the model are not always observed.
- The energy model should be re-evaluated based on the complete construction documents before submitting the minimum energy performance prerequisite for review by the USGBC.
- The commissioning professional should review the energy model against the design documents as part of the commissioning design reviews for LEED projects.

THE ENERGY MODEL AND COMMISSIONING IN LEED CERTIFICATION +



- The construction phase of a LEED project can lead to deviations between the modeled building or systems and the actual installation.
- The minimum energy performance prerequisite is a "design submission" item, not a "construction submission."
- The minimum energy performance prerequisite should be a "construction submission" based on the actual building they deliver, not just the design they prepare.
- This approach would provide better value to the owner and the environment with respect to the long-term energy performance of the building.
- The task of reviewing the final energy model inputs and assumptions against conditions observed during installation verification and functional performance testing could fall to the third-party commissioning professional.
- Adding energy model review and verification to the commissioning professional's responsibilities could help close the gap between the minimum energy performance and commissioning prerequisites.

LEED AND BUILDING ENERGY MODELING

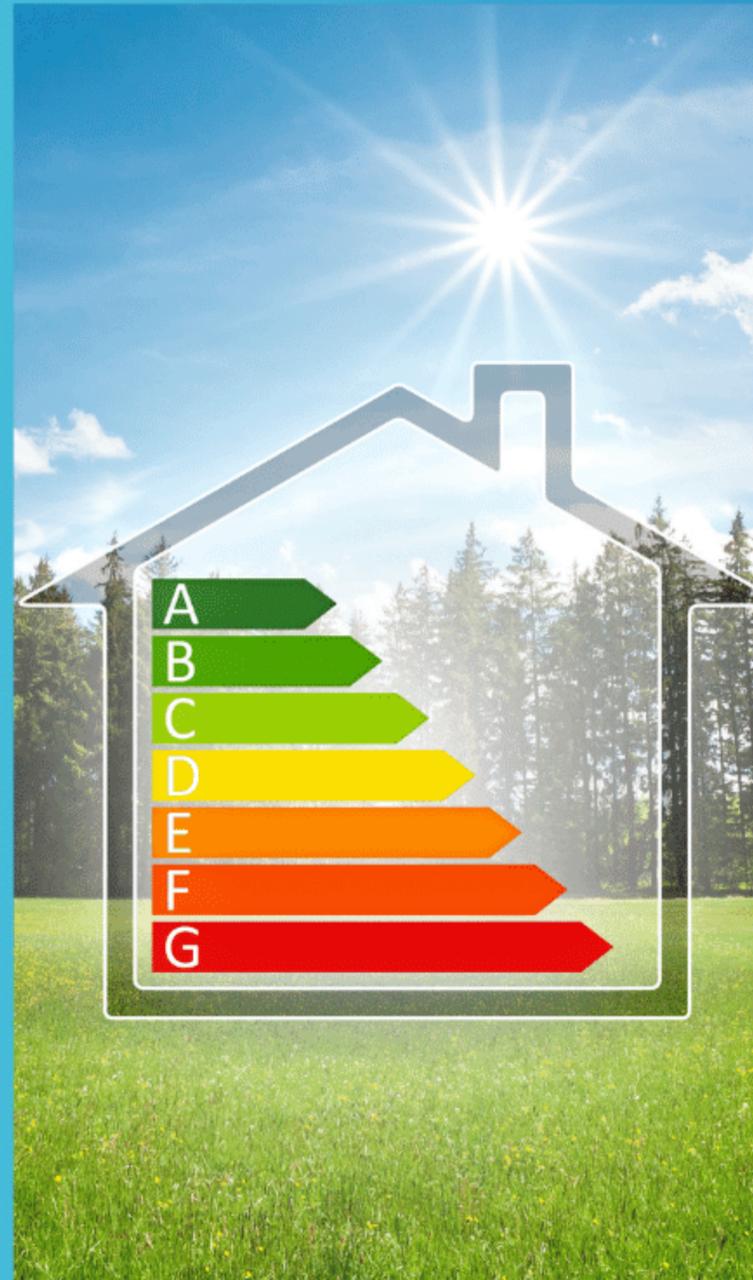
- LEED: Green Building Rating System
- Why should a LEED AP know energy modeling?
- Learning energy modeling benefits LEED APs. Why?
- What does LEED energy modeling cost?
- Economic Benefits of LEED





WHY GREEN BUILDING RATING SYSTEM

A Quantitative System to evaluate and measure the environmental impact of a building on the environment.



The U.S. Green Building Council (USGBC) developed LEED, which stands for 'Leadership in Energy and Environmental Design', to rate buildings' environmental performance and sustainability. Healthy, efficient, carbon-free, and cost-effective green buildings are supported by LEED. The US green building industry standard is used in over 160 nations.



WHY SHOULD A LEED AP KNOW ENERGY MODELING?



There are 110 possible credits for a LEED building, including all bonus points. Energy and Atmosphere Credit 1 is the single largest credit, with up to 19 points.

- Energy modeling is at the heart of sustainable building design, and its significance is paramount in the latest version of LEED.

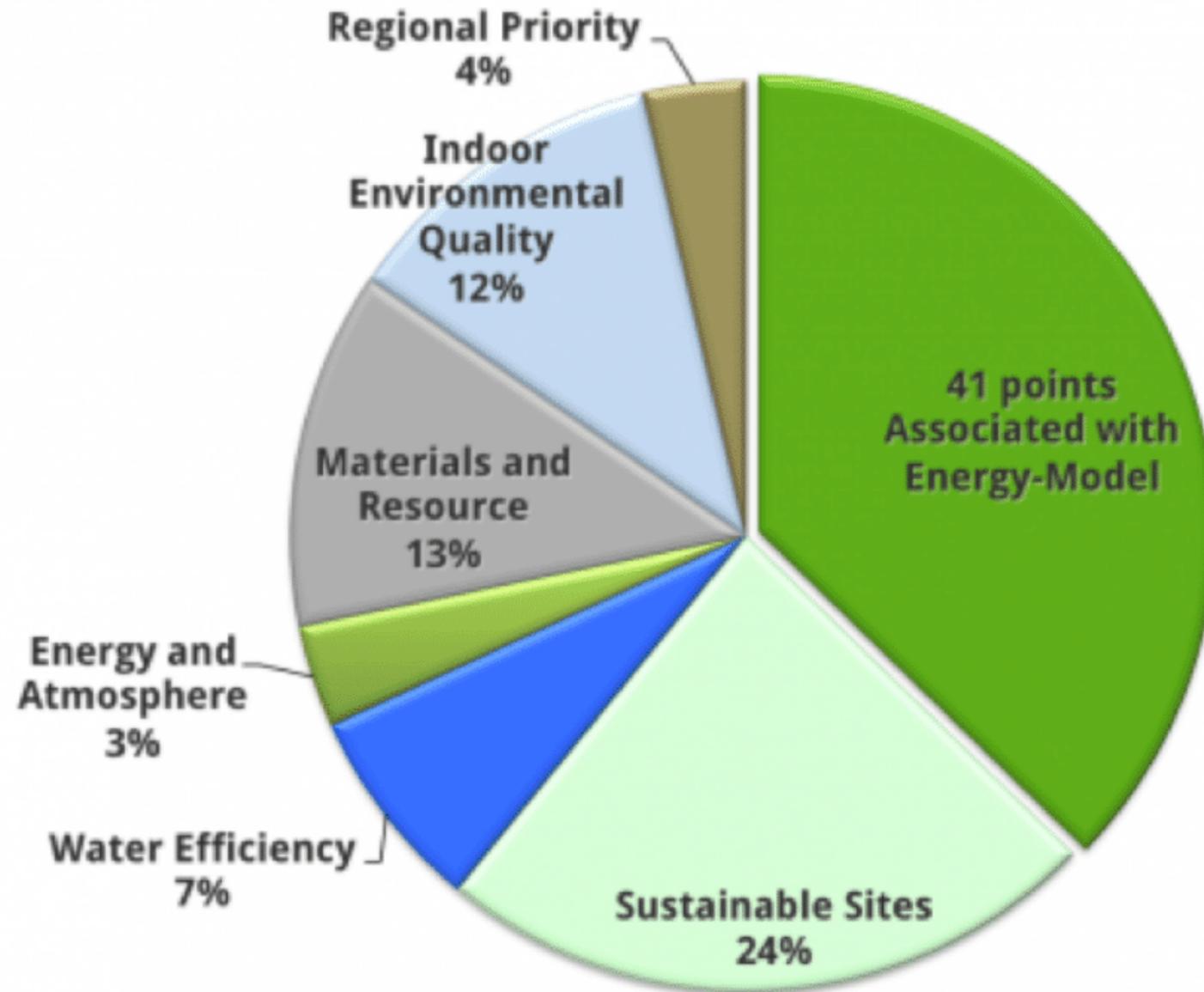
WHY SHOULD A LEED AP KNOW ENERGY MODELING?+

Some of the other points an energy model can earn you include(hover to display details):

- IDc1-2 Innovation and Design and LEED AP
- WEc2 Innovative wastewater technologies (2 points)
- EAc5 Measurement and Verification (3 points)
- EAc6 Green Power (2 points)
- EAc2 On site Renewable Energy (7 points)
- IEQc2 Increased Ventilation (1 point)



Possible LEED Points by Credit, Energy Modeling Points Grouped Together



WHY WILL IT BENEFIT A LEED AP TO LEARN ENERGY-MODELING?

- A mere fraction of the millions of LEED APs possess the knowledge and skills necessary to generate an energy model using a legitimate software application, such as TRACE 700, eQUEST OR Energy Plus, or Visual DOE 4.1.
- An even more minority possess a high level of proficiency.
- Why does this occur? Indeed, obtaining LEED training has been a relatively straightforward process thus far, while acquiring building simulation training has proven to be more challenging.





WHAT IS THE COST OF ENERGY-MODELING FOR LEED?

- Energy modeling costs \$.05/SF for larger/less complicated buildings and \$.45/SF for smaller/more complicated ones.
- Energy modeling costs depend on project size, analysis degree, building design complexity, and mechanical system complexity.
- The cost of energy modeling is disputed. Few people can generate correct models in a reasonable time, making it pricey.

GREEN BUILDING RATING SYSTEMS - BENEFITS

- Reduce energy consumption
- Reduce water consumption
- Reduce materials waste
- Reduce heat island effect
- Improve indoor air quality
- Reduce absenteeism
- Reduce Toxins in environment
- Improve productivity
- Preserve open space
- Preserve species habitat
- Improve asset value
- Increase infrastructure vitality



BUILDING ENERGY MODELING AND COMMISSIONING



- Building commissioning and energy modeling complement each other to optimize building performance and save energy.
- Energy models can identify energy savings opportunities, validate building system performance, and evaluate building performance after commissioning to help building owners save even more energy and ensure peak performance.

BUILDING ENERGY MODELING AND COMMISSIONING +

- Energy models help building commissioning optimize HVAC systems, install energy-efficient lighting, and evaluate solar panel performance.
- Thus, building owners should include building commissioning and energy modeling in any construction or renovation project.
- Combining these two processes allows building owners to reduce energy consumption and optimize performance.
- This class will examine the best energy models for building commissioning, with many examples.



COMMISSIONING THE BUILDING ENERGY MODEL

- Commissioning is a process - a systematic process of ensuring that a building performs in accordance with the design intent, contract documents, and the owner's operational needs.
- Energy models help building commissioning identify energy savings opportunities.
- Commissioning agents can use energy models to verify building system performance and energy savings.
- An energy model may estimate a 20% energy savings from a new lighting system.
- Energy modeling and building commissioning work together to improve building performance and save energy.



WHY DO WE DO AN ENERGY MODEL?

- Building owners can maximize energy savings and building performance by using energy models to identify energy savings opportunities, validate building system performance, and evaluate building performance after commissioning.
- Energy models help building commissioning optimize HVAC systems, install energy-efficient lighting, and evaluate solar panel performance.
- Building commissioning and energy modeling should be part of any construction or renovation project.





The "Commissioning of Buildings and HVAC Systems for Improved Energy Performance" task investigating the use of Whole Building Simulation in Commissioning has identified the following applications of whole building simulation in the commissioning process:

- 1) during the design process;
- 2) in the post-construction commissioning of new buildings;
- 3) design simulation for on-going commissioning;
- 4) calibrated simulation for retro-commissioning;
- 5) calibrated simulation for on-going commissioning;
- and
- 6) Simulation to evaluate the new control code

KEY FACTORS IN WHOLE-BUILDING SIMULATION FOR COMMISSIONING

- The use of whole-building simulation in commissioning is likely to be most practical in situations in which a simulation has already been performed as part of the design process or as part of an evaluation of a retrofit.
- After that, the simulation can be used to make predictions about the performance of the building, and any deviations from those predictions would indicate the need for commissioning measures to bring the building closer to the design intent.



KEY FACTORS IN WHOLE-BUILDING SIMULATION FOR COMMISSIONING+



- However, the specific comparisons that can be carried out will be dictated, at least in part, by the capabilities of the simulation model, as well as, at least in part, by the performance data that is available for comparison with the simulation.
- The majority of the time, the data from the EMCS will be used for comparison with the simulation.
- In general, we will use the simulation to evaluate either "passive testing" or "active testing," both of which we will refer to as "testing."



INTEGRATING ENERGY MODELING & BUILDING COMMISSIONING WITH EMIS TO OPTIMIZE BUILDING SYSTEM OPERATION

Integration of BEM, EMIS, and Cx provides increased accuracy of pre-handoff Cx services and more comprehensive Cx services that extend through initial post-occupancy evaluation (warranty phase) and into ongoing retro-commissioning (RCx).

- Cx and BEM-based design services can now be used to address the design performance intent.
- Integration of BEM, EMIS, and Cx provides increased accuracy of pre-handoff Cx services. Integration of BEM, EMIS, and Cx facilitates more comprehensive Cx services that extend through initial post-occupancy evaluation.





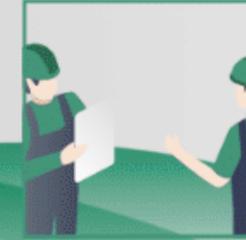
Design-Build Retrofitting

Design-build retrofitting (EPC and non/EPC) involves redesigning and replacing some or all of a building's energy systems to maximize efficiency and comfort. This service can be performed with or without support from EPC contracts.



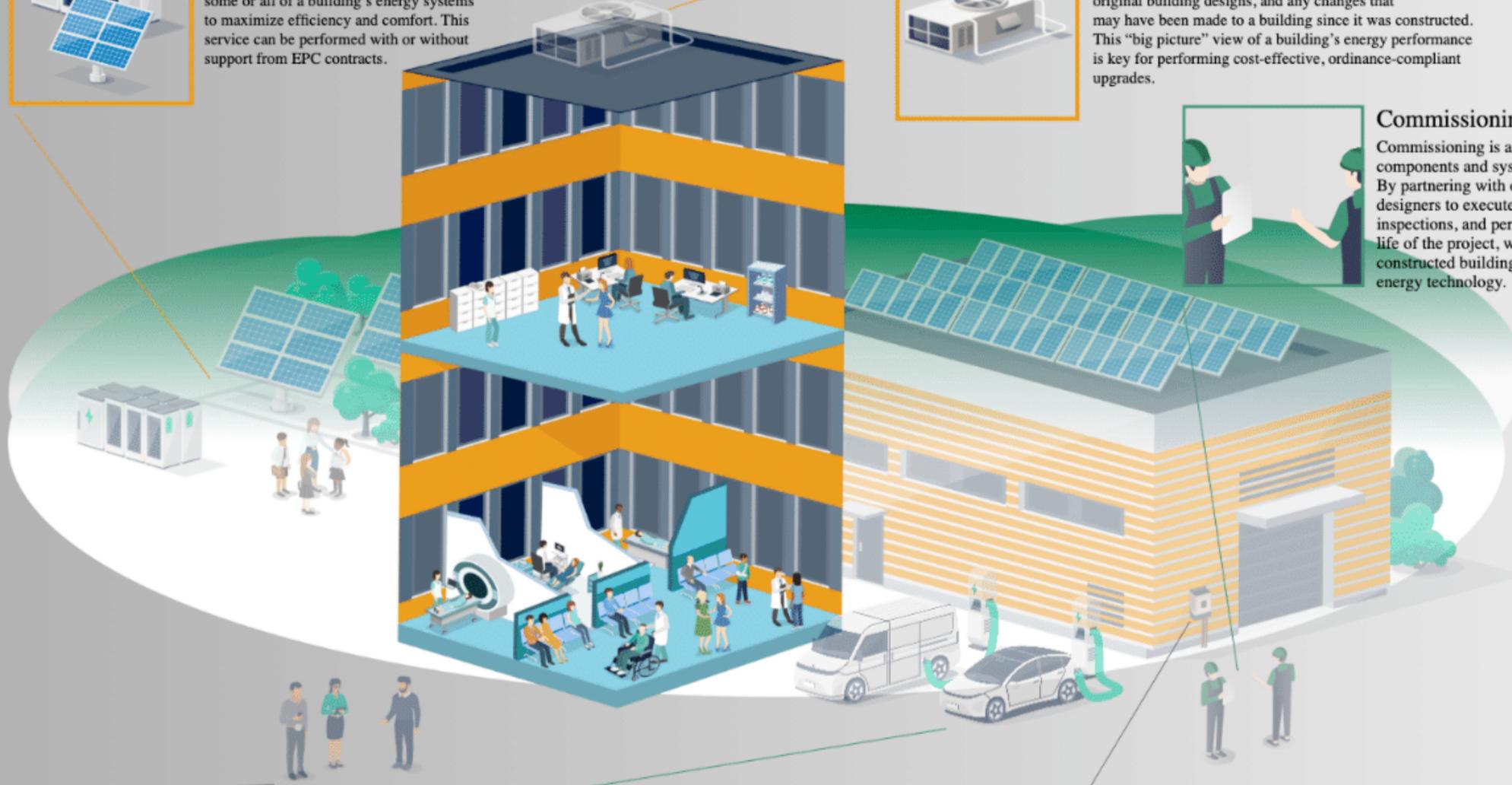
Retro-Commissioning (RCx)

RCx involves monitoring current energy performance, original building designs, and any changes that may have been made to a building since it was constructed. This "big picture" view of a building's energy performance is key for performing cost-effective, ordinance-compliant upgrades.



Commissioning

Commissioning is a process to ensure building components and systems meet the owner's intent. By partnering with owners, contractors, and designers to execute and document reviews, inspections, and performance tests throughout the life of the project, we can ensure your newly-constructed buildings contain the latest, greatest energy technology.



Energy Consulting

Virtually all of our projects start with energy consulting. We'll perform an in-depth assessment of your facilities, determine what infrastructure can be upgraded or replaced to improve efficiency, and set a timeline for your project. This process ensures we're checking all our boxes and laying out a concise framework for work to proceed.



Monitoring-Based Commissioning (MBCx)

Energy systems need regular maintenance to perform properly. MBCx allows us to monitor energy systems over time, find inefficiencies in system operations and maintain them to ensure long-lasting, cost-saving performance.



Energy Audits & Modeling

Making sense of your facility's energy use is vital for improving energy efficiency. Audits help us pinpoint wasteful energy systems, while modeling offers a look at how energy is used before, during, and after any changes to physical infrastructure.

INTEGRATING ENERGY MODELING & BUILDING COMMISSIONING WITH EMIS TO OPTIMIZE BUILDING SYSTEM OPERATION +

Improved access to BAS

- Reduced dependency on Controls Sub for BAS access
- No misrepresentation of construction status or operation

Early feedback on system operation

- Trending and fault detection begin immediately.

Holding the project team accountable for design, construction, warranty, and on-going operation

- Track corrective actions
- Verify that faults have been corrected.
- Validating building performance and Operation prior to turnover to facilities



INTEGRATING BEM AND EMIS WITH BUILDING SYSTEMS COMMISSIONING CAN PROVIDE AMORE THOROUGH ASSESSMENT OF POST-OCCUPANCY ENERGY CONSUMPTION BY ACCOMPLISHING THE FOLLOWING:

- Reduce and quantify the uncertainties implicit in any pre-occupancy EUI.model
- Accountability
- Audit or validate the drift from Design EUI into an item-by-item RCx action list.
- Assign project team accountability for addressing EU performance drift.
- Create a feedback loop to train, inform, guide, and incentivize building facilities.staff to help maintain continuous EI performance tuning via continuous RCx
- Project the future impact of selected corrective actions by the CX team.owners, facility personnel, subcontractors, and manufacturers on the wholebuilding EUI



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THANK YOU

