ENERGY MODELS.com

Instruction and Discussion for Energy Modelers

Intro to Energy Audits

Earn 1 GBCI CE Credits and PDHs.

ENERGY AUDIT MODELING

This introductory course provides an overview of the energy auditing process and focuses on how energy modeling can be used to provide accurate information to decision-makers. The goal of energy modeling for energy audits is to help make informed decisions about implementing energy efficiency improvements.

Part 1 – Energy Audit Types: ASHRAE Procedures for Commercial Energy Audits

This part provides a foundation in the building energy auditing process.

Level 1: Walk Through

- Calculate kBtu/sf and compare to similar buildings.
- Rough costs and savings for energy efficiency measures (EEMs)
- Identify larger capital projects versus smaller retrofit

Level 2: Energy Survey and Analysis

- End-Use breakdown
- Detailed analysis
- Cost and savings for EEMs
- Operations and maintenance recommendations

Level 3: Detailed Survey and Analysis

- Refined analysis
- Additional measurements
- Energy Modeling hourly simulation

Details

Unlimited
Online Access

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Video Instruction
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Earn LEED CE Hours & PDHs

For: Auditors, LEED, Architects, Materials & Equipment Sales, Engineers, Building Professionals

Part 2 – Purpose and Goals of Energy Model

This part provides an explanation of why a full energy simulation is utilized for many energy audits, and identifies the goals of the energy modeling process.

To provide accurate information so that important decisions can be made about implementing energy efficiency improvements.

- The target audience
- Clearly ranking different alternatives in financial terms
- Building the case for immediate and future investments in efficiency

Reduce the cost of the energy modeling and audit procedure so that it proves to be valuable.

- Streamline and reduce the analysis time
- Determine degree of accuracy required
- Maintain good accuracy where final results and recommendations are impacted

The cost of the audit and analysis should be considered relative to the life-cycle savings of the EEMs.

- Select modeling tool for speed advantages
- 10% error in modeling results is typically acceptable
- Focus efforts on the inputs that ensure higher levels of accuracy in regards to the EEMs
- Develop the list of potential EEMs before modeling is even started

Part 3 – Creating the Energy Model

This part discusses the key parts of the energy model, which are most important for accuracy, and how to simplify the model.

Data Collection

Known values (not all projects will be the same)

- HVAC system efficiencies and schedules
- Lighting power densities and schedules
- Controls
- Building Geometry
- Utility costs
- Window geometry and performance (hopefully!)

Roughly known values

- Ventilation rates
- Wall and roof R-values
- Weather

Unknown values (start with mid-range values)

- Plug load power and schedules
- Kitchen energy
- Infiltration
- Valve leakage

Simplify the building geometry and zoning

- Accurately model exterior wall, roof, and window areas and orientations
- Group together surfaces where possible
- Minimize number of rooms/zones

Choose a weather file

- Actual weather data vs. TMY file
- Once calibrated, weather file will have small effect on accuracy
- Keep in mind time to run each iteration (how many EEM's?)

Thoroughly check the simulation results for errors

- Peak heating and cooling loads in normal range
- Errors in data entry
- Check occupancy and other schedules
- Refer to course titled: "Matching Existing Models"

Calibrating the Energy Model--Energy not Dollars

This part discusses the importance of calibrating the energy model, the general do's and don'ts which are most important for accuracy, and what type of results we are looking for. This section of the course overlaps with the course titled "Matching Existing Models" which covers this topic in much more detail than described here.

Keep the original goals in mind when choosing which inputs to modify

- Only the unknown or roughly known values can be varied
- EEMs should not be dependent on values modified
- Usually focus on high accuracy in the HVAC and Lighting inputs

Compare energy model results to actual monthly utility bills

- Looking for similar shape of curve between actual and simulated
- Review occupancy schedules
- Refer to course titled "Matching Existing Models"

Choose values to calibrate each utility independently, possible choices:

- Plug loads for electricity
- Infiltration for gas (heating)

Modify only one value at a time between each iteration for calibrating

Part 5 – Simulating Energy Efficiency Measures (EEMs)

This part describes the process of modeling each different energy reduction recommendation. Once we have an accurate and calibrated energy model, we start getting results of how much energy we can expect to save.

Input current utility rates

- Enter exact rate schedules
- Include demand charges and variations throughout the year

Set up each EEM as an individual simulation or alternative and compare it to the baseline

- Typically 10 to 30 different recommendations are evaluated

Use various files (save as) and only change one thing at a time

- Stay organized

Some EEMs may be discarded at this point if savings are not going to payback

After all EEMs are evaluated individually, a combination of all recommendations can be simulated to consider synergistic effects.

- Some recommendations may be mutually exclusive, like different options to improve the same system Quiz

Part 6 – Reporting the Economic Results

This part discusses how to explain the results of the energy modeling. Each different energy reduction recommendation will be described in a report and assigned some economic feasibility numbers. This is how all of our work will be presented in a useable format for others to make important investment decisions.

First a cost estimate for implementing each EEM will need to be calculated

- Estimating references
- Getting actual price quotes
- Level of accuracy in pricing

Energy cost escalation rates

Operations and Maintenance costs

Life Cycle of equipment

Useful economic measures

- Simple Payback
- Life-cycle net present value
- Return On Investment