Purpose

• Basics of energy modeling simulations
• Benefits and uses of various programs
• Summary of available software tools
• Considerations for Affordable Housing
What is Energy Modeling?

Software simulation programs that take the building geometry, construction materials, insulation & mechanical systems, to combine with local weather conditions to develop custom estimates for energy use over time.

Consider:
- Load Calculations consider only the worst case scenario to determine maximum size of equipment
- Energy Modeling considers all interactions throughout the entire year to generate hourly simulations of energy use
New Construction Program Compliance
Evaluate new buildings for program compliance such as Energy Star, LEED, or Passive House.

Existing Buildings Retrofits
Evaluate existing builds energy use to evaluate energy savings opportunities

Decision Making
Assist in optimum decision making for energy efficiency for features such as insulation levels, mechanical systems, & building orientation.

What is Energy Modeling?
Various uses & applications for energy modeling
Programs

Simple Heat Loss
USES: Quick decision making
SOFTWARE: Excel

Energy Auditing
USES: Energy improvement evaluations on existing buildings
SOFTWARE: TREAT

HERS Rating
USES: Homes & Low Rise Multifamily Energy Star Homes Certification
SOFTWARE: REM/Rate

ASHRAE 90.1 Appendix G
USES: Whole building energy simulations Energy Star High Rise Certification
SOFTWARE: eQuest, Trane TRACE, Carrier HAP

Passive House
USES: Super low load buildings Passive House Certification
SOFTWARE: WUFI & PHPP
Benefits

- Quick to create, provides instant feedback
- Available at the time of decision making

Limitations

- Based on individuals experience
- Lack of detail can lead to over or underestimating savings
- Rarely done at the time of greatest need
Benefits

- Calibrates to existing utility bills
- Evaluate energy efficiency upgrades
- Determine cost effective strategies

Limitations

- Not applicable to new construction
- Not used in many certification programs
- Time consuming to evaluate simple retrofit options
Benefits

- Dedicated to homes & multifamily low rise
- Used by most state utility companies to demonstrate energy savings for new construction
- Recognized by Energy Star, LEED, Enterprise Green Communities
- Robust network of HERS Raters, fees reasonable

Limitations

- Does not include common areas, simple single zone analysis
- Does not provide realistic utility estimating, especially for multifamily/senior
- Methods designed for single family homes
Benefits

- Handles complex mechanical & building configurations
- More detailed inputs for nearly everything, lighting, fans, pumps, etc.
- Recognized by Energy Star, LEED, Enterprise Green Communities for high rise projects (6+ stories, sometimes 4-5 stories)

Limitations

- Costly to create, experience needed, usually created by a PE
- Created late in the design process after many major decisions already made
- Outputs not easy to understand, made for Engineers
Passive House
WUFI, PHPP

Benefits
- Module for thermodynamic modeling of building assemblies (i.e. will walls create moisture problems)
- Very detailed envelope inputs for super insulated buildings

Limitations
- Time consuming to create
- Does not handle cooling loads well, separate engineering load calculation needed for equipment sizing
- Typically single zone analysis for building envelope only
Affordable Housing Considerations

• Utility costs savings are vitally important for low income residents & long term building owners/operators

• Affordable Housing driven largely by compliance to obtain funding

• Energy modeling and efficiency usually brought into projects through programs (Utility Incentives, Energy Star, LEED, Passive House)

• Need better utility cost data to better inform utility estimates for high performance buildings
Summary

• Energy simulations are important for comparing energy efficiency options

• Consider cost and time to create vs. information gained

• Energy models used for program compliance don’t always provide realistic utility estimates

• Avoid information overload, work with partners who can condense information to help make decisions
Questions?