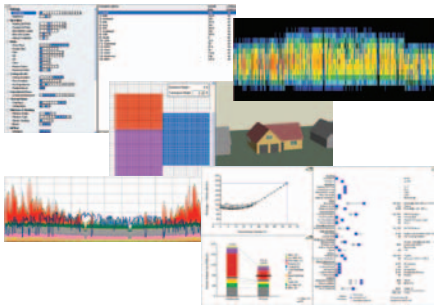
NREL Highlights RESEARCH & DEVELOPMENT

New Version of BEopt Software Provides Analysis Capabilities for Existing Homes

National Renewable Energy Laboratory (NREL) researchers enhanced this building energy optimization tool to analyze existing homes and identify upgrade packages that achieve specified energy efficiency levels at the lowest possible cost.



A new version of NREL's Building Energy Optimization (BEopt) software has been developed with significantly expanded capabilities to analyze energy efficiency upgrades for existing homes. Like the original BEopt software—developed for analysis of new construction homes targeting zero net energy—the new version identifies cost-optimal residential building designs at various levels of energy savings, based on simulations driven by hour-by-hour heat transfer, typical weather data, and standard occupants.

BEopt has been used extensively in the U.S. Department of Energy's Building America program to direct research, assess emerging technologies, evaluate innovative prototype buildings, and estimate energy savings potential.

For analysis of existing homes, the new version allows modeling of a wide range of energy efficiency upgrades and their corresponding retrofit costs (including removal, disposal, and re-installation). Also, while heating and air-conditioning (HVAC) equipment down-sizing cost benefits can materialize in conjunction with building improvements at the time of new construction, BEopt's costing algorithm has been modified to consider such cost benefits for retrofits only if and when the HVAC system is being replaced.

To account for the fact that existing homes can include equipment and materials of different ages, BEopt's economic calculations have been modified to handle remaining equipment life. In addition, BEopt now accommodates the use of minimum standard equipment—when an existing component (e.g., an air conditioner) fails, it must be replaced by a more efficient component (e.g., SEER 13) per federal standards or local codes. A minimum upgrade reference scenario is defined for simulation of such future equipment replacements in BEopt.

Retrofit financing calculations were added for short-term loans or cash payments, as opposed to long-term mortgages for new construction. The calculations include a new life-cycle cost metric, allowing energy savings or fuel costs, for example, to change over time.

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Reference: Building Energy Optimization Software. U.S. Department of Energy Building America website. *www.buildings.energy.gov/building_america/building_energy_optimization.html*

Key Research Results

Achievement

NREL extended the BEopt software tool—originally developed as an optimization software tool for analysis of new construction homes on the path to zero net energy—to include new analysis capabilities to address specific issues in the analysis of older, existing homes.

Key Result

The new version of BEopt provides capabilities to perform detailed simulation-based analysis and optimization using specific house characteristics (including variation by vintage) and location (including climate and utility rates) for existing homes.

Potential Impact

For the existing homes sector (116 million households), the new software provides stakeholders (national, state and local government entities, utilities, and retrofit companies) with a sound technical basis for program planning, identifying optimal strategies, and evaluating cost-effectiveness of specific energy efficiency upgrades. Note: the current software addresses single-family-detached housing; work is underway to allow modeling of attached and multi-family housing.

NREL
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NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

NREL/FS-5500-51416 • May 2011

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