

Quick Facts

Buildings account for a staggering 40% of energy use in the United States.

Building codes serve as the baseline for the least energy-efficient building an owner can construct. NREL's energy-saving recommendations can help design firms and construction companies achieve the highest practical level of energy savings in the buildings they design and build.

Energy-efficiency measures employed to cut energy costs in half included: reducing lighting power density; adding occupancy sensors in infrequently used spaces; day-lighting; providing control of plug-in devices; combining high-performance walls, roofs, doors, and windows; and installing high-efficiency equipment for heating, ventilating, and air conditioning.

The Advanced Energy Design Guides had a significant impact on the town of Greensburg, Kansas. After a 2007 tornado leveled nearly the entire town, DOE and NREL helped the town leaders create a newer, more efficient Greensburg. The whole town was rebuilt and able to achieve 50% energy savings.

The guides are an on-going attempt to promote improvements in energy efficiency and are generated in collaboration with the American Society of Heating, Refrigerating, and Air-Conditioning Engineers; the American Institute of Architects; the Illuminating Engineering Society of North America; and the U.S. Green Building Council

NREL Recommends Ways to Cut Building Energy Costs in Half

Building designers and operators could cut energy use by 50% in large office buildings, hospitals, schools, and a variety of stores—including groceries, general merchandise outlets, and retail outlets—by following the recommendations of researchers at the National Renewable Energy Laboratory (NREL). The innovative energy-saving recommendations are contained in technical support documents (TSDs) and Advanced Energy Design Guides (AEDG) compiled by NREL with support from the U.S. Department of Energy (DOE), under the direction of DOE's Building Technologies Program.

The technical reports analyze buildings in 16 cities that represent all the climate zones in the United States. NREL researchers used EnergyPlus, a whole-building energy simulation software, to model the energy performance of both the baseline buildings and the proposed low-energy buildings to verify that 50% net site energy savings can be achieved.

The reports also indicate regional variations in energy savings. For example, although the TSD for large hospitals found that 50% energy savings can be achieved across all eight U.S. climate zones (ranging from Miami, Florida, to Fairbanks, Alaska), the smallest savings were in humid climates and extremely cold climates, while the largest energy savings were achieved in marine climates.

Three of the NREL TSDs provide the basis for the 50% Advanced Energy Design Guide (AEDG) books. These user-friendly guides are the second part of a series aimed at promoting energy efficiency. The AEDGs expand upon the information archived in the technical reports, and offer strategies, constructive tips, and examples on how to deploy the research to make efficiency gains.

The three 50% ADEGs cover K–12 schools, medium–big box retail stores, and large hospitals. The AEDGs are written for owners, design teams, and contractors—the professionals who will be constructing these buildings. If they don't have experience in energy efficiency, they can look to these guides for examples and details on how to do it themselves.

The guides have recommendation tables for all climate zones in the United States, and the potential impact for the ADEGs is significant: there are roughly 450,000 copies currently in circulation. The full series of AEDGs is available as a free download at www.ashrae.org/aedg.

The AEDGs provide tools to make the new buildings more energy efficient, with even greater opportunities when it comes to deep retrofits—and the recommendations in the guides can apply to both.

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Greensburg, Kansas, now has nine buildings that use less than half of the energy of a standard building of its type, including this school, the city hall, the county hospital, and the biggest employer in town, the John Deere dealership.
Photo by Dennis Schroeder, NREL 21763

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