

Building Technologies Program Planning Summary

Introduction

The U.S. Department of Energy's (DOE) Building Technologies Program (BTP) works in partnership with industry, state, municipal, and other federal organizations to achieve the goals of marketable net-zero energy buildings. Such buildings are extremely energy efficient, ideally producing as much energy as they use over the course of a year. BTP also works with stakeholders and federal partners to meet any remaining energy needs for their buildings through on-site renewable energy systems.

Drivers

Population growth and economic expansion, along with an accompanying increase in energy demand, are expected to drive energy consumption in buildings to more than 50 quadrillion Btu (quads)¹ over the next two decades—further compounding the sector's impacts on U.S. electric transmission and distribution systems, the environment, and our national and economic security. With the President's National Energy Policy and legislation such as the Energy Independence and Security Act of 2007, BTP has taken on the mission to support high performance, green building activities that will lead to “reliable, affordable, and environmentally sound energy for America's future”—and help minimize the environmental and economic impacts from energy consumption in buildings.

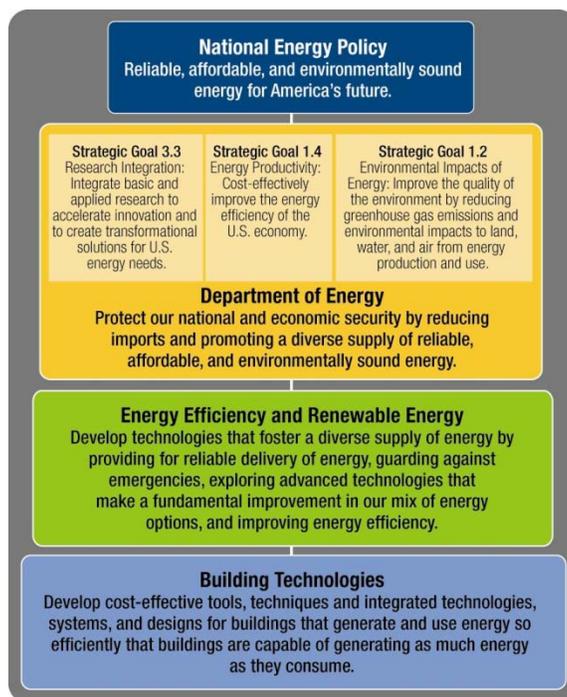


Figure 1. The goals of the Building Technologies Program are developed to support the U.S. Department of Energy's goals as well as the National Energy Policy

¹ *Annual Energy Outlook 2007 with Projections to 2030*. Energy Information Administration, DOE/EIA-0382 (2007), February 2006. [http://tonto.eia.doe.gov/ftproot/forecasting/0383\(2007\).pdf](http://tonto.eia.doe.gov/ftproot/forecasting/0383(2007).pdf), accessed August 2009.

To carry out its mission, BTP involves builders; appliance, window, lighting, operational systems, and component manufacturers; and end users in setting the program’s research priorities. These groups advise and help guide BTP through implementing, deploying, and standardizing new technologies, equipment, and processes being developed and tested in DOE’s national laboratories and in real-world applications in many U.S. communities.

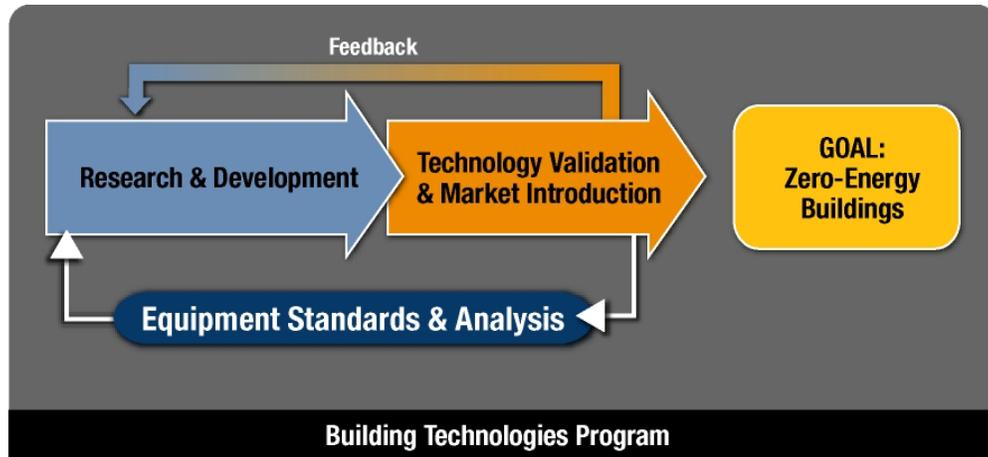


Figure 2. The various efforts of the Building Technologies Program all work together to support the goal of net-zero energy buildings

Analysis and Portfolio

BTP analysts estimate that technologies developed through the program could result in annual energy savings of about 8.5 quads by 2025—equivalent to the annual primary energy consumption of the state of California. Innovations in energy efficiency for residential and commercial building envelopes and structures, equipment, appliances, lighting, and windows, in conjunction with standardization and advances in renewable energy systems, could stabilize total primary energy consumption in the buildings sector to just below 2009 consumption levels by 2025.²

In determining the priorities and direction of its portfolio, BTP analyzes every aspect of residential and commercial buildings technologies and markets. Program personnel work toward the development and market integration of net-zero energy and high performance building technologies that optimize the interactions among commercial and residential building systems and components—reducing energy consumption and helping to meet our national goals for sustainable development, environmental protection, and energy security.

BTP’s partnerships with industry, stakeholders, and end users help guide and prioritize research, development, and deployment efforts and validate new and improved technologies through programs such as:

- Building America

² Pacific Northwest Laboratory. *Lost Opportunities in the Buildings Sector: Energy-Efficiency Analysis and Results*, PNNL-17623, September 2008.

- Net-Zero Energy Commercial Building Integration
- EnergySmart Schools
- EnergySmart Hospitals
- ENERGY STAR[®]
- Energy Codes
- Equipment Standards and Analysis

Multi-Year Program Plan

The BTP Multi-Year Program Plan (MYPP) describes the planned research, development, and demonstration activities BTP has taken on or plans to conduct from 2008 through 2012.³ The plan presents the program's goals and milestones for developing and demonstrating cost-effective technology solutions to save energy and reduce carbon emissions within the U.S. buildings sector. The MYPP also represents months of planning, including tough-minded peer reviews and rigorous internal evaluations, as well as a thorough examination of key opportunities offered by the program's external partners.

BTP's MYPP establishes the goals and benefits described in the sections that follow.

Strategic Goals

The program has set strategic goals to create technologies and design approaches that enable net-zero energy buildings at low incremental costs by 2025. A net-zero energy building is a residential or commercial building with greatly reduced needs for energy through efficiency gains (60% to 70% less than conventional practice), with the balance of energy needs supplied by renewable technologies. The efficiency gains will have application to buildings constructed before 2025, resulting in a substantial reduction in energy use throughout the sector.

Performance Goals and Benefits

The following key technology pathways contribute to achieving BTP's strategic goals of improving energy efficiency and incorporating renewable power technologies as part of the whole building infrastructure:

Research and Development

- Residential Buildings Integration: BTP will furnish the energy technologies and solutions to reduce energy use in new prototype residential buildings by 70%. These technologies and solutions, when combined with on-site energy technologies, will result in net-zero energy homes by 2020 and, when adapted to existing homes, will significantly reduce their energy use. By 2010, the program will develop, document, and disseminate cost-effective technology packages that achieve an average 40% reduction in whole house energy use.

³ *Buildings Technology Program: Planned Program Activities for 2008–2012.*
<http://www1.eere.energy.gov/buildings/mypp.html>, accessed August 2009.

- **Commercial Buildings Integration:** By 2010, BTP, in collaboration with industry, will develop, document, and disseminate a complete set of technology packages that give builders energy efficient options to help them achieve a 30% reduction in the purchased energy use in new and small- to medium-sized commercial buildings (relative to American Society of Heating, Refrigerating, and Air-Conditioning Engineers [ASHRAE] Standard 90.1-2004). Program representatives will also complete an initial set of technology options that establishes a basis for achieving a 50% energy use reduction in commercial buildings.
- **Emerging Technologies:** The program will accelerate the introduction of highly efficient technologies and practices for both residential and commercial buildings by conducting research and development on advanced lighting, building envelope, window, space conditioning, water heating, and appliance technologies. In the area of solid state lighting, the program goal is to achieve lighting technologies with double the efficiency of today's most efficient lighting sources.

Equipment Standards and Analysis

- To increase the minimum efficiency levels of buildings and equipment, the program will continue to develop codes, standards, and guidelines that are technologically feasible, economically justified, and save significant amounts of energy. By 2010, BTP will issue several formal proposals, consistent with enacted laws, for enhanced product standards and test procedures.

Technology Validation and Market Introduction

- The Building Energy Codes subprogram activities will support the development and implementation of energy-efficient building codes to increase the construction of more efficient residential and commercial buildings.
- The goal of BTP's Commercial Lighting Initiative is to spearhead a visible public campaign challenging commercial building owners to improve their building lighting efficiency by at least 30% using a combination of commercially available but underutilized technologies, lighting controls, expert lighting design, and integrated systems.
- Through the EnergySmart Schools subprogram, BTP aims to increase the use of energy-efficient technologies and strategies to achieve 30% energy savings in existing K-12 schools and 50% energy savings in new schools or major renovations or additions.
- BTP's EnergySmart Hospitals subprogram goals include providing technical guidance, education, and financing tools to increase construction of energy-efficient buildings.
- The program will support the Solar Decathlon, a high-profile university competition held biannually in Washington, D.C., that promotes public awareness of highly efficient building technologies and net-zero energy homes that use renewable energy technologies.
- BTP will partner with the Environmental Protection Agency to help accelerate the adoption of clean and efficient domestic energy technologies through ENERGY STAR[®] activities. By 2010, the program's goal is to increase the market

penetration of ENERGY STAR labeled windows to 65% (from a 2003 baseline of 40%), and maintain a 28% market share for ENERGY STAR appliances.