

Building Technologies Program

Planned Program Activities for 2008-2012



U.S. Department of Energy
**Energy Efficiency
and Renewable Energy**

Bringing you a prosperous future where energy
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List of Acronyms

AC/HP: Air Conditioner/Heat Pump

AEO: Annual Energy Outlook

AET: Appliances and Emerging Technologies

AIA: American Institute of Architects

AOP: Annual Operating Plan

ARI: Air-Conditioning and Refrigeration Institute

ASERTTI: Association of State Research and Technology Transfer Institute

ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers

BED: Building Energy Data Book

BEopt: Building Energy Optimization Tool

BT: Building Technologies Program

BTS: Office of Building Technology, State and Community Program

CBECs: Commercial Buildings Energy Consumption Survey

DEER: Distributed Energy and Electric Reliability

DOE: Department of Energy

ECPA: Energy Conservation and Production Act

EERE: Office of Energy Efficiency and Renewable Energy

EIA: Energy Information Administration

EPA: Environmental Protection Agency

EPACT 2005: Energy Policy Act of 2005

EPACT: Energy Policy Act of 1992

EPCA: Energy Policy and Conservation Act of 1975

EPRI: Electric Power Research Institute

FEMP: Federal Energy Management Program

FTC: Federal Trade Commission

GPRA: Government Performance Results Act of 1993

GRI: Gas Research Institute

HUD: Housing and Urban Development

HVAC: Heating, Ventilation, Air Conditioning

ICC: International Code Council

IECC: International Energy Conservation Code

IESNA: Illuminating Engineering Society of North America

LEED: Leadership in Energy and Environmental Design

MEC: Model Energy Code

NAECA: National Appliance Energy Conservation Act of 1987

NBI: New Building Institute

NC3: New Commercial Construction Characteristic

NEMS: National Energy Modeling System

NEP: National Energy Policy

NETL: National Energy Technology Laboratory

OBCS: Office of Buildings and Community Systems

PATH: Partnership for Advanced Technology in Housing

PV: Photovoltaic

R&D: Research and Development

RESNET: Residential Energy Services Network

RO: Regional Office

SDHV: Small Duct High Velocity

TD: Technology Development

TVMI: Technology Validation and Market Introduction

WIP: Weatherization and Intergovernmental Program

ZEB: Zero Energy Buildings



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Executive Summary

The next five years, as outlined in this Building Technologies Program (BT) Multi-Year Program Plan (MYP), will be an important time in improving the performance of the Nation's buildings. Increasing the energy efficiency of residential and commercial buildings leads to increased energy conservation by reducing the rate of consumption of oil, natural gas, and electricity. The reduction in energy consumption decreases America's vulnerability to energy supply disruptions and energy price spikes. With our Nation's annual energy bill for residential and commercial buildings reaching \$370 billion in 2005, the economic impacts of lowering energy use can be enormous.¹

In support of the President's policies and initiatives, BT has embraced the strategic goal of developing net-zero energy buildings (ZEBs) to reduce national energy demand. We have defined our strategic goal as:

To create technologies and design approaches that enable net-zero energy buildings at low incremental cost by 2025. A net-zero energy building is a residential or commercial building with greatly reduced needs for energy through efficiency gains, with the balance of energy needs supplied by renewable technologies. These efficiency gains will have application to buildings constructed before 2025 resulting in a continuous contribution to substantial reduction in energy use throughout the sector.

Through three main areas of activity, the BT Program is structured to achieve this goal. The areas are: Research and Development (R&D), Equipment Standards and Analysis, and Technology Validation and Market Introduction (TVMI). While initially focused on new construction, these technologies and design approaches will have application to the buildings constructed before 2025. Important breakthroughs include the development of integrated design approaches to ZEB, as well as technology breakthroughs such as solid state lighting and electrochromic windows. Also critical is the promulgation of minimum performance standards for appliances and equipment, per the new Energy Bill. Our proven history of success, coupled with focusing of our R&D and resources through tough-

¹ 2007 Building Energy Data Book, U.S. Department of Energy, Office of Planning, Budget Formulation and Analysis, Energy Efficiency and Renewable Energy. Prepared by D&R International, Ltd., September 2007.

mindful peer review, and the identified technology pathways discussed in this MYP, position BT well for achieving the strategic goal. Additionally, BT is working with major private entities through Building America, as well as the National Alliances and Accounts the competitive solicitation process, which results in significant cost-sharing by industry, a clear vote of confidence.

In order to reach the net-zero energy buildings goal by 2025, a series of intermediate goals in each area must be achieved. The following intermediate goals are expected to be achieved in the next five years:

Research and Development:

- Develop low-cost (target \$20/ft² in 2010), durable (measured by number of cycles to failure, per ASTM standard) prototype dynamic window
- By 2010, develop solid state lighting with efficacy of 160 lumens per watt in a laboratory device
- By 2010, develop technologies and design strategies that can achieve an average of 40 percent reduction in whole house energy use for new residential buildings
- By 2010, develop technologies and design strategies that can achieve an average of 30 percent reduction in purchased energy use for new, small commercial buildings

Equipment Standards and Analysis:

- By 2008, complete energy conservation standard final rule for packaged terminal air conditioners and heat pumps
- By 2008, complete determination for battery chargers and external power supplies
- By 2009, complete energy conservation standard final rules for incandescent reflector, fluorescent, and incandescent general service lamps, and also residential dishwashers, ranges and ovens/microwave ovens, residential dehumidifiers, and commercial clothes washers

- By 2010, complete energy conservation standard final rules for residential water heaters, direct heating equipment, and pool heaters and also small motors
- By 2010, complete determination for high-intensity discharge lamps
- By 2011, complete energy conservation standard final rules for electric motors (1-200 HP), fluorescent lamp ballasts, residential clothes dryers, room air conditioners, and residential central air conditioners and heat pumps

Technology Validation and Market Introduction:

- By 2010, increase the market penetration of ENERGY STAR[®]-labeled windows to 65 percent (40 percent, 2003 baseline), and maintain 28 percent market share for ENERGY STAR appliances

BT has arrived at this technology portfolio, as demonstrated in this MYP, through rigorous internal evaluations, using objective criteria, as well as examining key opportunities offered by external partners, including industry, universities, and other government agencies. By bringing together relevant stakeholders, BT has been able to build the critical mass necessary to address many of the barriers to increasing the energy efficiency of buildings and equipment. The path to ZEB outlined by BT will show continuous demonstrated success, focusing on incremental steps (such as 30 percent and then 50 percent for homes) and a series of technical targets.