

Buildings and homes use more than 73% of the electrical energy consumed in the United States. They also consume 40% of the nation’s total energy, with an annual energy bill of \$430 billion. These energy bills can be cost effectively reduced by 20%–50% or more through various energy-efficient technologies and techniques. The Building Technologies Office (BTO) will continue to develop and demonstrate advanced building efficiency technologies and practices to make buildings in the United States more efficient, affordable, and comfortable.

### What We Do

The Building Technologies Office (BTO) cuts energy costs for consumers and businesses through:

- ✓ **Research and Development (R&D)** of innovative, energy-saving technologies that transform the building energy landscape.
- ✓ **Technology-to-Market** activities that remove market barriers, making it easier for consumers and businesses to access and adopt energy-saving technologies and data.
- ✓ **Codes and standards** that lower energy costs for all Americans, while driving further technology innovation.

### Program Goals/Metrics

**Goal:** Reduce the U.S. building sector’s energy use per square foot by 30% by 2030, relative to 2010, with a long-term goal of achieving a 50% reduction.

**Impact:** By achieving the 2030 goals, the U.S. would lower energy use by 5%, mitigate 450 million metric tons of carbon dioxide emissions, and save consumers and businesses over \$100 billion in annual energy costs.

### FY 2017 Priorities

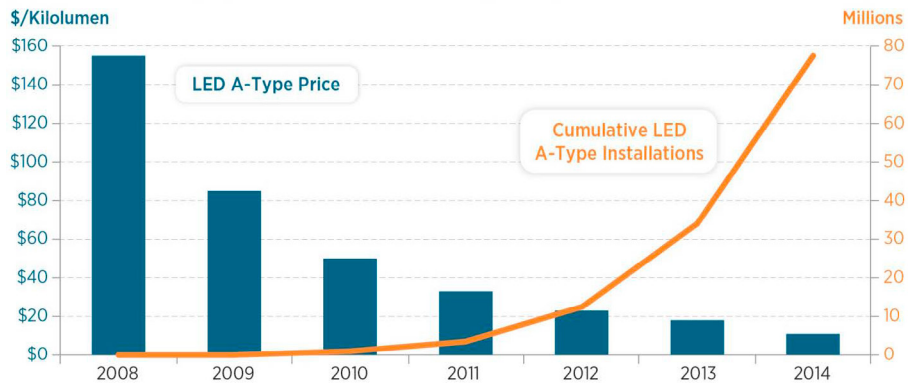
- Launch a **Low-Global Warming Potential (GWP) Advanced Cooling R&D** initiative to establish the U.S. as the global leader in manufacturing next-generation HVAC systems, taking advantage of the enormous energy savings and GHG reduction potential in the sector. This R&D will deliver revolutionary new technologies that transform how we’ve heated and cooled our buildings for the past 100 years, spurring an entirely new market.
- Reduce the rapidly growing fraction of building energy usage coming from **Miscellaneous Electrical Loads**. This includes consumer electronics and small appliances that incorporate advanced power electronics like sensors and controls, which ultimately enable a holistic system-wide approach to intelligent building efficiency.
- Advance DOE’s **Grid Modernization Initiative** through R&D to improve automated controls, interoperable systems, and data analytic tools that will allow buildings to share information with each other and with the grid at large scale while reducing utility costs.
- Create a **Metropolitan Systems Initiative** that enables U.S. cities to achieve their economic, environmental, and energy targets. This can be achieved through new sensing, communication, and computation technologies that integrate measurement and data sources with advanced analytics to create actionable information for local decision-makers.
- Conduct **Decision Science R&D** to better understand consumer needs and preferences when purchasing new technologies, allowing DOE to better direct R&D investments toward energy efficient technologies that consumers are likely to adopt and use, ultimately helping them capture their full cost savings potential, while spurring a larger national energy reduction.

(Dollars in Thousands)	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Requested
Emerging Technologies	\$55,740	\$85,915	\$169,000
Commercial Buildings Integration	\$27,643	\$32,000	\$28,000
Residential Buildings Integration	\$22,758	\$23,000	\$23,000
Metropolitan Systems	\$0	\$0	\$15,000
Equipment Standards and Building Codes	\$53,359	\$57,485	\$54,000
Penn State Consortium for Building Energy Innovation	\$10,000	\$0	\$0
NREL User Facility	\$2,500	\$2,100	\$0
<b>Total, Building Technologies</b>	<b>\$172,000</b>	<b>\$200,500</b>	<b>\$289,000</b>

## Key Accomplishments

- Solidified U.S. as Global Leader of LED Manufacturing and Innovation:**

LED bulbs now use 85% less energy than incandescents, while their costs have dropped 90% since 2008—a direct result of government-industry partnerships. Consequently, installations of home LED bulbs increased from 400,000 in 2009 to 78 million in 2014. Total LED installations saved consumers \$1.4 billion in energy costs and prevented 7.1 million metric tons of CO2 emissions in 2014 alone.



- Commercialized Energy-Saving, Climate-Friendly Refrigerant for U.S. Supermarkets:**

Honeywell, in partnership with Oak Ridge National Laboratory, commercialized a new refrigerant for supermarkets that reduces greenhouse gas emissions by 67% and cuts energy consumption by 10% compared to standard refrigerants. More than 37,000 supermarkets could immediately benefit from this drop-in replacement.

- New Efficiency Standards Will Save Consumers Billions:**

The Energy Department finalized a historic standard in FY 16 for commercial air conditioners and furnaces that will vastly expand the availability of efficient units, saving businesses more than \$167 billion in electricity bills over 30 years, while cutting carbon pollution by 885 million metric tons.

- Developed a Revolutionary Water Heater to Usher In New Era of Super-Efficient, Zero-GWP Technologies:**

A small business partner, Xergy, Inc., developed the first electrochemical compressor for home water heaters—the first in a new generation of technologies that transform how heating and cooling have operated for the past 100 years. By using water as the working fluid, instead of harmful refrigerants, it can operate with low global warming potential. If widely adopted, the technology can deliver energy savings equal to the electricity used by 24 million homes a year.

- Quantified Actual Consumer Energy Savings from Building Codes:** Five states completed a baseline field study in 2015 to identify the energy savings potential from building standards in newly built single-family homes. The results indicate that builders are overall meeting energy targets, but homeowners could receive significant additional energy savings. The states will now initiate training programs for builders to determine if they can increase homeowners' savings.

- Expanded Access to High Efficiency Commercial Air Conditioners:**

BTO's Advanced Rooftop Unit Campaign has spurred more than 200 public and private sector organizations to upgrade 43,000 units with high-efficiency replacements or advanced controls since 2013, saving them \$37 million, or 4 trillion BTUs of energy.

- Saved American Households Money on Energy Bills:**

The Better Buildings Residential and Home Performance with ENERGY STAR programs have retrofitted more than 550,000 homes across the country, saving households up to 25% on their annual energy bills, while increasing residents' health and comfort.