

Chapter 7: ZERO CARBON BUILDINGS

BACKGROUND

- Residential and commercial buildings use nearly 40 percent of U.S. energy and are responsible for 38.5 percent of U.S. greenhouse gas emissions.¹ The U.S. Energy Information Administration projects that larger buildings and more appliances will be major contributors to rising energy consumption and greenhouse gas emissions in the years ahead – if we continue business as usual.
- Homes have been growing steadily in size. New homes in 2005 were 26 percent larger on average than the existing stock. Residential energy use has increased by one third since 1980.
- National building stock turns over at approximately 2 percent per year. This means most buildings built today will still be in use 50 years from now. Many energy-consuming building components can be easily retrofitted. Retrofitting walls and windows with better insulating options is also cost effective in many areas.
- Under current energy market circumstances, by 2020 energy efficiency could be cost-effectively improved by a median average of 20 percent.² Under an intensive effort, substantially greater savings may be achieved. And, the savings would be even greater if reducing greenhouse gas emissions is explicitly counted as an economic benefit.
- Equipment subject to energy efficiency standards was responsible for more than 50 percent of building energy consumption in 2007.³
- Up to 5 percent of a household's energy use is from phantom loads – power consumed by devices that are plugged in but not in use.⁴
- The federal government spends billions of dollars annually on energy use in its own buildings and on programs that influence energy use in other public and private buildings, including low-income households. Much of this energy is inefficiently used and could be saved cost-effectively (see PCAP chapters on equity, state and local actions and federal actions).

WORK FOR FEDERAL POLICY

- Federal, state and local governments must collaborate in an unprecedented national effort to improve the efficiency of buildings and appliances. Setting new national goals – such as achieving zero-net-energy commercial buildings by 2025 and residential buildings by 2030 -- and working together to meet them should be part of the Intergovernmental Climate Action Plan proposed by PCAP.
- The U.S. Department of Energy (DOE) must do a better job of creating and implementing national appliance efficiency standards. Some standards authorized in 1992 are still pending completion of a rulemaking process. Timely creation and adoption of new standards will provide continuing stimulation for technological innovation and encourage ever increasing efficiency.
- States generally should not be preempted by the federal government if they wish to set building and appliance standards that exceed federal standards.

- States should give increased emphasis to updating building codes and providing the necessary resources for enforcement. Federal incentives should encourage states to develop codes that exceed the most recent model national building codes.
- The federal government must lead by example by cost-effectively and intensively improving energy efficiency in its own buildings and in those of the public and private buildings it supports.

EXECUTIVE ACTIONS

1. Direct the DOE to **diagnose the causes, and propose solutions to, the logjam in setting appliance efficiency standards.** In March 2007, the [Government Accountability Office](#) reported the DOE had missed all 34 deadlines set by Congress, some more than a decade old. The GAO estimated that the failure to update efficiency standards had resulted in consumers paying tens of billions of dollars more for energy than they would have had the deadlines been met. The President and Secretary of Energy can take further action based on the results of the DOE's analysis.⁵
2. Direct the DOE to work with ASHRAE,⁶ the U.S. Green Building Council, the American Institute of Architects and other stakeholder organizations to **develop zero carbon model national building codes.** All new and substantially remodeled commercial buildings should attain this goal by 2025 and all new/remodeled residential buildings by 2030. The codes should require that starting in 2010, all new construction (residential and commercial) must use 50 percent less energy than regional averages.⁷ These targets should adjust downward over time to achieve net zero by 2025/2030. These new building codes should also take adaptation into account – buildings should be designed to withstand and function adequately during increasingly violent storms, heat waves, droughts and other extreme weather events that will occur as a result of changing climate. The DOE should partner with the FEMA-led Interagency Task Force on Climate Adaptation proposed in the Adaptation chapter.
3. Direct the DOE and the U.S. Environmental Protection Agency (EPA) to reinvigorate the [Energy Star program](#) for buildings.⁸ Energy Star has been one of the most successful and important programs reducing greenhouse gas emissions. However, this important effort has lapsed somewhat, with lax qualifying standards, outdated testing and enforcement and lack of product differentiation. It should be reinvigorated by a) bringing standards in line with available technology; b) bringing test procedures in line with available technology; c) more frequently reviewing standards as new technology enters the market; d) adopting a graded qualifying system to differentiate higher performers; and e) independently verifying test results and better enforcing standards.
4. **Use federal loan and loan-guarantee programs to encourage the construction of energy-efficient, transit-oriented housing** through the Federal Housing Administration, the Department of Veterans Affairs and other agencies that provide federally insured loans. The President should direct the Department of the Treasury to determine what new energy efficiency features can be leveraged through the federal government's association with Fannie Mae and Freddie Mac, and the federal rescue package for other financial institutions. By reducing energy bills and increasing the cash flow of homeowners, energy efficiency measures can help ensure that mortgages remain affordable and that fewer face foreclosure. Locating housing near transit is another money-saving factor that should be encouraged by federal agencies. Energy savings should be recognized in the structure of mortgages. Incentives might include: a) interest-rate

reductions for purchasers of green homes, as defined by the U.S. Green Building Council, the Energy Star program, the ANSI Standard developed by the National Association of Homebuilders or comparable state-based green building programs; b) bonus credits for Fannie Mae and Freddie Mac toward meeting their affordability goals for purchasing mortgages for energy-efficient houses; and c) federal tax incentives for builders and homeowners who build to the highest standards of the rating systems mentioned above – for example, LEED Gold rather than LEED Silver.

5. **Provide technical assistance and incentives for adaptive designs** that facilitate building retrofits as new efficiency and renewable energy technologies become affordable. Buildings should be designed to accommodate building-integrated or rooftop solar power systems. The President should direct agencies to encourage adaptive designs in applicable financial assistance programs – by giving bonus points in competitive grant programs.
6. **Direct the DOE to work with ASHRAE to develop new model building standards for schools and public housing projects.** Wise investments in high efficiency developments can save states and localities money in the long term and provide spaces that are healthier and more economical for low-income families. For more information, see the States and Localities chapter.
7. Direct the DOE to **propose climate adaptation measures** that are appropriate for and can be undertaken by the Weatherization Assistance Program (WAP) as it weatherizes the homes of low-income families. In addition, direct the DOE to determine whether WAP should implement higher insulation and other efficiency standards in the homes it weatherizes in view of predicted impacts of climate change such as increasing numbers of heat waves.
8. Direct the DOE and other affected agencies to **immediately implement the energy efficiency provisions in the Energy Independence and Security Act of 2007.** The most urgent provisions are new standards for fan, furnace and standby mode energy consumption. These will require additional rule-making processes that should be fast tracked for quick implementation.
9. Update and strengthen directives to all federal agencies to rigorously and intensively implement cost-effective energy efficiency measures in federally owned and leased facilities (see the PCAP chapter on federal energy and carbon management).
10. Direct the U.S. Department of Housing and Urban Development and the United States Department of Health and Human Services to establish measures to rigorously and intensively implement cost-effective energy efficiency in public, assisted, and LIHEAP⁹ assisted low-income housing where the federal government directly or indirectly pays some or all of the energy bills.

LEGISLATIVE ACTIONS

11. Propose funding for the **Zero-Net-Energy Commercial Buildings Initiative.** Congress directed the DOE to establish this program in the Energy Independence and Security Act of 2007 and authorized, but did not appropriate, funding.
12. Currently, states are prohibited from passing appliance efficiency standards that are more stringent than those set by the federal government. While this is beneficial to industries manufacturing these appliances for consistency, it is harmful to consumers when new rule-making processes are severely delayed. **Congress should amend laws prohibiting preemption of federal standards by states** in two circumstances: a) if the DOE fails to complete updates of appliance efficiency standards in a timely manner; and b) when economic justification can be provided.

- 13. Double funding for the Energy Star program to \$100 million annually.** In 2007, Energy Star represented approximately one-third of the EPA's program-related greenhouse gas reductions. Additional funding will allow Energy Star to expand into new areas, including creating an energy performance program that would send trained and certified contractors into homes to properly size and install HVAC equipment. Funding should support the program improvements discussed in Action 3.
- 14. Double funding for energy efficiency investments in federally owned and leased facilities, and in low-income households that currently receive assistance with utility bills.¹⁰**
- 15.** Reduce the **home mortgage interest deduction** for extremely large homes. This deduction was designed to encourage home ownership by private citizens. However, there are no limits on the size of the home or mortgage. Given the increasing size of homes, this has become a perverse incentive for increased energy consumption and related greenhouse gas emissions. The President should support [Rep. John Dingell's proposal](#) and recommend the bill cover secondary as well as primary homes. Rep. Dingell's proposal stipulates: a) For every 200 square feet over 3,000, the amount that can be deducted is reduced by 15 percent. For example, homes from 3,000 to 3,199 square feet can only deduct 85 percent of their mortgage interest; b) Homes over 4,200 square feet get no deduction; and c) Exemptions are made for homes that acquire LEED certification.
- 16. Fully fund the [Energy Efficiency Public Education Initiative](#)** at \$90 million annually, as authorized in the EAct 2005. This program will provide funding for a national program similar to California's successful [Flex Your Power](#) campaign aimed at educating consumers about energy efficient practices. In 2005, according to the program's website, the initiative saved over 4 billion kilowatt hours. To aid consumers in making better climate informed choices, all products should be better labeled with their lifecycle carbon impact. For more information on product labeling, see the Carbon Policy chapter.

¹ "Annual Energy Outlook," United States Energy Information Administration, 2008, <http://www.eia.doe.gov/oiaf/aeo/index.html>.

² Joe Loper et al., "Reducing Carbon Emissions Through Improved Energy Efficiency in Buildings," Alliance to Save Energy, 2008.

³ "Annual Energy Outlook," United States Energy Information Administration, 2004, in Loper et al., 71.

⁴ Joe Loper et al.

⁵ More detailed recommendations on building performance are available at: http://www.climateactionproject.com/docs/PCAP_Buildings_Report_5-8-082.pdf.

⁶ American Society of Heating, Refrigerating and Air-Conditioning Engineers

⁷ For more information, see [Architecture 2030](#) and its [model building codes](#).

⁸ For a recent review of Energy Star, and detailing of areas for improvement, see Consumer Reports, October 2008, <http://www.consumerreports.org/cro/home-garden/resource-center/energy-star-has-lost-some-luster/overview/energy-star-ov.htm>.

⁹ Low Income Home Energy Assistance Program

¹⁰ See the PCAP Equity Chapter for a recommendation to substantially increase funding for the DOE's Weatherization Assistance Program, which makes permanent efficiency improvements to low-income households.