



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

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Federal Energy Management Program

Federal Building Energy Efficiency Standards in the US

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Outline of Presentation

- Introduction
- Federal Building Energy Efficiency Rules
- DOE Guidance to Federal Agencies
- Ideal Agency Design Process



Introduction

- DOE's Federal Energy Management Program (FEMP) has responsibility for developing building energy standards for all new Federal residential and commercial buildings in the United States
- The new building standards follow the guidance provided to DOE by Energy Policy Act of 2005



Building Energy Efficiency Rules

- EPACT 2005-Section 109 provides the basis for the rules
- Provides explicit direction to DOE to develop revised energy efficiency performance standards based on current voluntary sector standards
 - Low-rise residential - Minimum based on 2004 International Energy Conservation Code (IECC)
 - Commercial and High-Rise Multi-Family Residential - Minimum based on ANSI/ASHRAE/IESNA Standard 90.1-2004



Building Energy Efficiency Rules (cont)

- All new Federal buildings must achieve energy consumption of at least 30% below these minimum standards (if cost-effective)
- All new Federal buildings must use sustainable design principles for siting, design, and construction (if cost-effective)
- If water is used to achieve energy efficiency, water conservation technologies shall be applied to the extent that the technologies are life cycle cost-effective.



Implementation of EPACK 2005

- Follows Section 109 guidance as closely as possible
- Requires use of whole building simulation approaches in baseline standards for “30% better” calculation
 - Slight modification for commercial buildings allowing exemption for plug and process loads



New Federal Rules

- DOE is publishing rules on sustainable design and water conservation
- DOE is looking into updating the baseline standards to updated versions
- DOE is looking at incorporating new requirements from the Energy Independence and Security Act of 2007

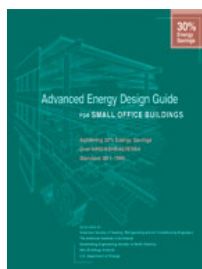


DOE Direction to Agencies Charged with Meeting the New Requirements

- Look at what others have done to design energy efficient buildings
- Take those pieces suitable to your building
- Demonstrate energy efficiency and cost-effectiveness of your design



Look at what others have done



**High
Performance
Buildings**

An Initiative of the
U.S. Department
of Energy Building
Technologies Program





Take pieces suitable to your building

- Choose approaches that are suitable to your building type, location, and function
- Consider both load reduction and renewable energy options
- Don't be afraid to go beyond 30% savings



Envelope Pieces

- More roof insulation
- More wall insulation
- Mass walls
- Cool roofs
- Building elongation
- Shading devices
- Lower window U
- Lower window SHGC
- Window massing
- Building orientation



HVAC, SWH, and Lighting Pieces

- Higher equipment efficiency
- More efficient equipment selection
- More efficient system selection
- Demand controlled ventilation
- Daylighting
- Occupancy sensors
- Lower lighting power density
- Advanced lighting controls
- Instantaneous water heaters
- Advanced HVAC controls



Renewable Pieces

- Photovoltaics
- Solar hot water
- Microhydro
- Wind turbines
- Fuel cells
- Cogeneration



Example High Efficiency Packages

- AEDG-small office, Miami
 - cool roof, double-pane glazing, low SHGC, window massing on NS orientations, overhangs on EWS orientation, lighting power density of 0.9 w/ft², high-efficiency cooling equipment, demand control ventilation, high-efficiency service water heating equipment
- Large Office, DOE database
 - daylighting, gas-fired absorption chiller/heater, additional insulation, 400 kW fuel cells, 15 kW PV, demand controlled ventilation, fiber-optic outdoor signage, occupancy sensors



Example High Efficiency Packages

- Whole Building Design Guide
 - Passive solar, light colored roof, interior dock space (in cold climates), ceiling mounted fans, white painted metal roof decking (on inside), energy-efficient fixtures, systems, appliances, and motion sensors
- Annex 46
 - Under Development



Demonstrate energy efficiency and cost-effectiveness of your design

- Following published Federal rules



Ideal Agency Design Process

- Envision
- Establish Baseline
- Establish First Costs
- Simulate
- Life Cycle Costing
- Decide
- Re-Envision (as necessary)



Envision

- The first step in developing a building design that achieves at least 30% energy savings and is cost-effective is to **ENVISION** the building you think will achieve these savings cost-effectively
 - The preamble to the new Federal rule contains web links to a variety of resources that can help provide ideas.



Establish Baseline

- The next step in the process is to figure out what baseline is needed for your energy savings comparison.
 - The baseline is dependent on your design to some extent. Baselines are defined in Appendix G of Standard 90.1-2004 and Section 404 of the 2004 IECC



Establish First Costs

- The basic idea is that your design has to be cost-effective compared to the baseline design. So you need cost-estimates for both your design and the baseline design.
 - Designers should use the cost-estimating tools and processes they use now.



Simulate

- You can't predict energy savings without doing an energy simulation on both your proposed design and the baseline design.
 - The preamble to the new Federal rules provides a link to DOE's Tools directory.
 - Agencies should use the tool they currently use.



Life Cycle Costing

- “If cost-effective” means that the energy savings achieved (translated into dollars saved) must justify the increased first costs.
 - Agencies should already be performing life cycle costing.



Decide

- Does my building save enough energy?
- Can I build a more efficient building?
- Is it cost-effective?
- Can I build it cheaper?
- Do I need to back off?



Envision Again

- Once you have decided on answers to the previous questions, you may need to loop through the process again.
 - Depending on what you change in your design, you may or may not be able to “re-use” your baseline design, first-costs, and simulations.



Questions?

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