

# Institute for Market Transformation

[www.imt.org](http://www.imt.org)

Greening DC Building Codes  
[www.imt.org/codes](http://www.imt.org/codes)

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# DC Greening Building Code

- DC's Green Building Act of 2006 requires the Mayor to “submit to the Council for approval construction code revisions that shall incorporate as many green building practices as practicable...”
- Amendments to the 2006 International Code Council model codes to be submitted to City Council in March 2008
- The DC Department of the Environment contracted with IMT and the Institute for Building Technology and Safety (IBTS) to work with the GBAC to identify best practices in green building code amendments

# Jurisdictions' Codes Reviewed

- Albuquerque, NM
- Austin, TX
- Boston, MA
- Boulder, CO
- Chicago, IL
- Milwaukee, WI
- New York, NY
- Portland, OR
- San Antonio, TX
- San Francisco, CA
- Scottsdale, AZ
- Seattle, WA
- Jurisdictions across the Washington region

# Removing Impediments to Greening Building

- Top Priority: Remove impediments to Greening Building
- We've identified surprising few impediments
  - Recommended amendment to make it easier to disconnect downspouts and retain rainwater on site
- Some impediments have been removed in the update to the 2006 ICC codes (e.g. waterless urinals and green piping)
- Many impediments are actually in zoning code – DC is separately seeking to green its zoning code
- Some impediments are the product of building officials misinterpretation of building codes
- We'd love to hear about other impediments

# Raising the Bar: Mandating Greener Practices

Amendments will likely mandate greener practices in these key areas:

- Water efficiency (low-flow fixtures)
- Energy efficiency
- Reducing heat island effect (requires flat roofs be white or green)
- Improve indoor air quality and reduce moisture (require ventilation fans in all bathrooms to vent to outside)

# Water Efficiency: Changes to International Plumbing Code

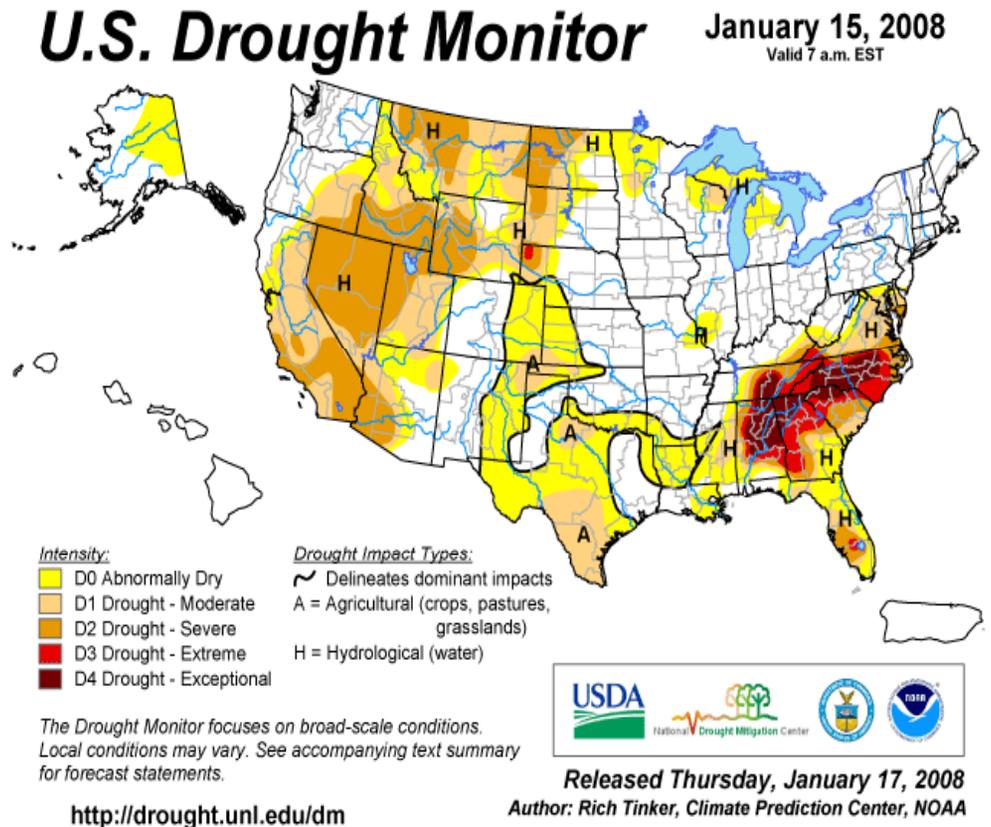
PLUMBING FIXTURE	MAXIMUM FLOW RATE OR QUANTITY	
	Old	New
Lavatory (private)	2.2 gpm	1.5 gpm
Shower	2.5 gpm	2 gpm
Urinal	1.0 gpf	0.5 gpf
Toilet	1.6 gpf	1.28 gpf

All major manufacturers make products meeting new standards. Many fixtures have no cost premium; others have paybacks under three years.

Sources: EPA WaterSense Program, NAHB, ASHRAE Standard 189.1P

# The Case for Water Efficiency

- 2007 was one of driest years on record locally
- Suburban Virginia counties instituted water restrictions
- Water bills rising partly due to WASA spending \$2 billion to reduce combined sewer overflow
- Jurisdictions, including Sandy Springs, Georgia, have mandated or proposed low-flow fixtures, landscaping restrictions and graywater recycling

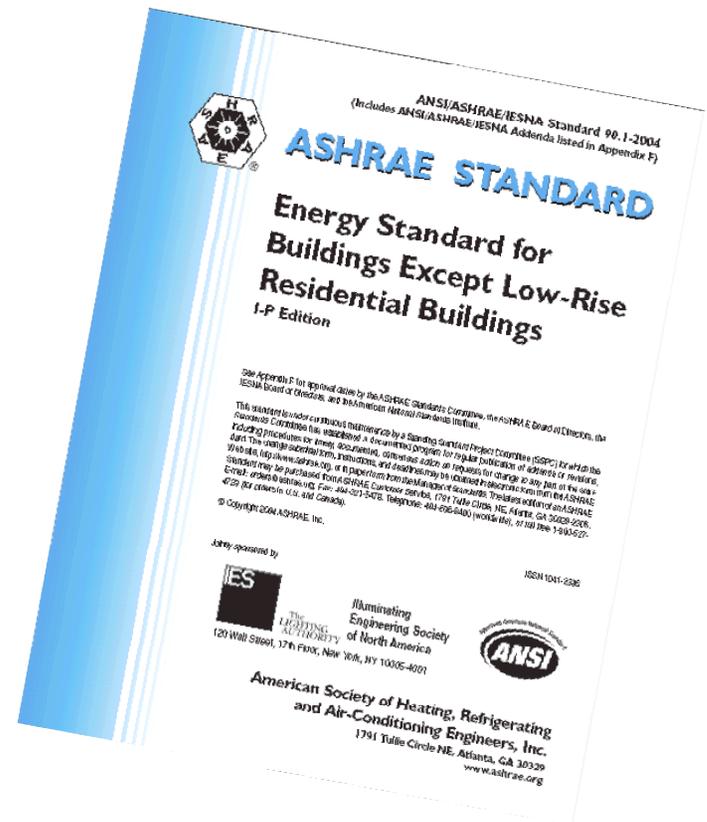


# Washington's Current Commercial Energy Code

International Energy Conservation  
Code (IECC 2006)

ASHRAE Standard 90.1 2004

- ASHRAE is the American Society of Heating, Refrigeration and Air Conditioning Engineers



# Washington's Proposed Commercial Energy Code

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## ASHRAE Standard 189.1's energy chapter

- Standard 189.1 is a model code that provides standards for high-performance, green buildings
- Standard 189.1 applies to all buildings except low-rise residential buildings (same as ASHRAE Standard 90.1)
- Standard 189.1 requires efficiency 27-30% greater than 90.1
- Second review draft due February 22

*not a design guide, not a rating system*

# Sponsors and Project Committee 189.1

- Consensus process
- Sponsor and co-sponsors:
  - ASHRAE  
(American Society of Heating, Refrigeration and Air Conditioning Engineers),
  - USGBC (U.S. Green Building Council),
  - IESNA (Illuminating Engineering Society of North America)
- Project committee: 22 voting members



# Commercial Energy Efficiency

## Mandatory Provisions

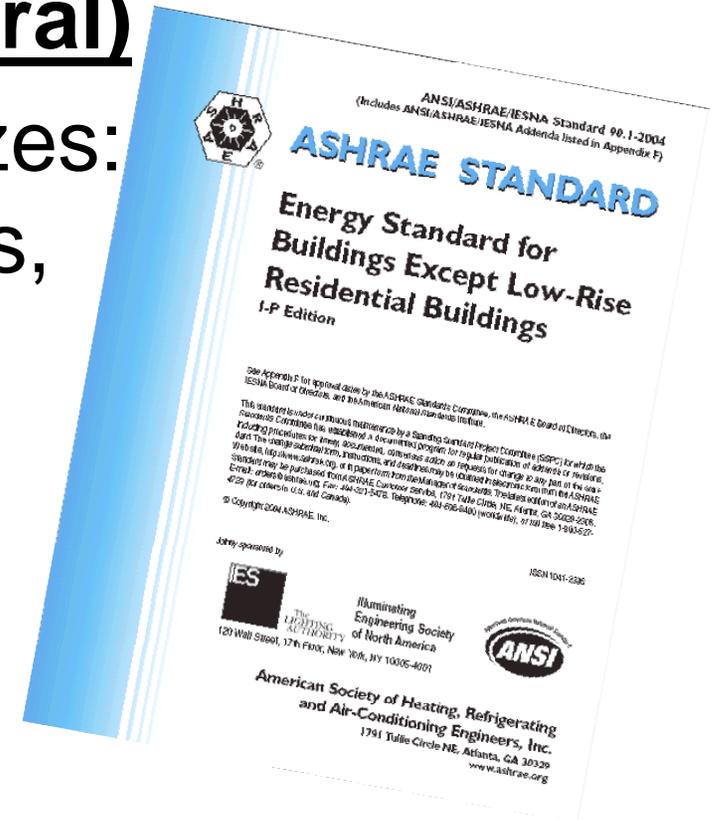
- Sub metering
- “Solar Ready” for on-site generation



# Energy Efficiency

## Prescriptive Option (General)

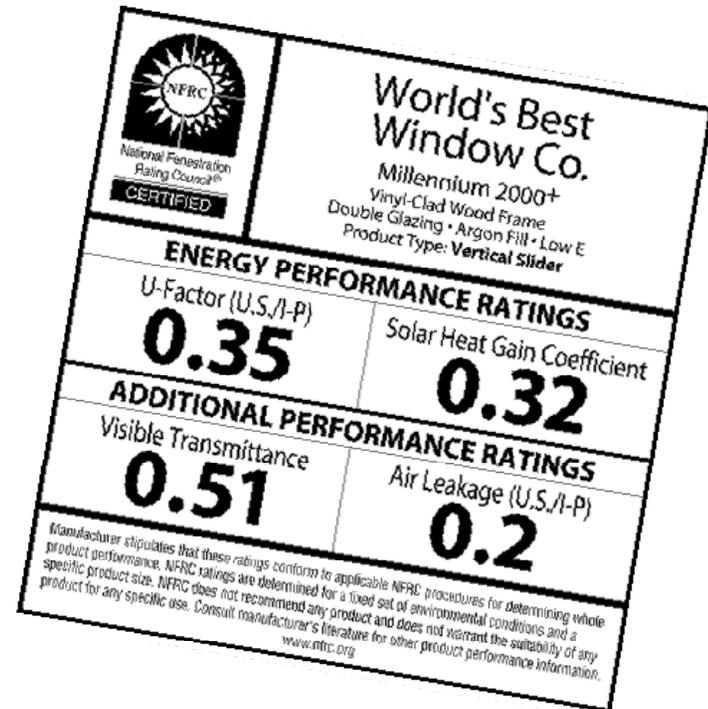
- Maximum dwelling unit sizes:  
900 ft<sup>2</sup> for 1-bedroom units,  
1,250 ft<sup>2</sup> for 2 BR,  
1,700 ft<sup>2</sup> for 3 BR,  
2,100 ft<sup>2</sup> for 4+ BR



# Energy Efficiency

## Prescriptive Option (Building Envelope) CZ-4 Washington, Maryland, Virginia

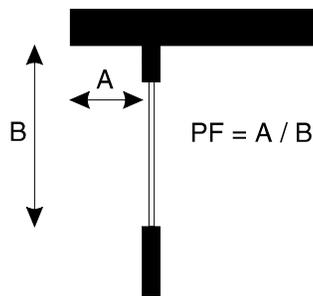
- **Roof insulation:** R-25 continuous,  
R-49 attic
- **Wall:** R-13 cavity + R-10 cont.  
R-11.4 mass wall
- **Fenestration assembly:**  
U-0.30 wood, vinyl,  
fiberglass frame  
U-0.40 curtainwall  
U-0.45 other metal  
SHGC-0.35



# Energy Efficiency

## Prescriptive Option (Building Envelope)

- Overhang:  $PF > 0.5$



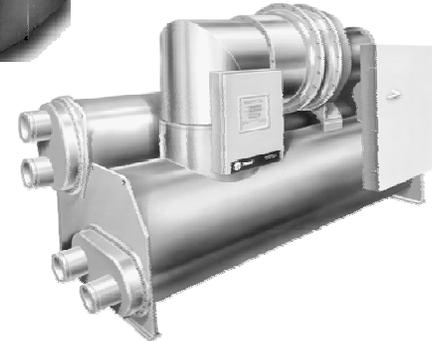
- Orientation:  
solar gain through  
east/west < north/south
- Continuous air barrier



# Energy Efficiency

## Prescriptive Option (Mechanical)

- Higher equipment efficiencies (CEE Tier II)
- More pipe/duct insulation
- Fan power to be 10% less
- Unoccupied hotel/motel rooms to have auto-shutoff



# Energy Efficiency

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## Prescriptive Option (Lighting)

- Interior lighting power to be 10% less
- Occupancy sensor controls
- Auto-controls for lighting in daylight zones



# Energy Efficiency

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## Prescriptive Option (Other Equipment)

- Energy Star equipment and appliances



# Energy Efficiency

## Performance Option

Two criteria:

- Annual energy cost:  
proposed <  
mandatory plus prescriptive
- Annual carbon dioxide equivalent (CO<sub>2</sub>e):  
proposed < mandatory plus prescriptive



# Proposed Low-Rise Residential Energy Code

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- International Energy Conservation Code (IECC) 2006 amended to increase efficiency by 30%
- Amendment package: proposed informative appendix to IECC 2009
- Written by national coalition of energy code experts with input from US Dept. of Energy

# Energy Efficiency in Low-Rise Residential

## Prescriptive Option (Building Envelope) CZ-4 Washington, Maryland, Virginia

- **Ceiling insulation:** R-38 continuous or R-49 attic
- **Wall:** R-18 cavity
- **Fenestration assembly:** U-0.35

The image shows a tilted Energy Performance Rating (EPR) label from the National Fenestration Rating Council (NFRC). The label is for a 'World's Best Window Co. Millennium 2000+' window. It lists the following performance metrics: U-Factor (U.S./I-P) of 0.35, Solar Heat Gain Coefficient of 0.32, Visible Transmittance of 0.51, and Air Leakage (U.S./I-P) of 0.2. The label also includes the NFRC logo and a 'CERTIFIED' seal.

ENERGY PERFORMANCE RATINGS	
U-Factor (U.S./I-P) <b>0.35</b>	Solar Heat Gain Coefficient <b>0.32</b>
ADDITIONAL PERFORMANCE RATINGS	
Visible Transmittance <b>0.51</b>	Air Leakage (U.S./I-P) <b>0.2</b>

Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information.  
www.nfrc.org

# Energy Efficiency in Low-Rise Residential

- HVAC equipment to be sized properly
- More pipe/duct insulation
- Air barrier requirements enhanced and clarified
- Half of lighting to be efficient



# The Case for Greening Energy Codes

- “Threat of Power Shortages Generating New Urgency,”  
*Washington Post*  
February 3, 2008  
(front page)
- DC Electric rates up 49% since 2001
- Blackouts in DC and Md. possible as early as 2011
- New NAHB survey: 51 percent of consumers “willing to pay up to \$11,000 more” if energy costs are reduced \$1,000 annually
- Majority of our electricity comes from burning coal => buildings account for 75% of DC’s greenhouse gases



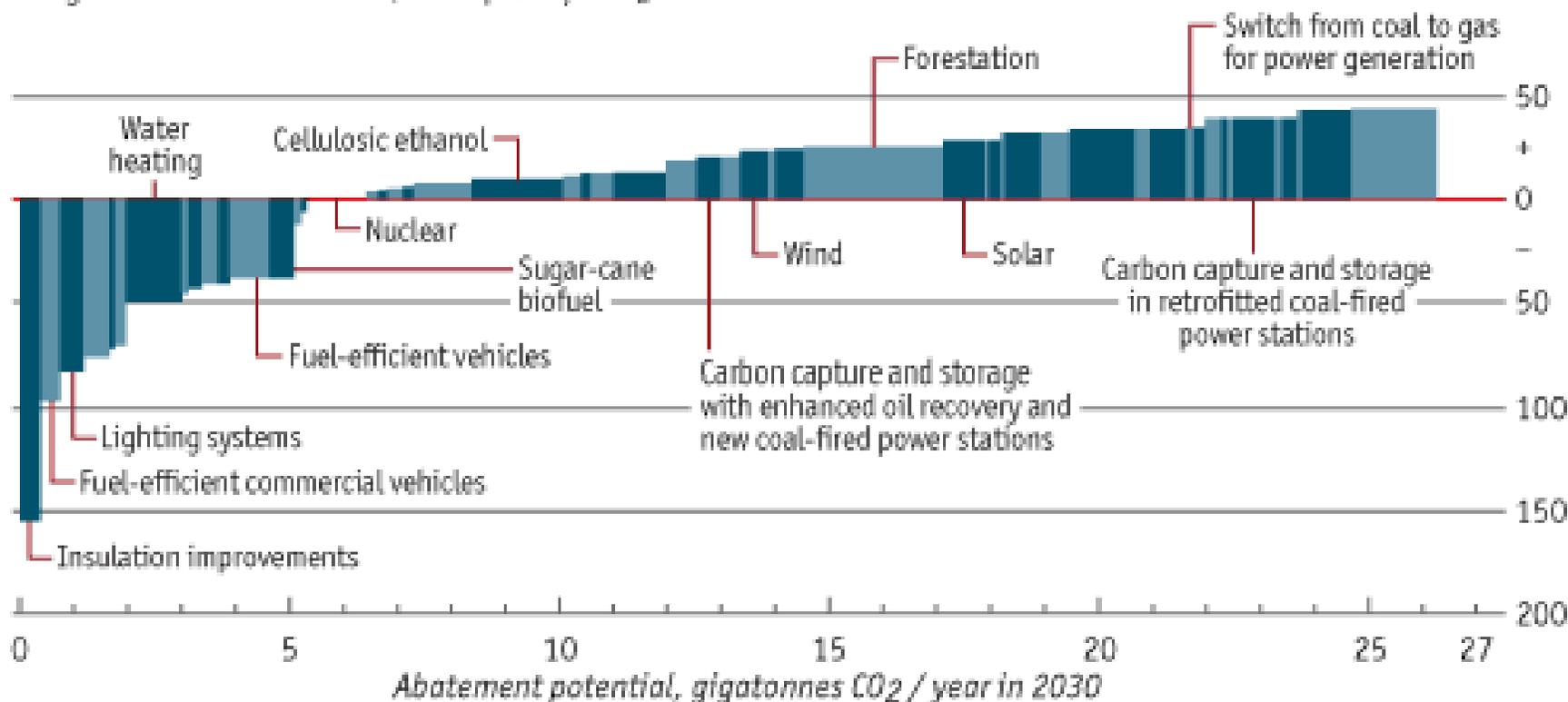
# Supporters for Greening Energy Codes by 30+%

- US Conference of Mayors
- Consumer Federation of America
- American Institute of Architects (AIA)
- Metropolitan Washington Council of Governments (COG) Intergovernmental Green Building Group
- National Association of State Energy Officials (NASEO)
- Edison Electric Institute
- American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
- US Department of Energy
- New Building Institute
- World Business Council for Sustainable Development (WBCSD)
- Business Council for Sustainable Energy (BCSE)
- NRDC, RMI, ACEEE, 2020 Vision and ASE

# Energy Codes are Cost Effective

## The cost of cutting carbon in different ways

Marginal cost of abatement, examples €/t CO<sub>2</sub>

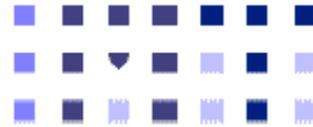


Source: Vattenfall

- Energy is local office buildings #1 operating expense at 30% of total
- Inefficient homes hurt the poor because the poor spend a greater portion of their income on energy costs. Greener energy codes will reduce the number of future foreclosures and evictions.

# Acknowledgement

- IMT is grateful to the District Department of the Environment, its other funders and its partners for their support and contributions to this slideshow.
- IMT particularly acknowledges the work of:  
**John Hogan**, AIA, P.E., LEED AP, Senior Energy Code Analyst  
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Seattle, WA 98124-4019
- Portions of this slideshow (the good parts) were taken or adapted from John's work.



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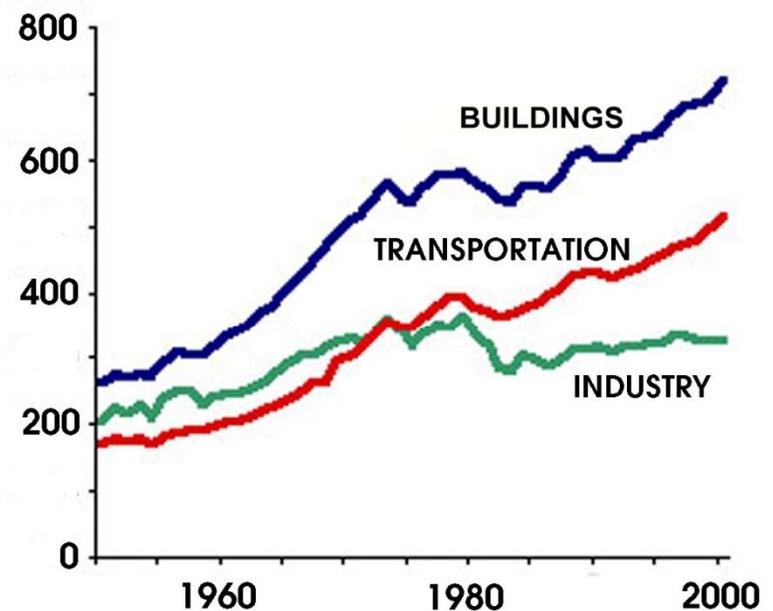
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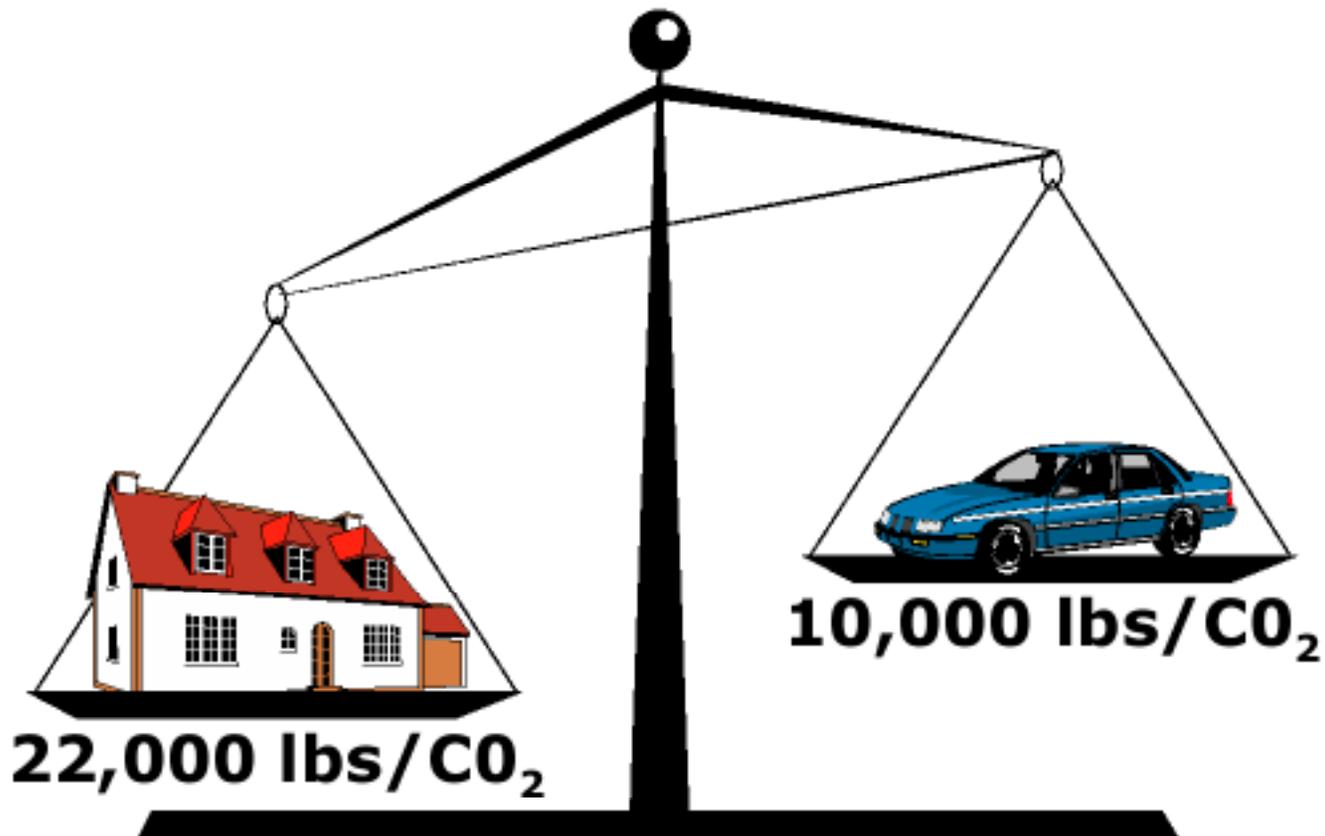
# The Case for Greening Energy Codes: Global Warming

- Energy codes are most powerful local weapon in the fight against global warming
- Majority of our electricity comes from burning coal
- Coal is worst fuel for causing
  - global warming
  - air pollution  
(23,600 US deaths annually)
- Buildings account for 40+% of greenhouse gases nationally and for about 75% in DC



**CO2 EMISSIONS by SECTOR**  
(Million Metric Tons of Carbon)

## Annual Carbon Dioxide Emissions from the Average House vs. the Average Car



Each year the average house releases over twice as much greenhouse gases as the typical car.

**Housing generates 20% of all U.S. CO<sub>2</sub> emissions**  
**Commercial buildings generate 18% of all US CO<sub>2</sub>**