



# United States ZEB Overview

## EGNRET-33 Chinese Taipei 5-6 October 2009

**P Marc LaFrance, CEM**  
**Building Technologies Program**  
**Office of Energy Efficiency and Renewable Energy**





“We're using 19th and 20th century technologies to battle 21st century problems like climate change and energy security.”

Remarks of President Barack Obama,  
Signing of the American Recovery and  
Reinvestment Act, February 17, 2009



President Barack Obama



## Electric Power Generation

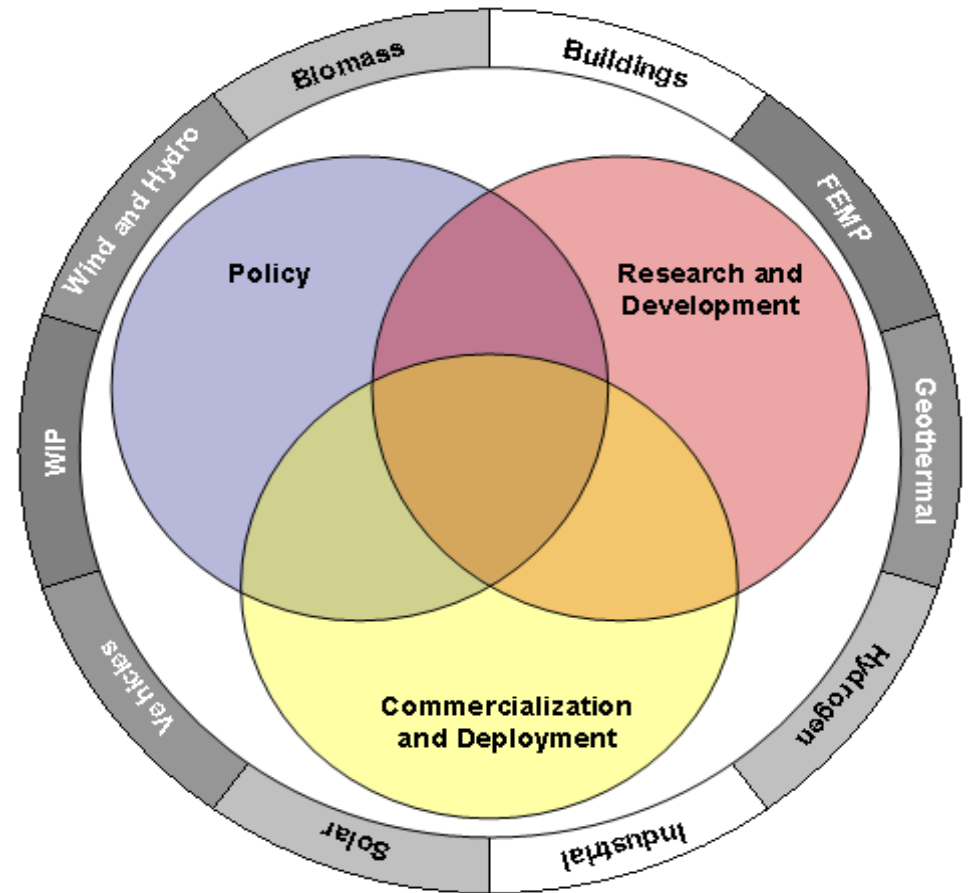
- Geothermal
- Solar
- Wind
- Hydropower & Advanced Water Power

## Advanced Transportation

- Biomass
- Fuel Cells
- Advanced Vehicles

## Energy Efficiency

- Buildings
- Industrial
- Federal Energy Management
- Weatherization and Intergovernmental

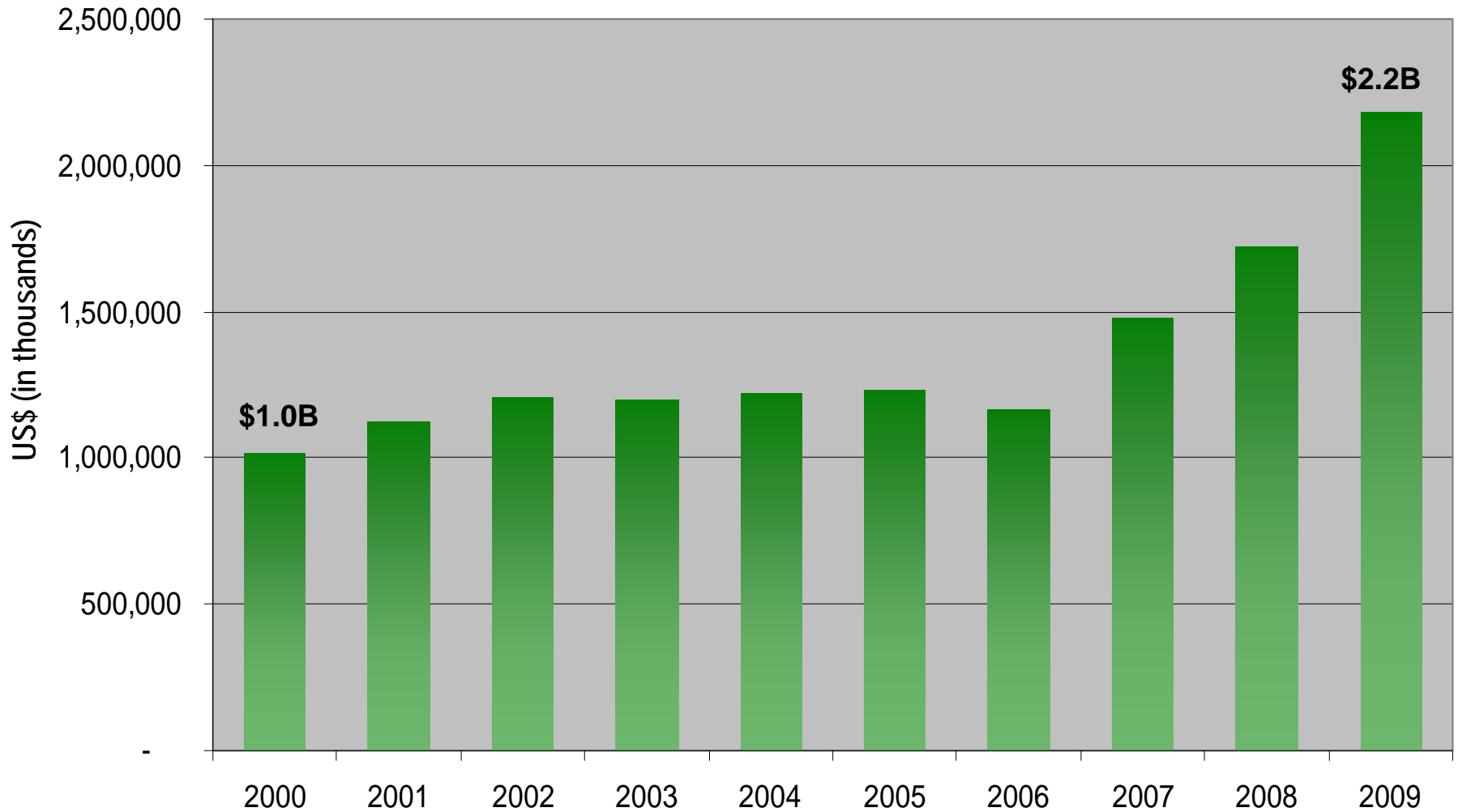


## Mission Statement

To develop cost competitive technology, facilitate commercialization and deployment to the marketplace



# EERE Budget History (2000-2009)

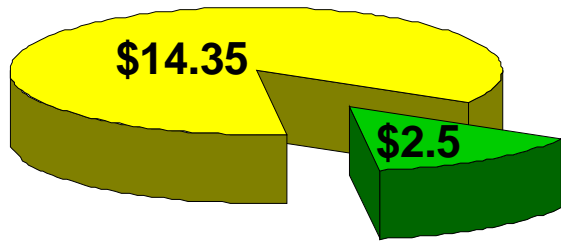


In addition to FY09 funding, EERE received \$16.8 billion in funding through the American Recovery and Reinvestment Act of 2009



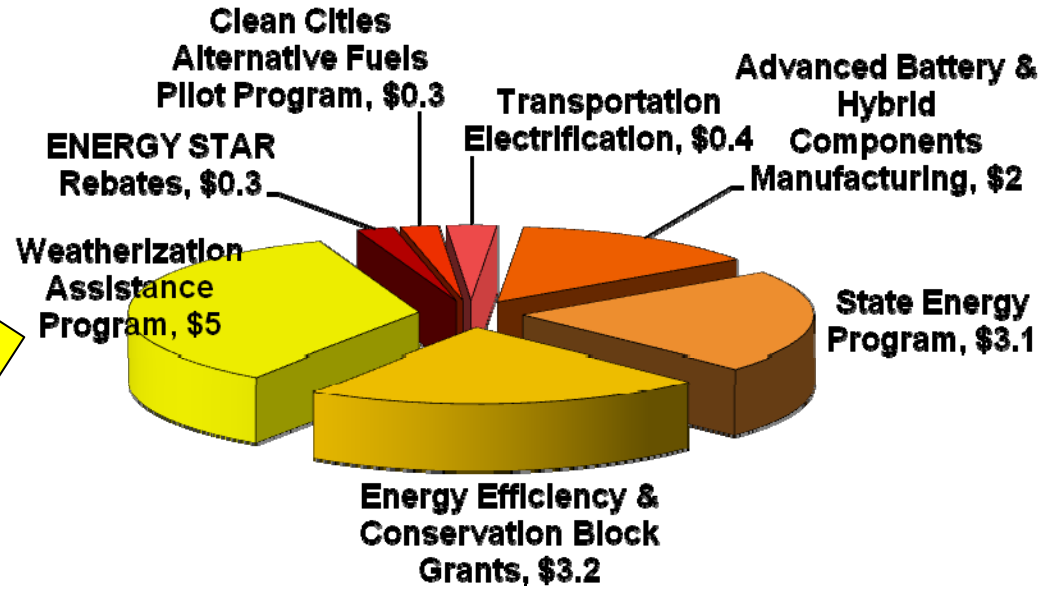
# EERE Recovery Act Funding

## \$16.8B EERE Recovery Act Funding

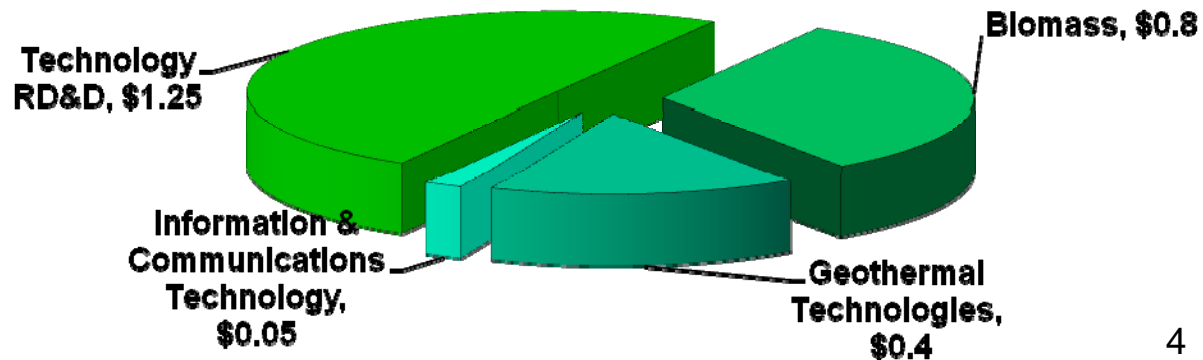


- EERE Discretionary RD&D
- EERE Directed Funding

## \$14.35B Directed Funding



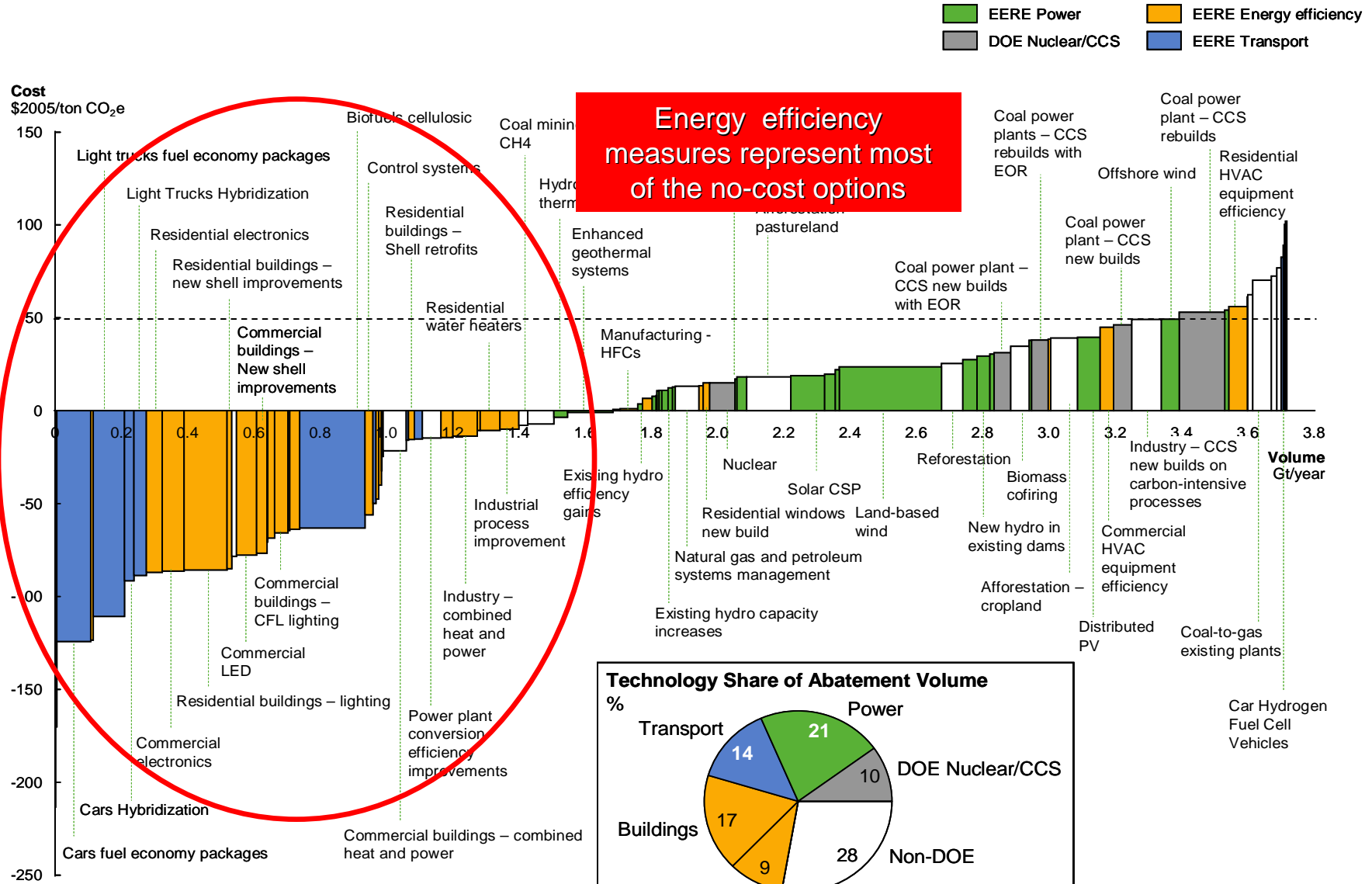
## \$2.5B Discretionary RD&D



Amounts are in billion US Dollars



# EERE Technologies – Potential Carbon Abatement



**Energy efficiency measures represent most of the no-cost options**

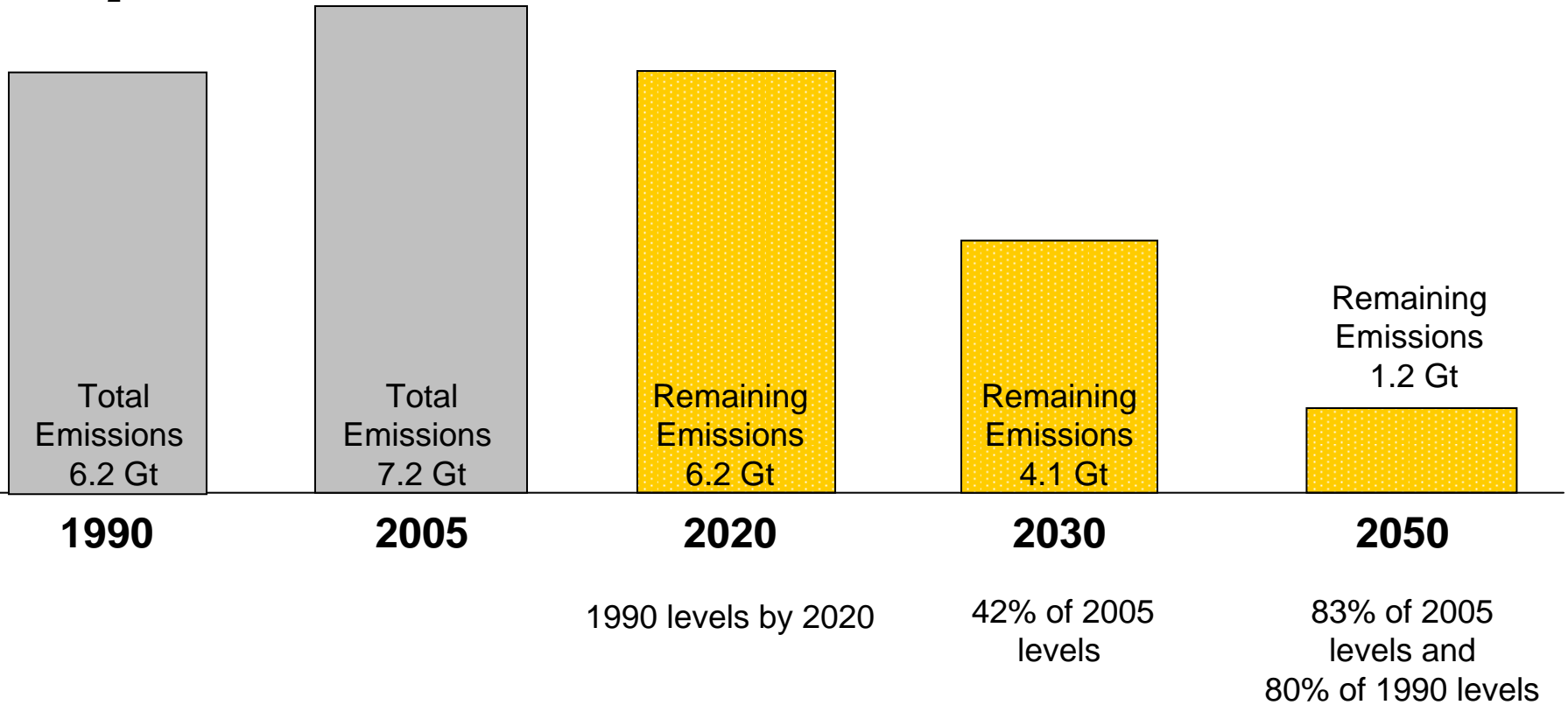
Source: December 2008 analysis conducted by EERE with McKinsey using 2008 DOE technology performance projections; mid-range case

Note: Preliminary analysis, under technical review



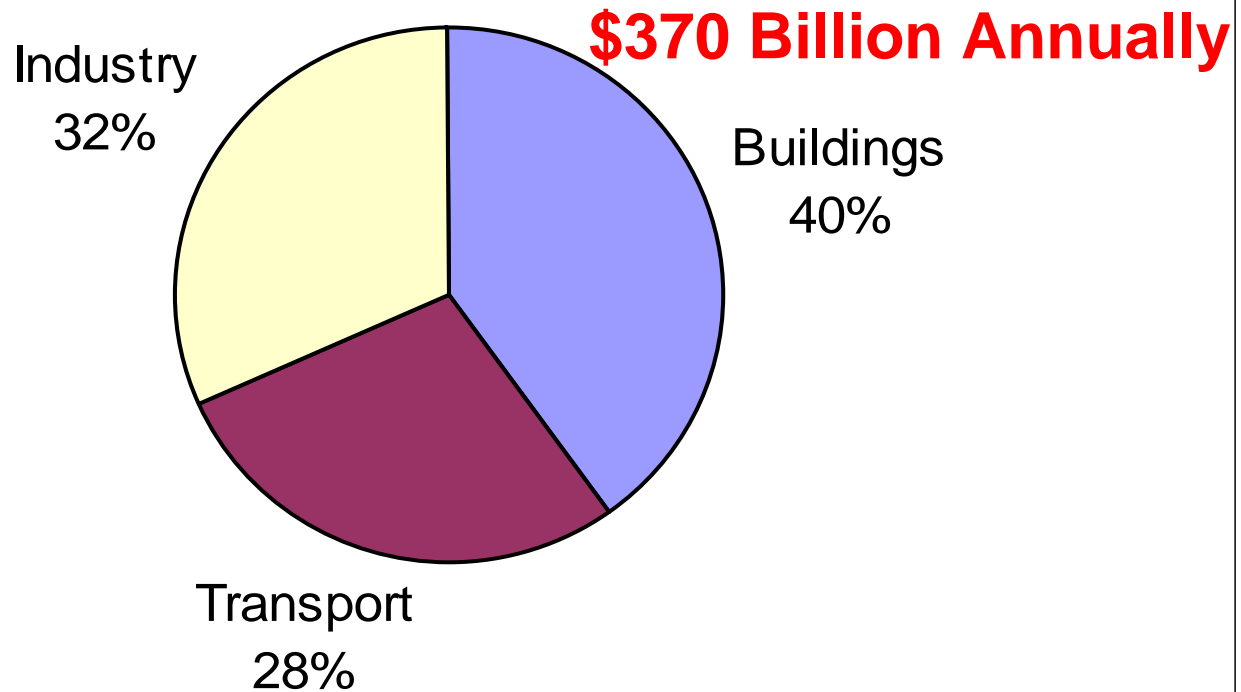
# Presidential Initiatives and U.S. Legislative Proposals Anticipate Dramatic Reductions in GHG Emissions

**US GHG emissions**  
(Gt CO<sub>2</sub>e)





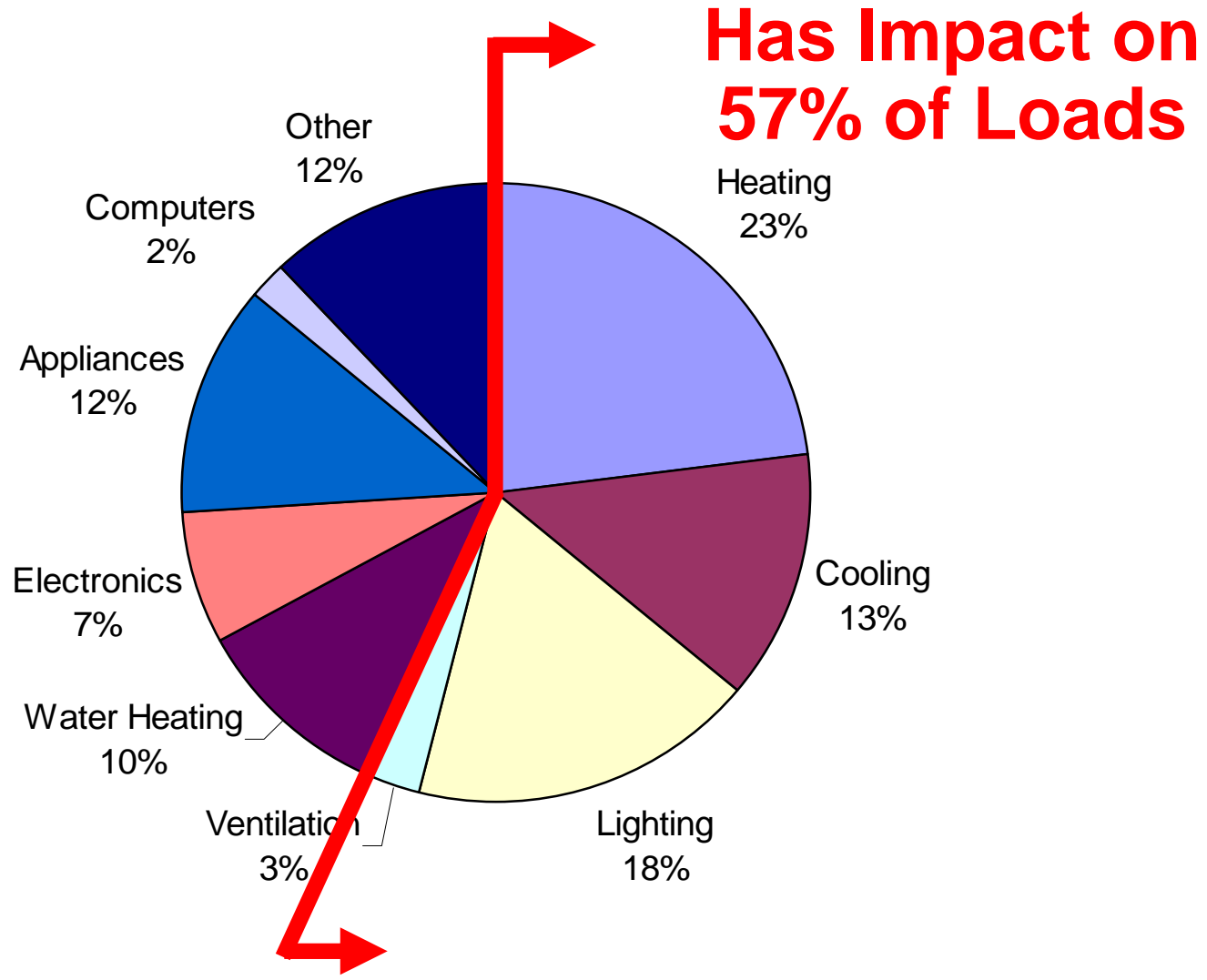
## Electricity – 72% for Buildings Natural Gas – 55% for Buildings







# Building Consumption – Envelope Relationship





Net-Zero Energy Buildings by 2025

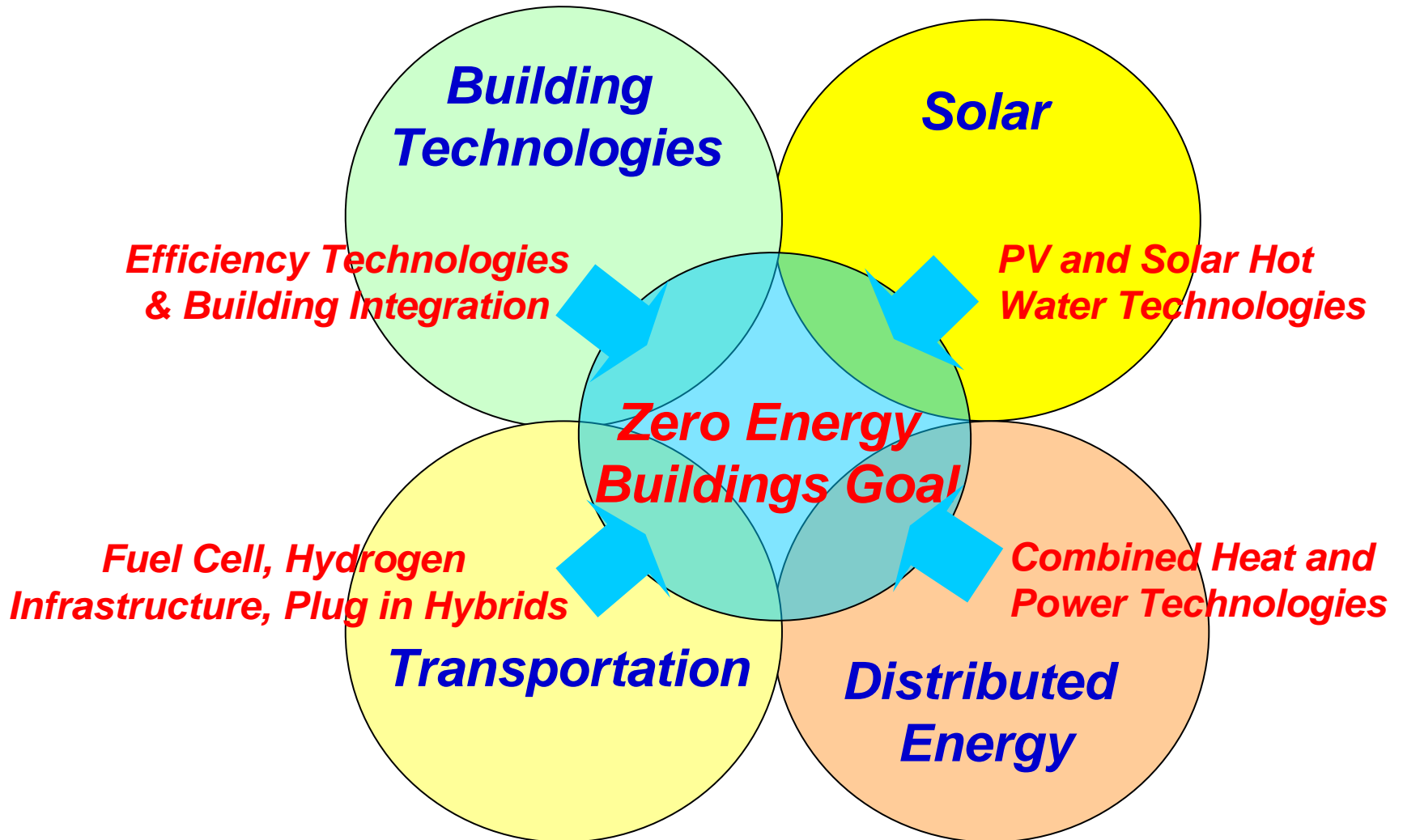
Net-Zero Energy Homes by 2020

Low incremental cost.





## Renewable Energy, Building Technologies, and Transportation become Fully Integrated with ZEBs





# Major Areas of Building Technologies Program

## Research & Development

- Emerging Technology (Component R&D)
  - Lighting R&D (Solid State Lighting)
  - Envelope R&D (Windows and Thermal Materials)
  - HVAC and Water Heating R&D
- Residential Integration (Building America)
- Commercial Integration (National Accounts)
  - Retail, Schools, Office Buildings, etc
  - Energy Plus Software

## Deployment

- Technology Validation & Market Introduction
  - ENERGY STAR
  - Building Codes

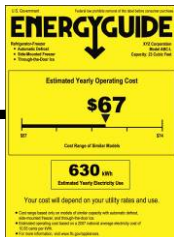
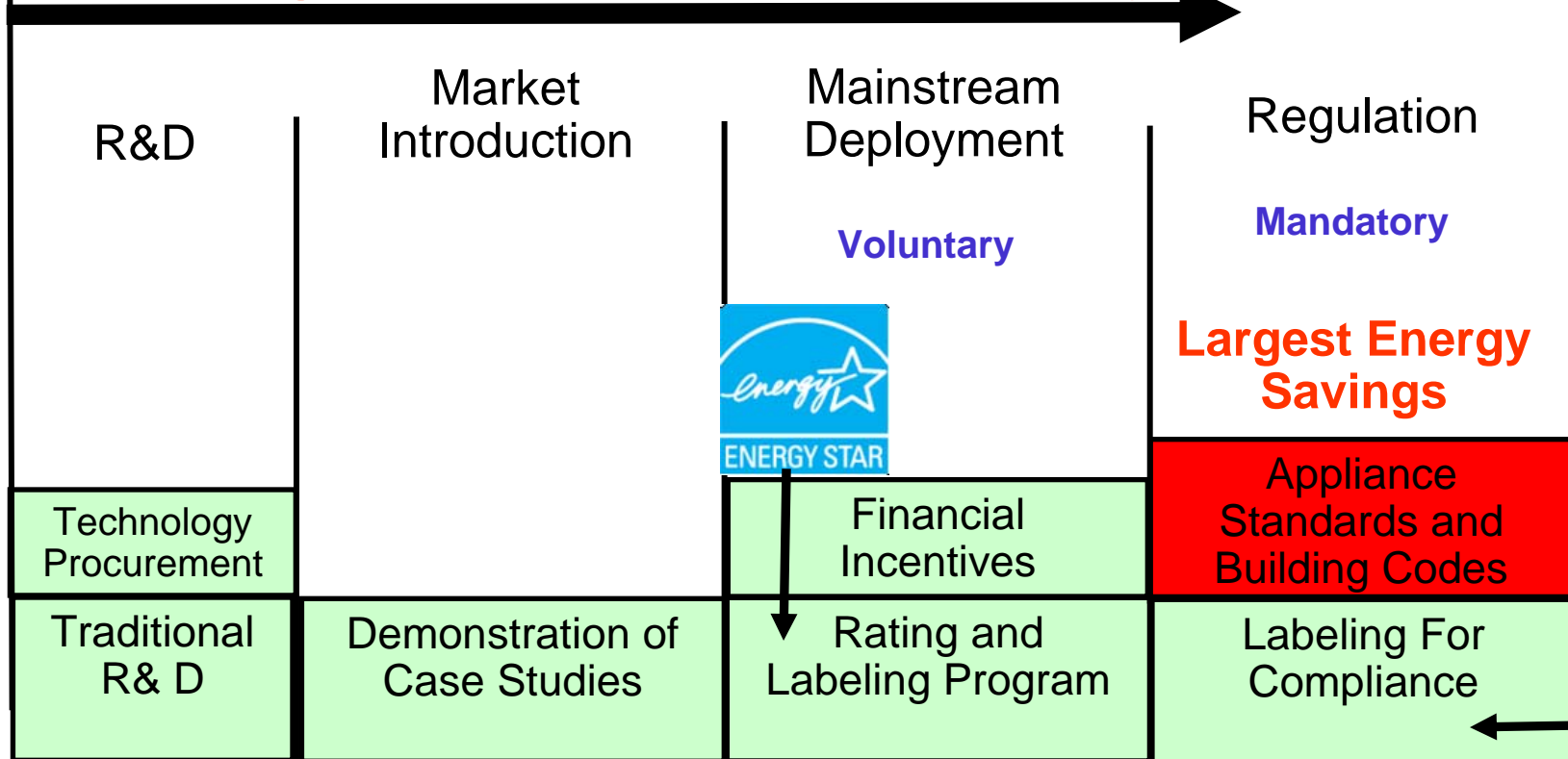
## Regulatory

- Appliance and Equipment Standards



# Policies – Commercialization Path

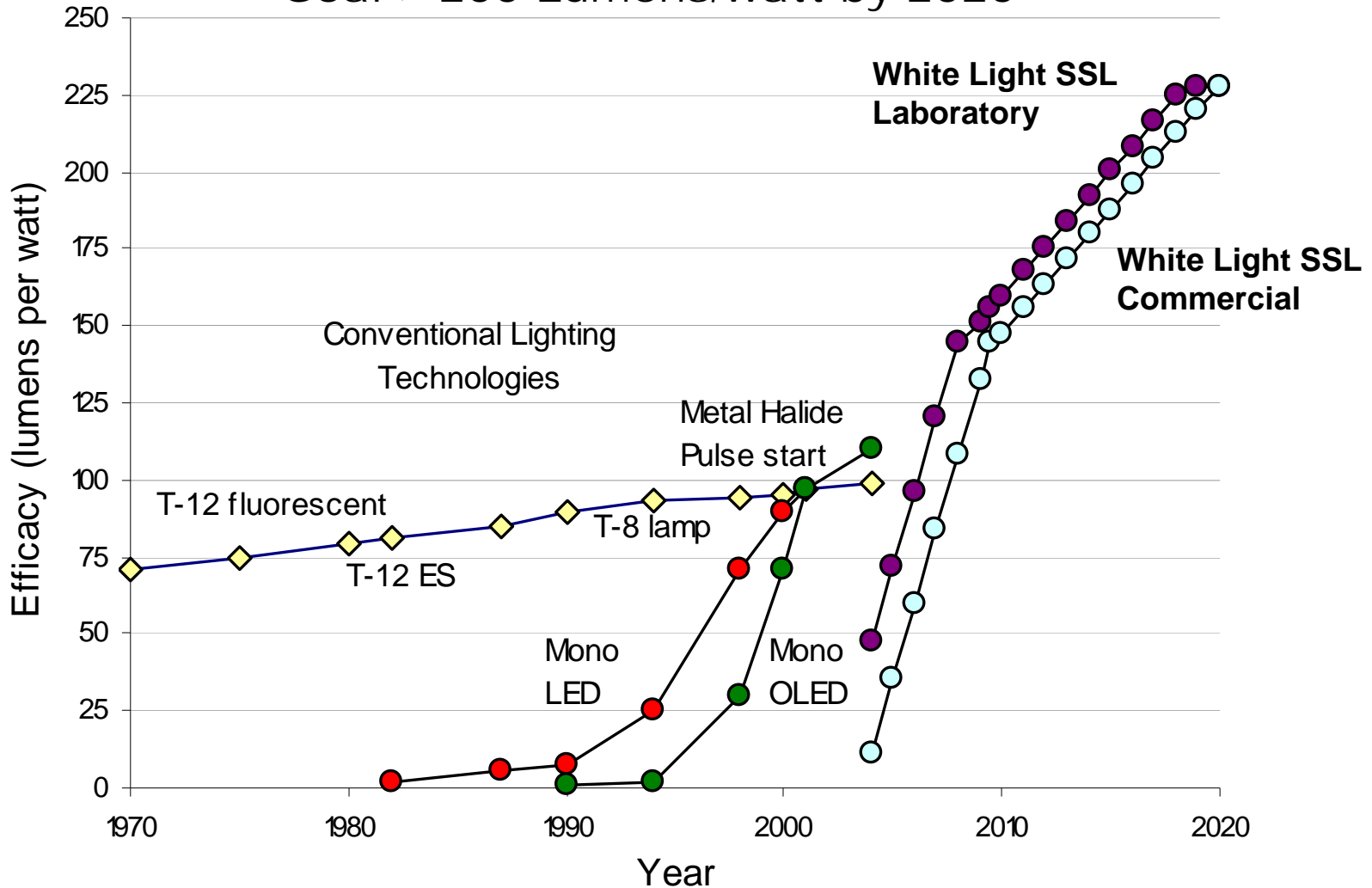
**Product Development/Market Conditioning  
Make Regulations More Viable and Probably**





# R & D Program Solid State Lighting (SSL)

Accelerated R&D for White Light SSL –  
Goal > 200 Lumens/watt by 2020



SSL Laboratory and Commercial Curves, revised January 2008





# Next Generation of Windows

- **Highly Insulating**
  - Goal U value 0.10 (SI U value 0.56)
  - Possible vacuum glazings
- **Dynamic solar control**
  - Passive heating
  - Dramatic peak cooling reduction
  - Market ready, prices will drop with more investment



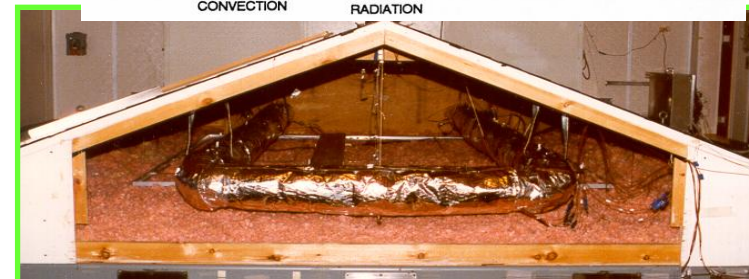
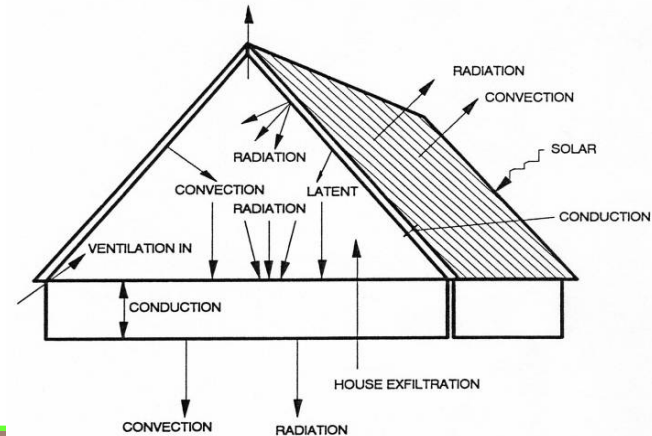
**Prototype – Concept Window**  
**(Highly Insulating and Dynamic**  
**U Value 0.18 (SI U value 1.0)**  
**SHGC 0.04 – 0.34)**  
**Low cost unsealed center lite**





# Thermal Envelope R&D

- Advanced walls to reach R20 in 3.5" cavity, exterior insulation systems, R30 total wall
- Next Generation of Attic/Roof System to save 50 Percent Energy
- New Material Development
  - 100 R&D Award in 2009 for phase change insulation
  - Higher performing foams and aerogels
  - Dynamic membranes







## Step Function in Performance Soon



Heat Pump Water Heater



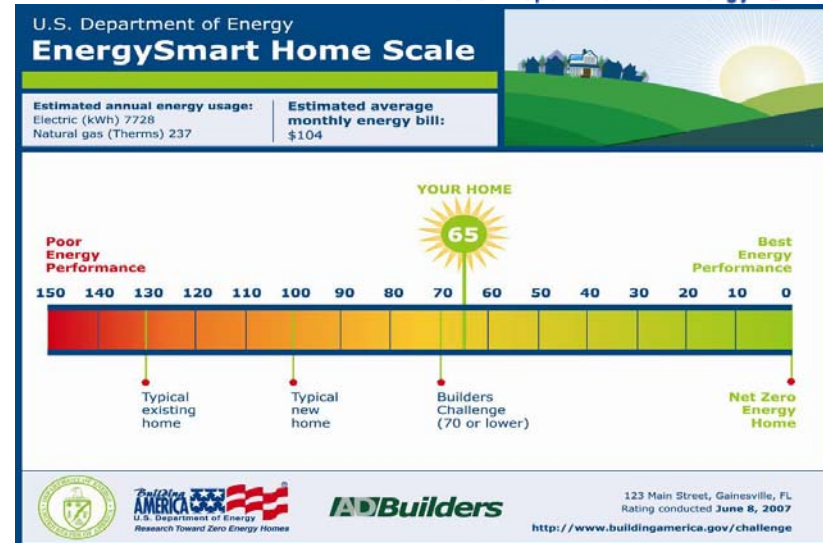
Condensing Gas

The USA has seen greater use of instantaneous water heaters, but product and installation costs are still very high

**Without major R&D breakthroughs, ENERGY STAR was delayed, regulatory savings have been limited**



**ZEB Solar Decathlon in Washington, DC**



**Oberlin College Lewis Center, Oberlin, OH**

Result: 117%  
 Goal: zero net site energy use



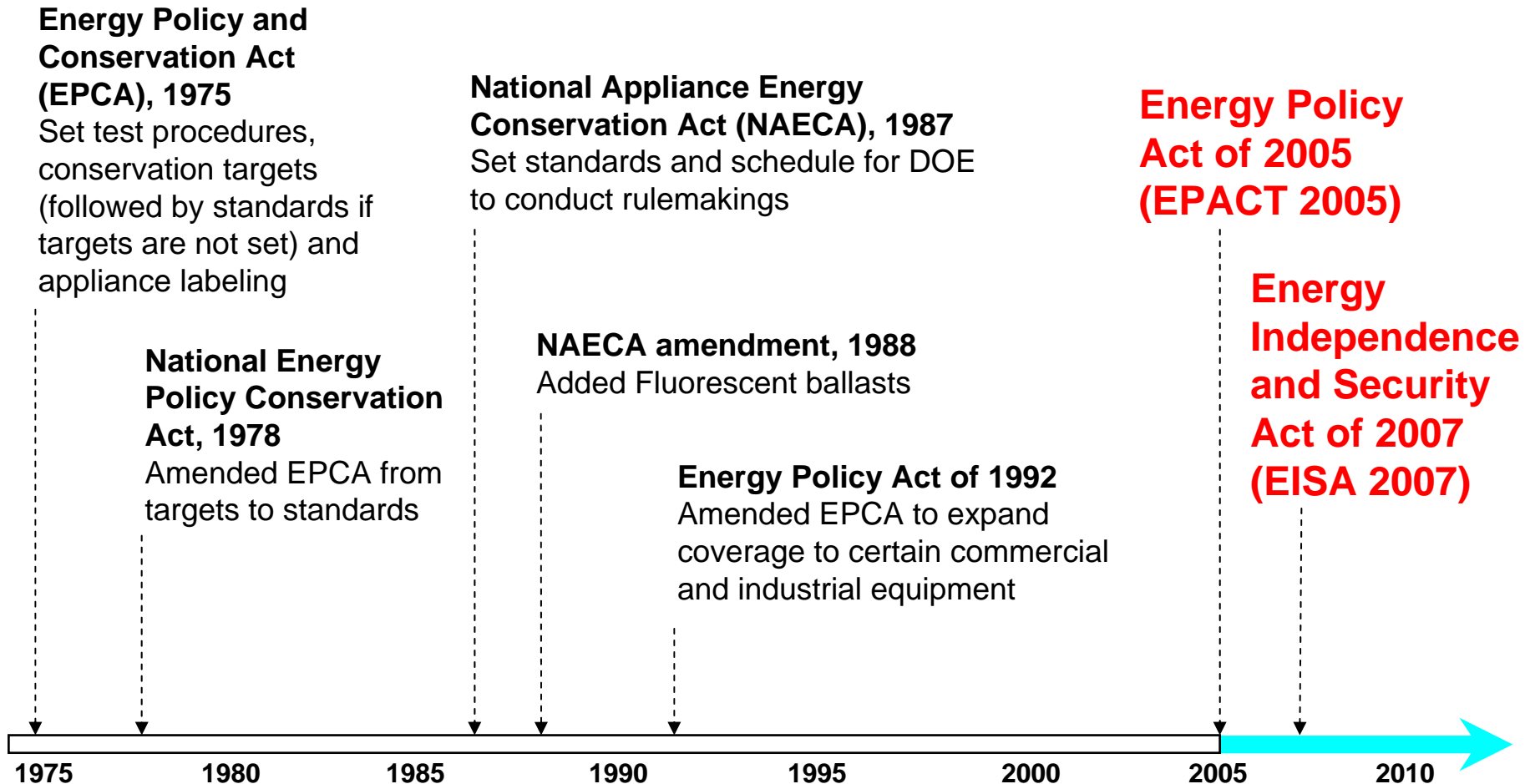
## Appliance Labeling – ENERGY STAR

- ENERGY STAR voluntary program is jointly managed by the US DOE and US EPA
- Recognizes top performing energy-efficient products in their market
  - Appliances – e.g., Battery Chargers; Clothes Washers; Dehumidifiers
  - Heating & Cooling – e.g., Air-source Heat Pumps; Boilers; Central AC; Ceiling Fans; Dehumidifiers
  - Home Envelope – e.g., Home Sealing (Insulation and Air Sealing); Windows, Doors, & Skylights
  - Home Electronics – e.g., Battery Chargers; Cordless Phones; DVD Products; Televisions
  - Office Equipment – e.g., Computers; Copiers and Fax Machines; Monitors; Printers
  - Lighting – e.g., Compact Fluorescent Light Bulbs (CFLs); Residential Light Fixtures
  - Commercial Food Service – e.g., Dishwashers; Fryers; Hot Food Holding Cabinets; Ice Machines





## Legislative History of Standards Program







## Key Bilateral Activities

- China
- India
- Brazil
- Sweden
- Israel
- New priorities: Canada, Japan, Mexico

## Key Multilateral Activities

- **Biofuels** – Global sustainability analysis
- **ECPA** – Energy and Climate Partnership for the Americas
- **EDIN** – Energy Development in Island Nations
- **APEC** – Asia-Pacific Economic Cooperation
- **APP** – Asia-Pacific Partnership on Clean Development & Climate
- **MEF** – Major Economies Forum on Energy and Climate
- **IPEEC** – International Partnership for Energy Efficiency Cooperation
- **IPGT** – International Partnership for Geothermal Technology
- **IEA** Working Groups and Implementing Agreements
- **IPHE** – International Partnership for Hydrogen in the Economy





# Major Projects on Building and Appliance Task Force

## Appliances

- Harmonization of Test Procedures
- Standby Power
- Market Transformation

## Buildings

- Building Certification
- Improvements to Existing Buildings
- **Building Codes**
  - **Window Ratings and Labeling**
  - **WUFI Training**
- High-Performance Buildings and Development
- Financing and Contracting

**New US Buildings Project Initiative, Cool Roofs, at  
October BATF in Tokyo**



## Final Remarks

- The USA has initiated unprecedented investment in energy efficiency and renewable energy
- President Obama's New Leadership for EERE, Assistant Secretary Cathy Zoi
- New technology will be essential to achieve zero energy buildings – major investment with Stimulus Funding
- Japan and US collaboration can accelerate breakthrough technologies and systems integration
- Greater focus on international collaboration



## Contact Information

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