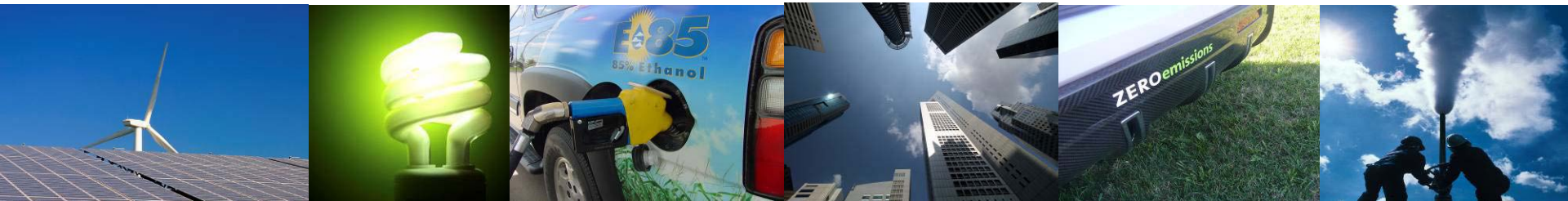
DOE Windows R&D Program Volume Purchase Kick-off Event NAHB

27 May 2010

Marc LaFrance
Technology Development Manager
Building Technologies Program
Office of Energy Efficiency and Renewable Energy



EERE Technology Portfolio

Electric Power Generation

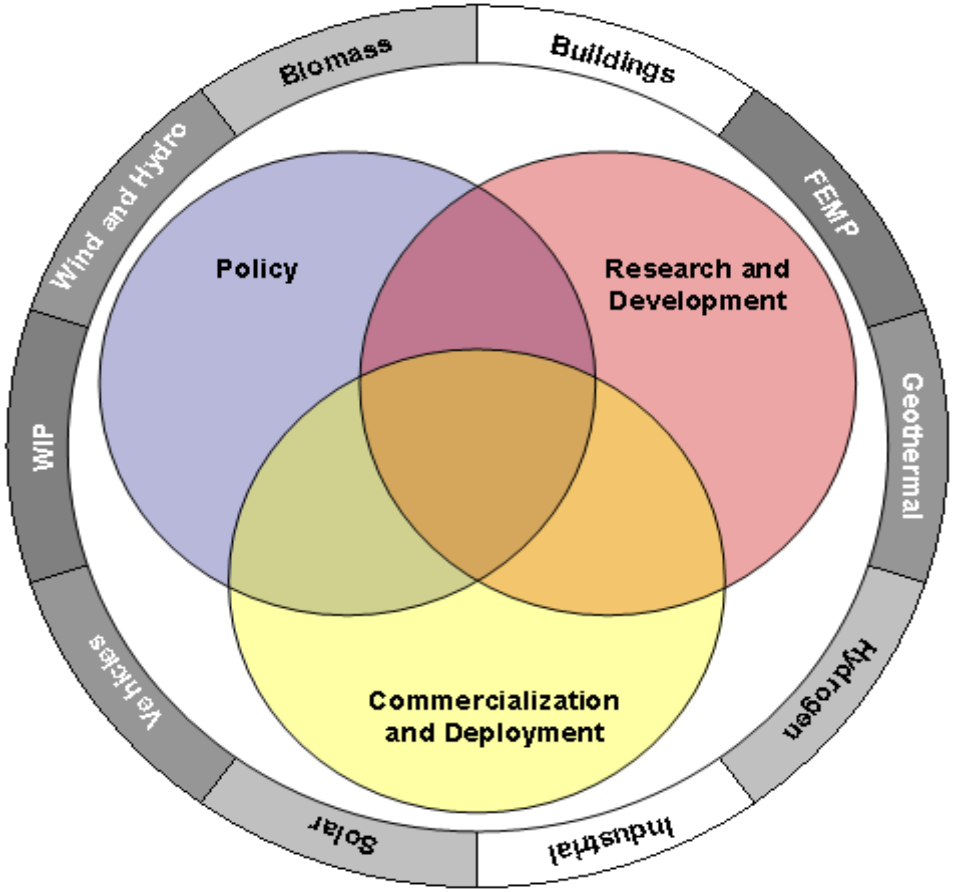
- Geothermal
- Solar
- Wind
- Hydropower & Advanced Water Power

Advanced Transportation

- Biomass
- Fuel Cells
- Advanced Vehicles

Energy Efficiency

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

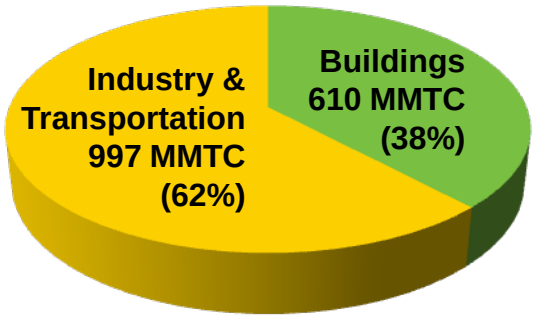


Mission Statement

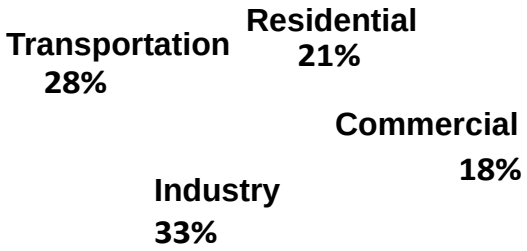
To develop cost competitive technology, facilitate commercialization and deployment to the marketplace

US Building Energy Use and Carbon Emissions

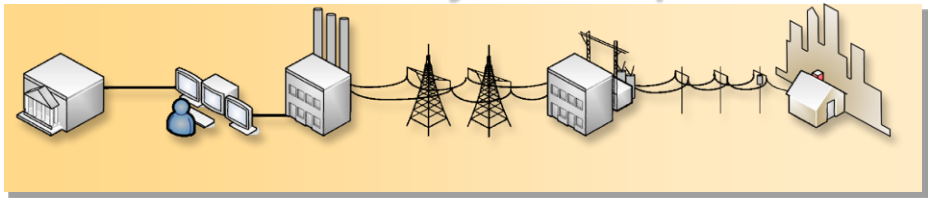
38% of U.S. Carbon Emissions



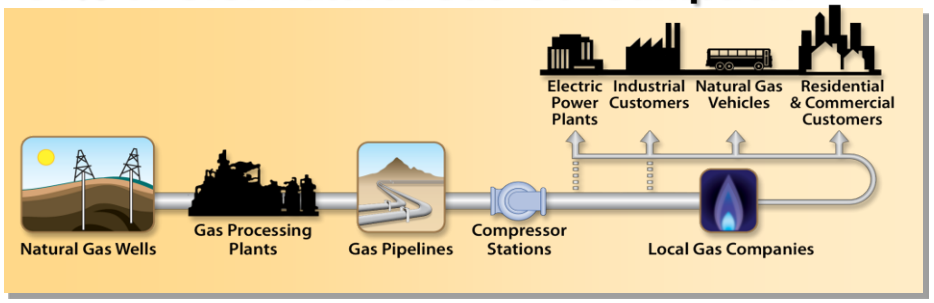
39% of U.S. Primary Energy Consumption



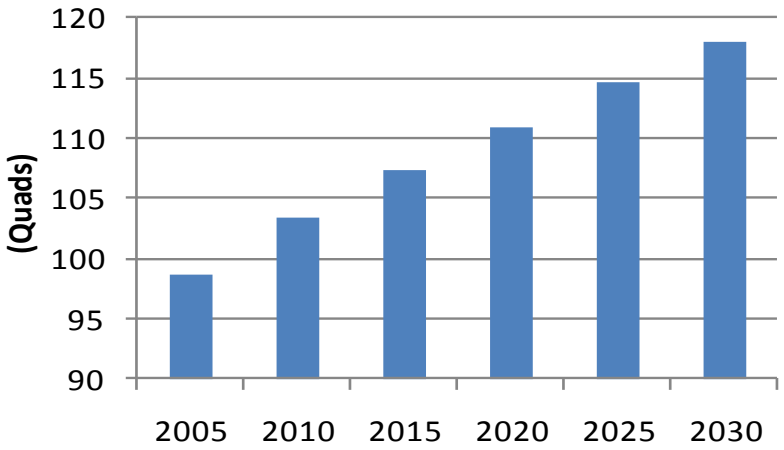
72% of U.S. Electricity Consumption



54% of U.S. Natural Gas Consumption



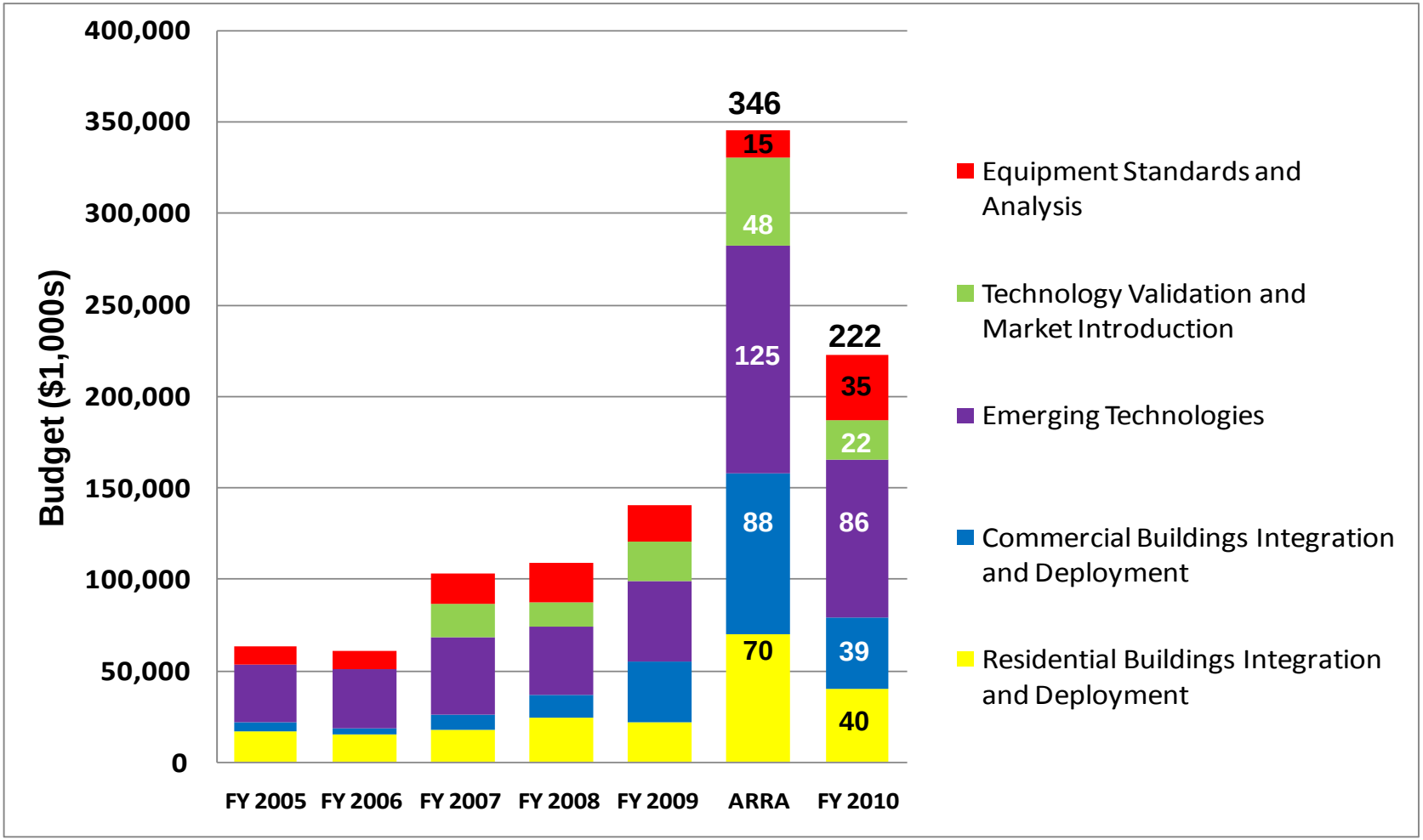
Total U.S. Energy Consumption



Sources: BED 2009; AEO 2010

BTP's funding has increased dramatically over the past 5 years.

Budget History



Source: U.S. DOE

Background: Addressing Existing Buildings

Where BTP has been

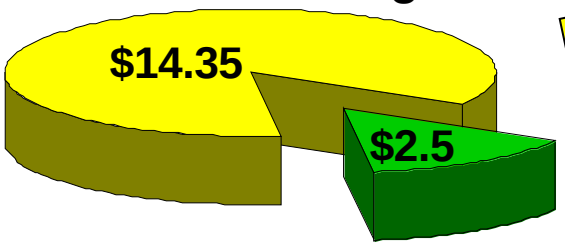
- Long-term focus on zero energy buildings
- Focus on new construction
- Independent subprograms

Where BTP is going

- Supporting short-term solutions, while meeting long-term energy and carbon reduction goals
- Increased focus on improving existing buildings today, while maintaining efforts in new construction
- Integrated subprograms within BTP, and across EERE and other Federal agencies
- Emphasis on reducing the cost of new energy efficient technologies

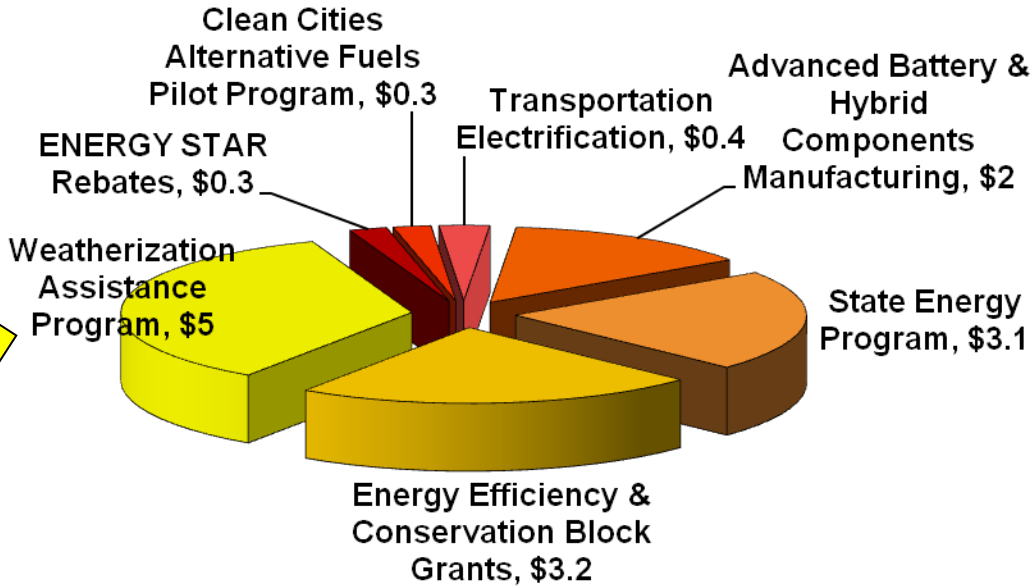
EERE Recovery Act Funding

$16.8B EERE Recovery Act Funding

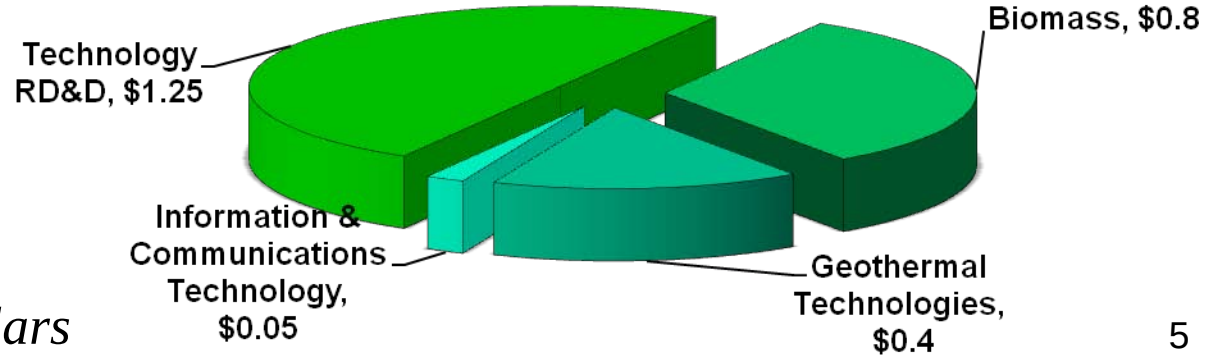


- EERE Discretionary RD&D
- EERE Directed Funding

$14.35B Directed Funding

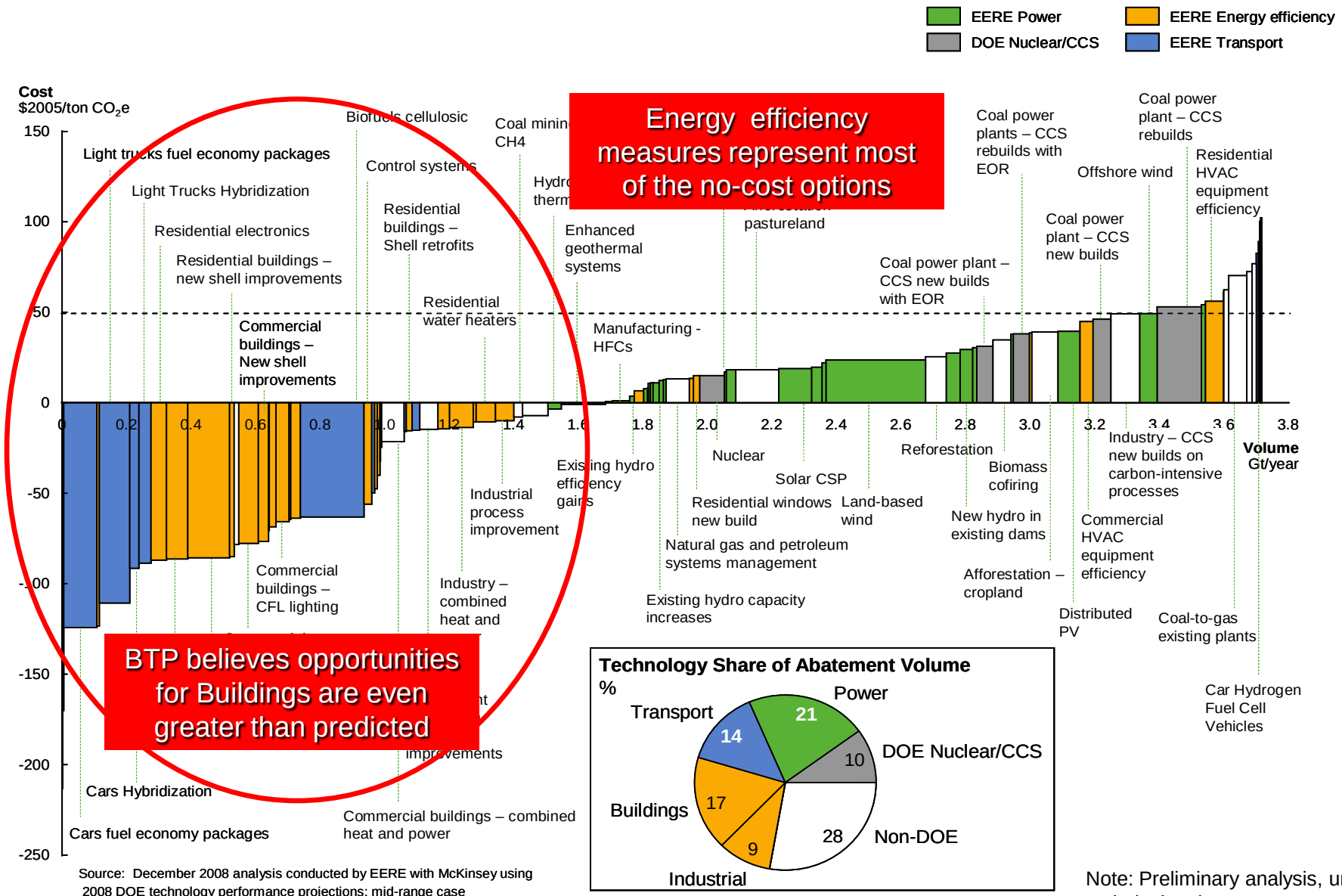


$2.5B Discretionary RD&D



Amounts are in billion US Dollars

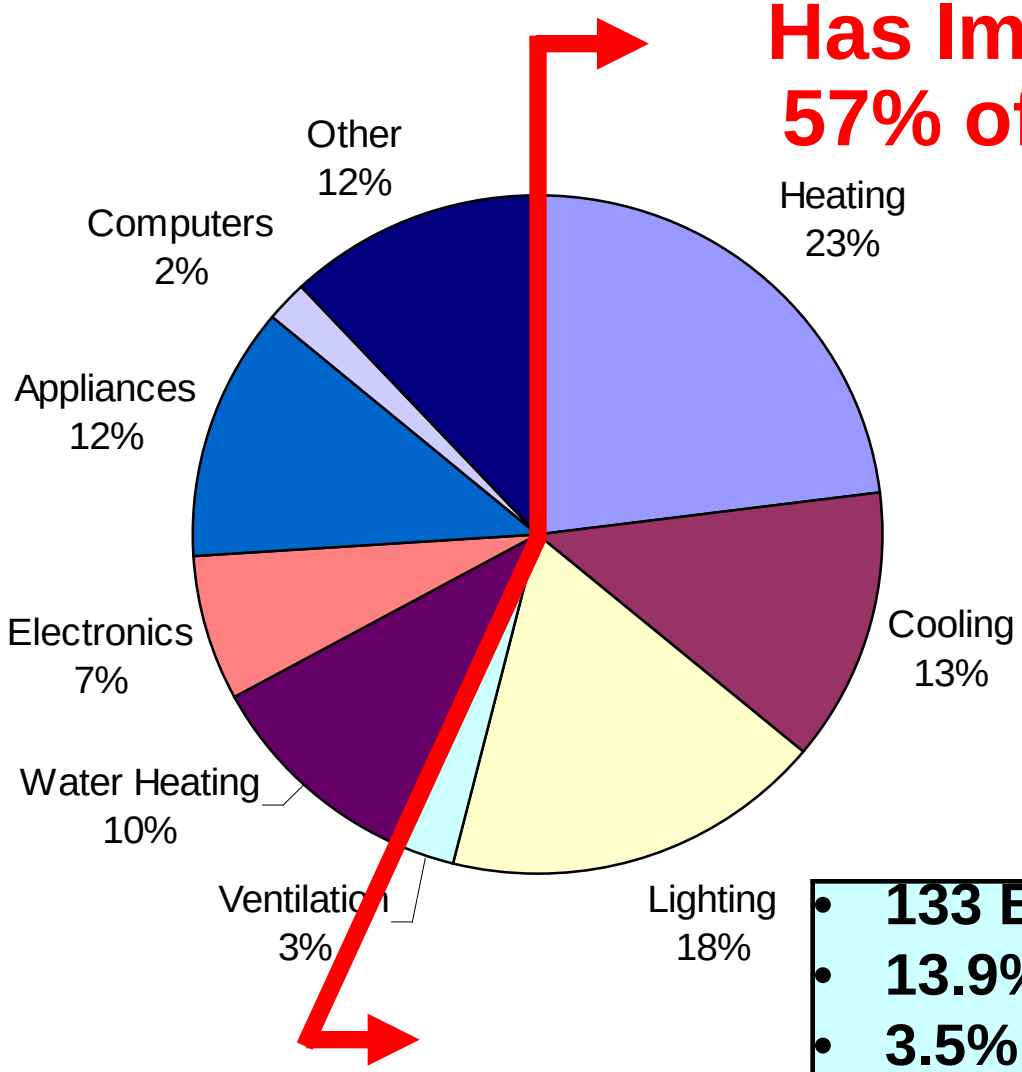
EERE Technologies – Potential Carbon Abatement



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

Note: Preliminary analysis, under technical review

Building Consumption – Envelope Relationship



Has Impact on 57% of Loads

- **133 Billion $/yr**
- **13.9% US Energy**
- **3.5% Global Energy**

Building Technologies Goal

Net-Zero Energy Buildings by 2025

Net-Zero Energy Homes by 2020

Low incremental cost.

Next Generation of Windows

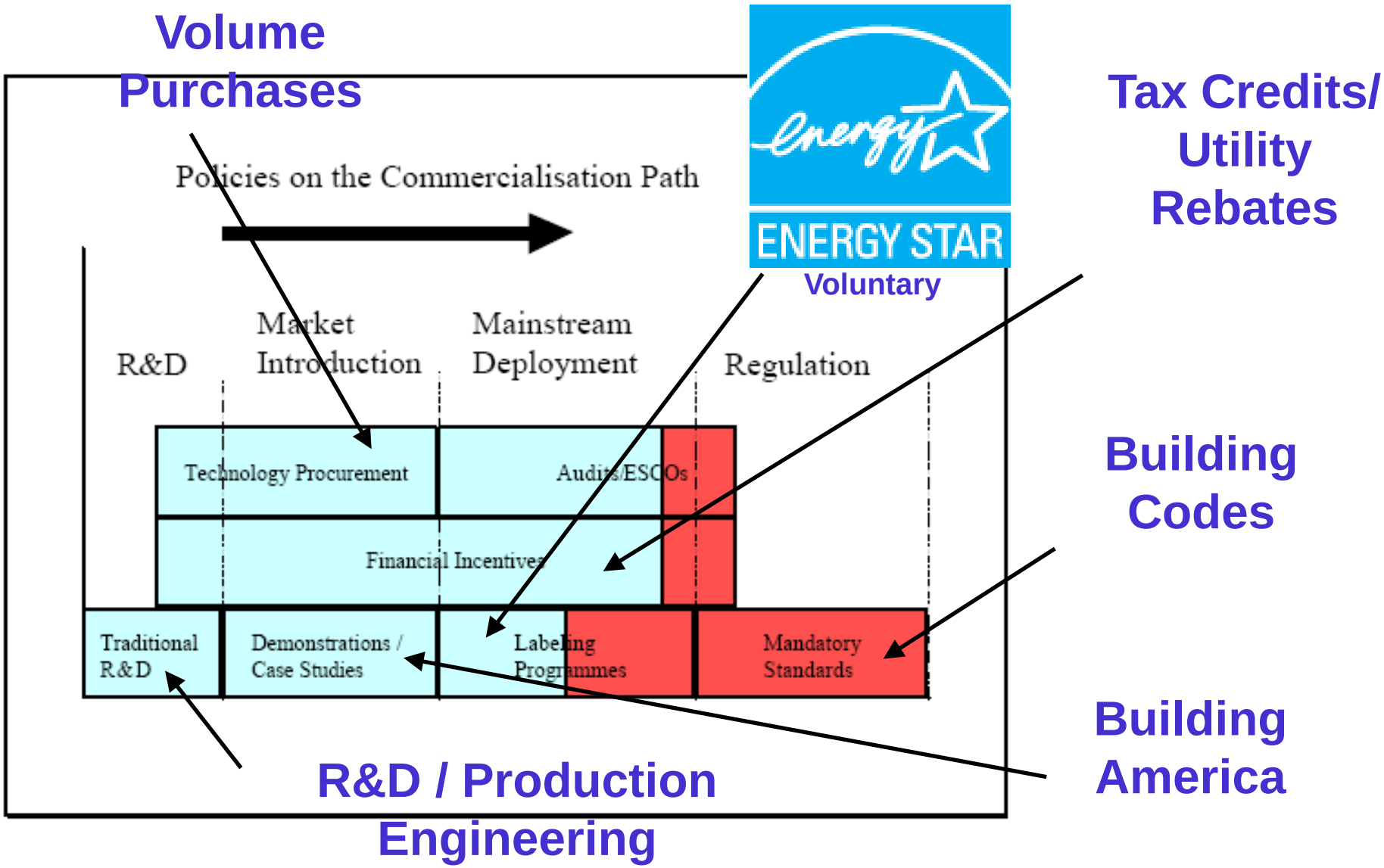
- Highly Insulating
  - Goal U value 0.10 (SI U value 0.56)
  - Possible vacuum glazings
- Dynamic solar control
  - Passive heating and dramatic peak cooling reduction, SHGC 0.53 – 0.09
  - Market ready, prices will drop with more investment
  - Many new projects underway, competitive market in 2012 - 2014

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

Total Building Envelope and Window R&D Budget

	Administration Budget Request	Enacted Appropriations
FY04	5.1M	8.2M
FY05	5.0M Windows 0 Envelope	5.8M Windows 2.8M Envelope
FY06	5.0M Windows 0 Envelope	*3.8M Windows (*earmarks) 2.9M Envelope
FY07 & FY08	4.7M Windows 2.4M Envelopes	4.7M Windows 2.4M Envelope
FY09	5.2M Windows 3.4M Envelopes	5.5 Windows 4.5 Envelope
FY 10	10.5M Windows 5.5M Envelope	**Core** **10.5M Windows** **5.5M Envelope** **ARRA** **~ 25M**
FY 11	10.5M Windows 8.0M Envelope	TBD

Efficiency Policies for Windows



ENERGY STAR – New Criteria by DOE, Now Managed by EPA

ENERGY STAR for Windows – Effective January 2010

ENERGY STAR® Qualification Criteria for Residential Windows, Doors, and Skylights

Windows

Climate Zone	U-Factor[1]	SHGC[2]	
Northern	≤ 0.30	Any	Prescriptive
	=0.31	≥ 0.35	Equivalent Energy Performance
	=0.32	≥ 0.40	
North-Central	≤ 0.32	≤ 0.40	
South-Central	≤ 0.35	≤ 0.30	
Southern	≤ 0.60	≤ 0.27	

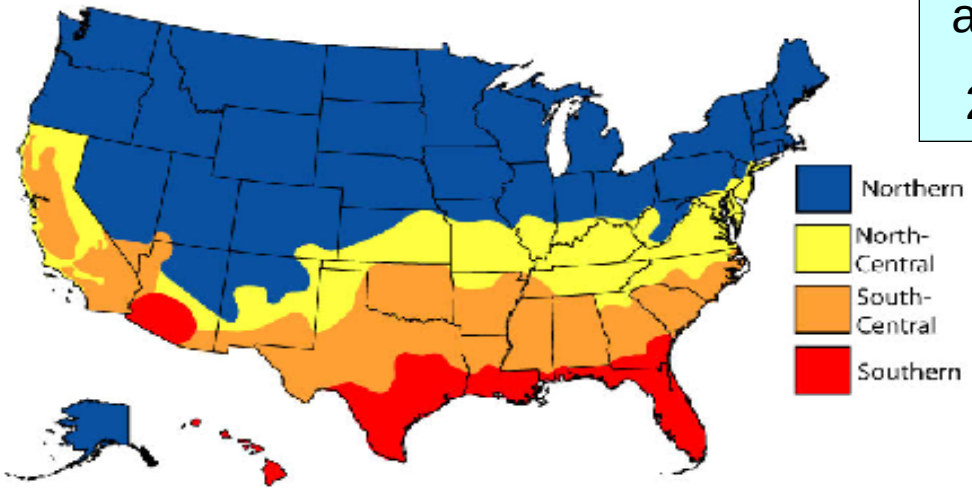
Doors

Glazing Level	U-Factor[1]	SHGC[2]
Opaque	≤ 0.21	No Rating
≤ ½-Lite	≤ 0.27	≤ 0.30
> ½-Lite	≤ 0.32	≤ 0.30

Skylights

Climate Zone	U-Factor[1]	SHGC[2]
Northern	≤ 0.55	Any
North-Central	≤ 0.55	≤ 0.40
South-Central	≤ 0.57	≤ 0.30
Southern	≤ 0.70	≤ 0.30

[1] Btu/h.ft^2.°F
[2] Fraction of incident solar radiation



EPA: Doug Anderson
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202-343-9350

Integrated Programs to Reduce Price of Highly Insulating Windows

Building America demonstrations/ production housing for easy markets

High-performance specs in LEED for Homes & NGBS

Production Engineering RFP – 50% Cost Share

Technology Procurement/Volume Purchases
– Multifamily/Public Housing/Condo, Builders, etc

Develop advanced utility program specs

Utility programs for advanced windows

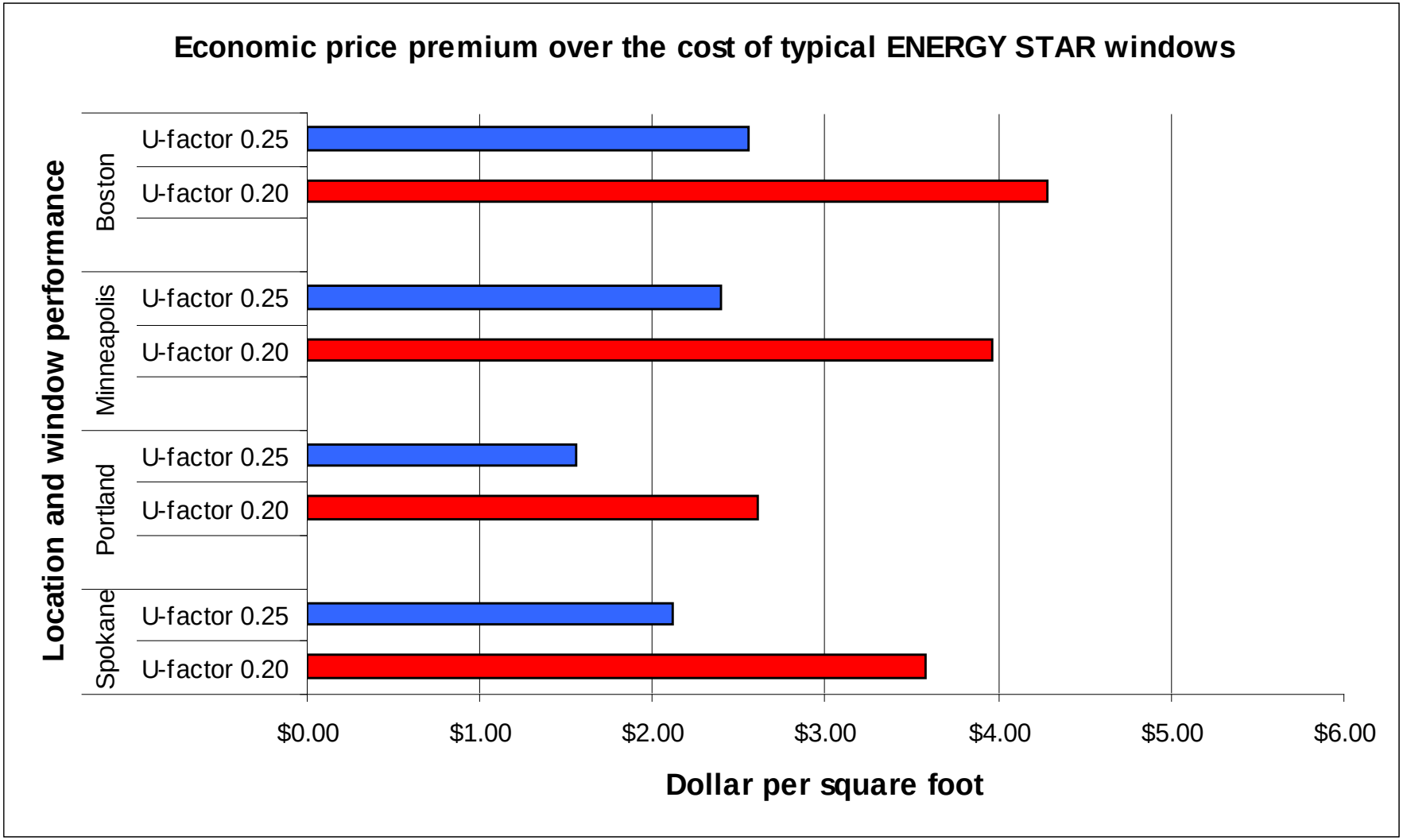
ENERGY STAR spec revision

New ENERGY STAR / Phase II

2007 | 2008 | 2009 | 2010 | 2011 | 2012

Up to what price premium are highly-insulating windows economic?

8% annual discount rate, 25 years time horizon



Oak Ridge National Laboratory / Building America Window Whole Demonstrations

- Highly Insulated Window Demonstrations
- System affects – central ducts, reduced HVAC capacity, improved comfort
- Future project – highly insulating (>R5) and dynamic control

Highly Insulating R5 Production Engineering Solicitation

- DOE Selected GED Integrated Solutions in partnership with PPG, and other major window companies
- Goal – Affordable R5 (U value of 0.22 or less for operable window and 0.20 or less for fixed window) with price premium less than $4/ft^2 compared to conventional double pane low e
- Multiple paths to market, window companies and IGU sales
- Product availability 12 – 24 months
- Second round RFP closed Aug 18, 2009
- 50% cost share requirement
- Strong response, evaluation underway

R5 (~U 0.2) and Low E Storm Windows Volume Purchase

Develop Buyer Groups

↓

Develop Draft RFP Specifications with Buyers and Possible Manufacturer Bidders

↓

Issue RFP – Dec 2009

↓

Mfg Submissions – Feb 2010

↓

Finalize Agreements with Vendors - April 2010

↓

Promote Qualified Products with Partners – June 2010

R5 (~U 0.2) and Low E Storm Windows Volume Purchase

Letters of Support

- Apartment and Office Building Association of Metropolitan Washington (AOBA)
- Build America Industrialized Housing Partnership (BAIHP)
- Community and Economic Development Association of Cook County, Illinois (CEDA)
- Common Wealth of Massachusetts
- Clayton Homes
- Consortium for Energy Efficiency
- Curtain Wall Design & Consulting (CDC)
- Davis Energy Group
- Energy Trust of Oregon
- Fenestar
- Habitat for Humanity
- IBACOS
- Jordan, Knauff & Company
- Midwest Energy Efficiency Alliance (MEEA)
- National Community Action Foundation (NCAF)
- NP Group, Inc
- Northwest Power and Conservation Council
- Palm Harbor Homes
- Pierce and Associates
- Systems Building Research Alliance (SBRA)
- The Window Man
- Youthbuild USA
- ZETA

Examples of Articles - VP Program in Major Trade Press

Builder The Information Source for the Home Building Industry

From: BUILDER 2010 | Posted on: January 4, 2010 12:28:00 PM

Greener Windows at a Nicer Price

DOE hopes to make energy-efficient windows more economical throug

By:
Jenny Sullivan

High-performance windows could become more affordable for builders and homeov
Department of Energy (DOE) effort to lower costs goes as planned.

DWM DOOR & WINDOW MANUFACTURER MAGAZINE

Volume Purchase Program: Music to our Ears

Dec 1st, 2009 | By DWM Mag | Category: Collins, the Trend Tracker

I had a conversation recently with a consultant working on the Department of Energy (DOE) Highly Insulating (R-5) Window and low-E Storm Window Volume Purchase Program. The purpose of this program is to facilitate volume purchases of highly energy efficient windows. The U-factor equivalent of an R-5 is .2, significantly lower than the .3 U-factor required for the tax credit. The goal of this program is to bring volume buyers together with window manufacturers, creating a virtual market for high volumes of energy efficient windows. By

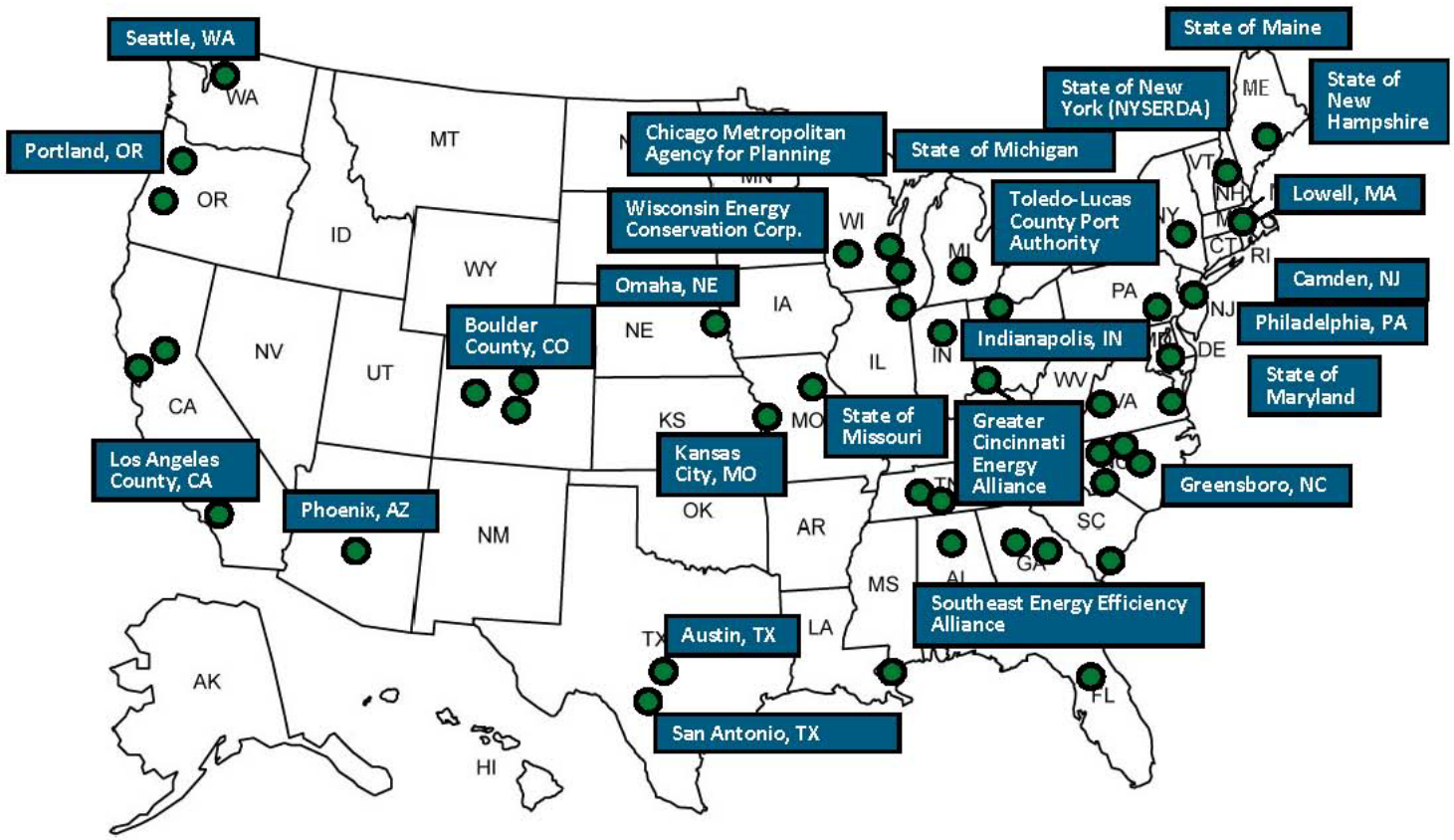
Targeted Buyers Groups

- Associations
- K-12 Schools
- Public Housing
- Local/State Agencies
- Weatherization
- Federal Government
- Builders/Contractors
- Non-profits
- Universities

Retrofit Ramp-Up
Need To Market to Cold Climates

U.S. DEPARTMENT OF ENERGY

Retrofit Ramp-Up: Selected Projects*



* Some projects include more than one participating city

April 21, 2010

2009-2010 Fenestration Tax Credit

- Raised limit for home improvements to $1500
- Increased to 30 percent of product cost
- Does not cover installation costs
- Removed individual caps on windows and doors
- Established U-factor and SHGC at 0.30 or less
- Took effect February 17, 2009, through end of 2010

Proposed Future for ENERGY STAR from R&D Perspective

- Phase II analysis should be based on new triple pane products, likely 3 – 15 months
- Pursue window film and low e storm program for lower cost retrofit options – large disparity of products
- DOE to support EPA in moving ahead with Phase II ENERGY STAR criteria
- Could consider Super Star approach, advanced criteria sooner, longer time for current Energy Star
- DOE originally proposed in 2008 a U value of 0.2 to 0.24 for Northern Climates with SHGC > 0.35 in the 2013 to 2014 timeframe

Significant Interest in Window Technical Criteria

- DOE does not have a role in tax credit formulation
- Window R&D provides support to ENERGY STAR, Code Analysis, etc – will continue to work with EPA
- Significant effort to support new products entering the market and the mission of transforming window market
- Attention needed on long term goals to achieve impacts for low carbon buildings, ZEB and contribution to carbon targets
- Renewed interest in air infiltration reduction, but lower U values in cold climates is a bigger opportunity
- Need to pursue greater effort on durability, especially long term performance that has potentially a bigger impact on infiltration, gas fill leakage, ensure return on investment, etc

Key Policy Needed to Support Highly Insulating and Dynamic Windows in the Future

- Could extend tax credits 2011 – 2013 for triples
- Utility Rebate Programs 2010 – 2015
- To keep policy easy, require low U values (0.20 – 0.24) with any SHGC requirement
- Stimulus program makes sense for the whole country
- Energy Policy only needs to address critical technology development problem (Low U values for mixed and cold climates); could be extended to dynamic glass for significant impact in hot and mixed climates, SHGC < 0.10

Current Technical Support Activities

- **Tools**
  - Rating/Design Software
  - Decision tools, RESFEN
  - Residential Handbook
  - Commercial Handbook
- **Knowledge Base (Education)**
  - Efficient Windows Collaborative
  - Education to manufacturers/consumers
  - Commercial web page
  - Evaluation of commercial tools by users (builders, designers, suppliers,etc)
- **Industry Support**
  - International Optics Database
  - Assistance with tools to users
  - Durability studies
  - NFRC Documentation
  - NFRC, ASHRAE, ASTM, & ISO participation/leadership
  - International Std. Harmonization

DOE Assists with Technical Support Activities

http://windows.lbl.gov/software

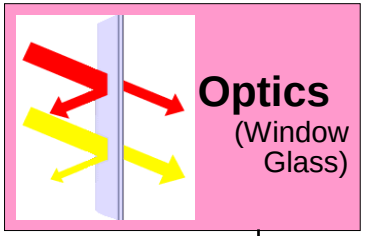
www.nfrc.org

www.efficientwindows.org

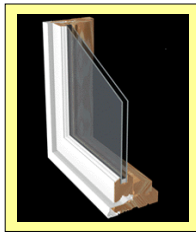
- Full range of software support tools, education materials and expansion to new product categories
- Continued financial support to assist industry in rating and promoting efficient product

WINDOW6 Software Suite

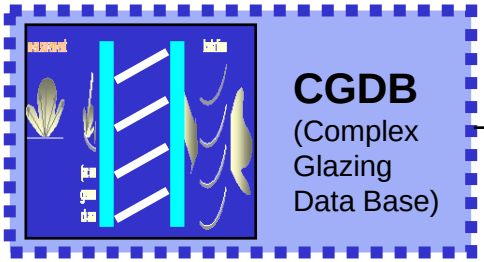
IGDB
(Specular Glass Data Source)



Optics
(Window Glass)



THERM
(Window Frame)



CGDB
(Complex Glazing Data Base)

WINDOW
(Whole Window)

NFRC Ratings and Labels

National Fenestration Rating Council

Design / Simulation Tools
DOE-2, EnergyPlus
Radiance

COMFEN
(Whole Building Commercial)

RESFEN
(Whole Building Residential)

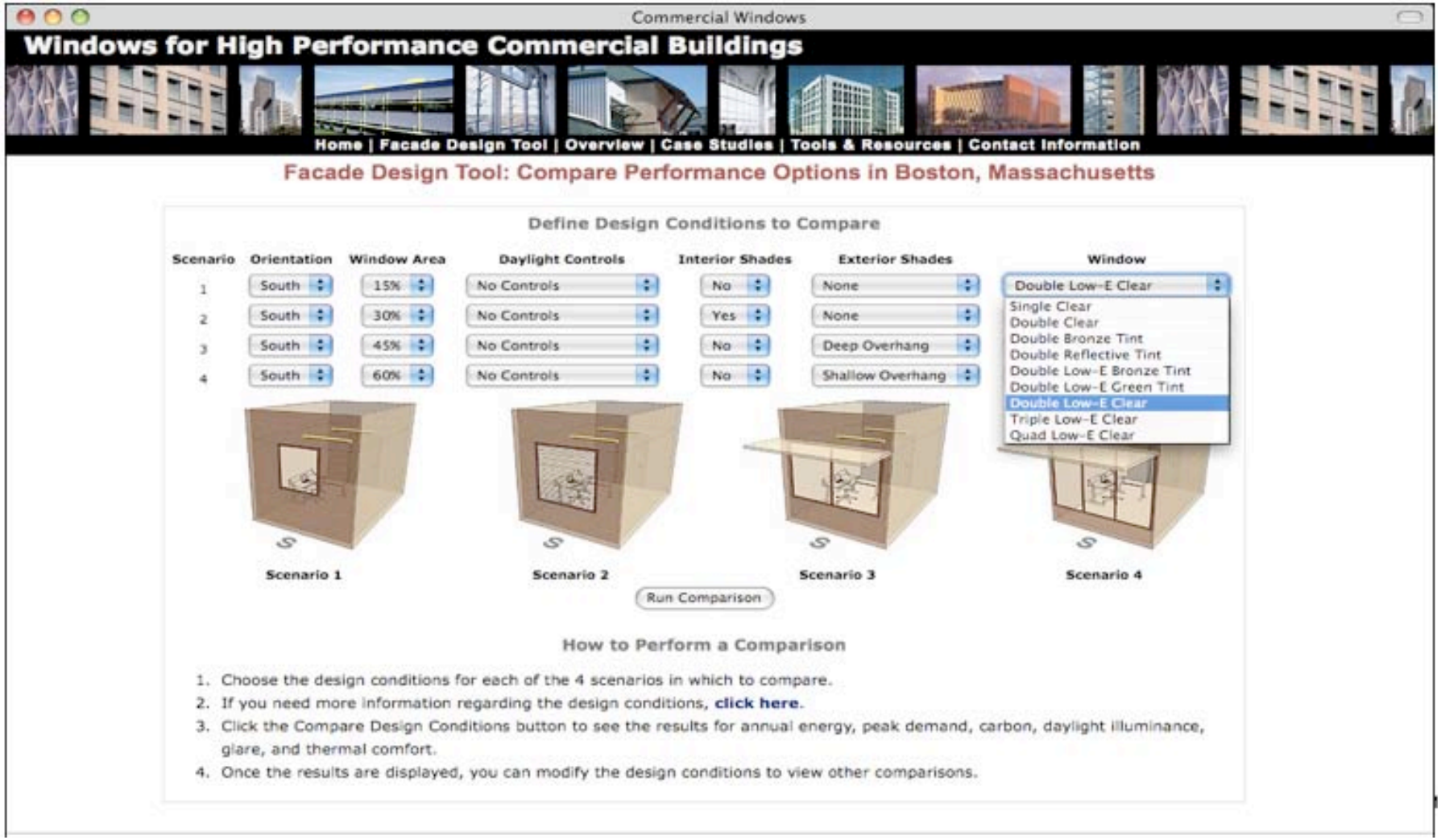
- **Design tools for advanced products**
- **ISO 15099 Compliant**
- **NFRC Ratings**

http://windows.lbl.gov/software

BERKELEY LAB

Façade Design Tool

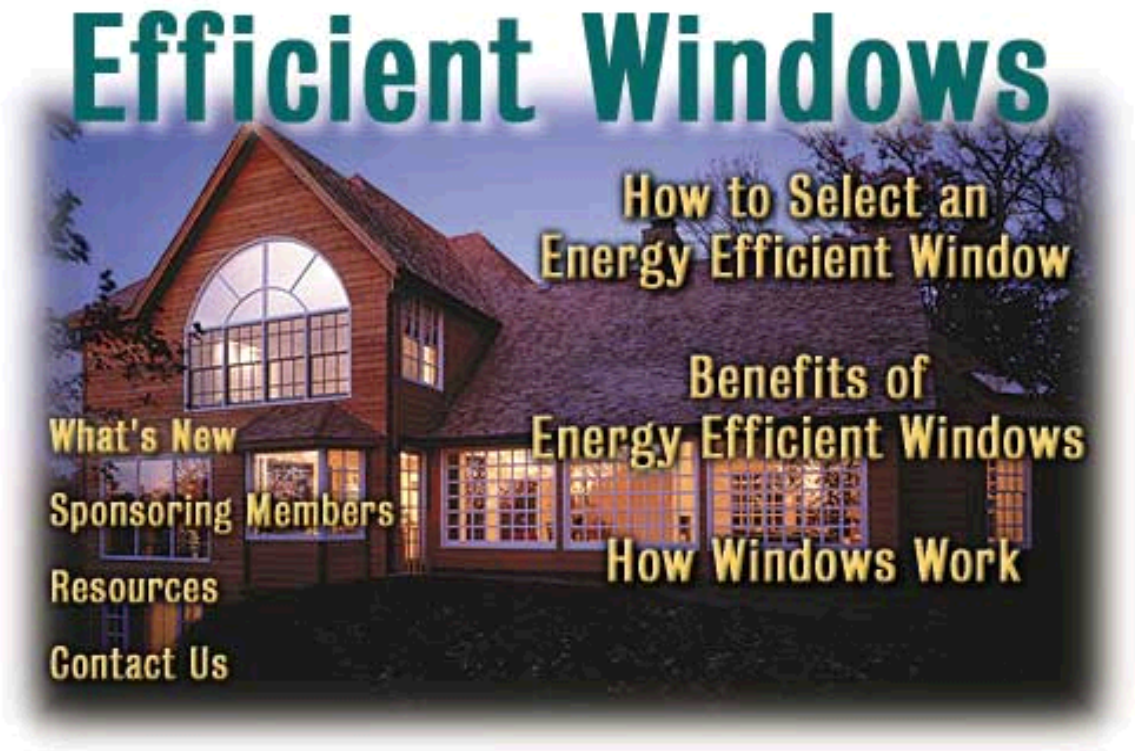
http://www.commercialwindows.org



National Fenestration Rating Council

NFRC-Component Modeling Approach or CMA

- Calculates U-factor, SHGC and VT according to NFRC 100 and NFRC 200 as required by IECC and ASHRAE 90.1
- CMA is most efficient way to satisfy code for commercial fenestration
- Program launched in January 2010
- CMA software tool (CMAST) makes calculations using frame, glass, and spacer data
- Download software here: www.nfrc.org/cmaprogram.aspx



Efficient Windows Collaborative

This web site provides unbiased information on the benefits of energy-efficient windows, descriptions of how they work, and recommendations for their selection and use. EWC members have made a commitment to manufacture and promote energy-efficient windows. Take a look to learn more!

The Efficient Windows web site is sponsored by the Efficient Windows Collaborative (EWC) with support from the U.S. Department of Energy's Windows and Glazings Program and the participation of industry members.

Over 60,000 users per month

www.efficientwindows.org

International Activity
Renewed Interest from New Administration

- Recent years with NFRC support
  - Australia (NFRC Partner Country)
  - India (NFRC Partner Country)
  - China
  - South Africa (NFRC Partner Country)
  - Middle East
- Go beyond Fenestration to Whole Envelope Activity
  - Cool Roofs
  - Passive structures in hot climates (low e, window films, cool roofs, reflective walls, radiant barriers, exterior insulation, etc)
  - Envelope certification – India project under the Asia Pacific Partnership on Clean Development and Climate

Final Remarks

- The USA has initiated unprecedented investment in energy efficiency and renewable energy
- New technology will be essential to achieve zero energy buildings and impacts to existing building stock – major investment with Stimulus Funding
- Fenestration industry can play a major role in implementation and new product development
- Need greater incentives for 2011 – 2013 time frame to support R5 and dynamic windows
- VPP Launch is a major milestone on this journey

Contact Information

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