



## **Windows Volume Purchase Program (WVP) Mountain Region Webinar**

### **Agenda**

- 1:00pm Mountain West Regional Webinar Welcome**
- 1:05pm U.S. Department of Energy Building Envelope Program Activity Summary**  
Terry Mapes, Pacific Northwest National Laboratory (PNNL)
- 1:10pm What are High Performance Windows and How Can They Help Me?**  
Nils Petermann, Alliance to Save Energy (ASE)
- 1:20pm The Construction of the WVP Program and purchasing windows from**  
[www.WindowsVolumePurchase.org](http://www.WindowsVolumePurchase.org)  
Terry Mapes, PNNL
- 1:35pm Impacts and Achievements of the WVP Program**  
Walt Zalis, Energetics Incorporated
- 1:45pm A Perspective from Questar Gas**  
Bryan Taylor, Questar Gas
- 1:55pm A Perspective from National Fenestration Rating Council (NFRC)**  
Ray McGowan, NFRC
- 2:10pm SAVE Act Introduction**  
Tom Simchak, ASE
- 2:15pm Audience questions and discussion**
- 2:30pm Conclude**



Window and Envelope Solutions for  
Today and Tomorrow

Mountain Region Webinar  
November 16, 2011

## Goals of this presentation

- Show DOE purpose and planning for window-related programs
- Introduce a market transformation program that is increasing the availability of highly insulating windows and low-E storm windows
- Explain the benefits of these products and how they work



## DOE and Windows

How the WVP program fits  
into the big picture

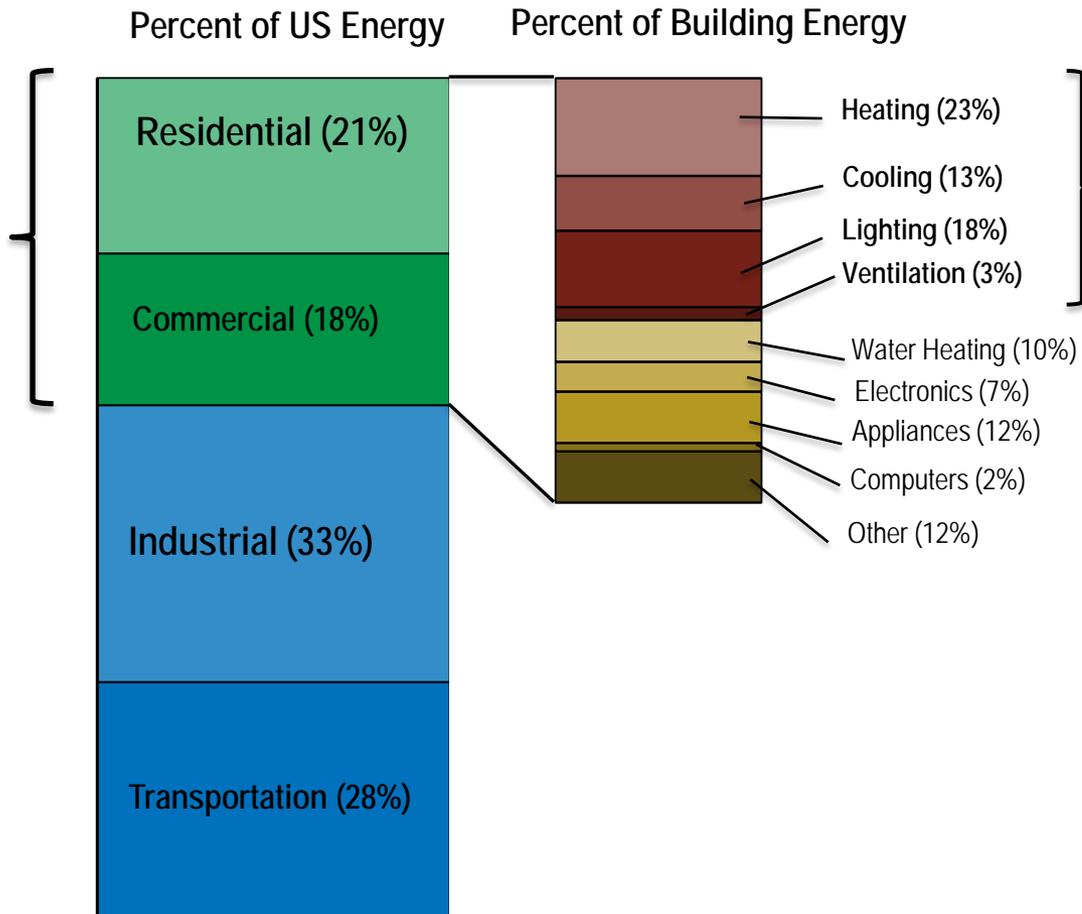


Terry Mapes  
Pacific Northwest National Laboratory

# Impact on US Energy Consumption

## Why worry about windows?

Buildings are responsible for about 40% of US primary energy consumption



58% of the energy used in a building is impacted by windows. Almost 14% of the total energy in the US.

# Current Residential Windows Market

Home / Doors & Windows / Windows / Single Hung

## Single Hung

PRICE

- \$50 - 100 (18)
- \$100 - 200 (15)

BRAND

- American Craftsman, an Andersen Company (16)
- JELD-WEN (9)
- TAFCO (6)
- TAFCO WINDOWS (2)

**ENERGY STAR COMPLIANT**

- Energy Star (25)

ECO OPTIONS

- Eco Options (21)

MATERIAL

33 Products

Sort By: Top Sell

Select up to 4 items to compare. COMPARE

American Craftsman, an Andersen Company 2301 Single Hung Vinyl Windows, 3/0 in. x 5/0 in. White with LowE3 Insulated Glass, Argon Model 2301

American Craftsman, an Andersen Company 2301 Single Hung Vinyl Windows, 3/0 in. x 5/0 in. White with LowE3 Insulated Glass, Argon Model 2301

Home Depot  
Three largest window categories

Over 85%  
Energy Star compliant

Home / Doors & Windows / Windows / Double Hung

## Double Hung

PRICE

- \$50 - 100 (1)
- \$100 - 200 (55)

PRO

- Pro (1)

STORM WINDOW

- No (32)

MORE WAYS TO SHOP

- Special Values
- Most Popular

56 Products

Sort By: Top Sell

Select up to 4 items to compare. COMPARE

American Craftsman, an Andersen Company 8500 Double Hung Vinyl Windows, 28 in. x 54 in. White, with LowE3 Insulated Model 8500

American Craftsman, an Andersen Company 3000 Double Hung Vinyl Windows, 2/4 in. x 3/2 in. White with LowE3 Insulated Model 3000

### Product Comparison

Here are the products you have to compare:

	Model 3000	Model 8500	Model 3000	Model 8500
Remove Product	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Image				
Price	\$137.00/EA-Eac Ships FREE with \$249.00 Order	\$128.00/EA-Eac Ships FREE with \$249.00 Order	\$133.00/EA-Eac Ships FREE with \$249.00 Order	\$138.00/EA-Eac Ships FREE with \$249.00 Order
Manufacturer	American Craftsman, an Andersen Company			
Window Type	Double Hung	Double Hung	Double Hung	Double Hung
Collection Name		8500		8500
Color/Finish	White	White	White	White
Energy Star Compliant	Yes	Yes	Yes	Yes

R3 is now  
becoming the  
BASELINE

Home / Doors & Windows / Windows / Gliders

## Gliders

PRICE

- Less than \$50 (1)
- \$50 - 100 (17)
- \$100 - 200 (17)

BRAND

- JELD-WEN (21)
- TAFCO (6)
- TAFCO WINDOWS (4)
- American Craftsman, an Andersen Company (4)

**ENERGY STAR COMPLIANT**

- Energy Star (25)

ECO OPTIONS

- Eco Options (20)

MATERIAL

35 Products

Sort By: Top Sell

Select up to 4 items to compare. COMPARE

JELD-WEN Vinyl Horizontal Sliding Window Low-e Glass 48 in. x 48 in. LH Model A92967

JELD-WEN Vinyl Horizontal Sliding Window Low-e Glass 48 in. x 36 in. LH Model A92965

# Total Building Envelope and Window R&D Budget

	<b>Administration Budget Request</b>	<b>Enacted Appropriations</b>	
<b>FY05</b>	5.0M Windows <b>0 Envelope</b>	5.8M Windows 2.8M Envelope	
<b>FY06</b>	5.0M Windows <b>0 Envelope</b>	*3.8M Windows (*earmarks) 2.9M Envelope	
<b>FY07 &amp; FY08</b>	4.7M Windows 2.4M Envelopes	4.7M Windows 2.4M Envelope	
<b>FY09</b>	5.2M Windows 3.4M Envelopes	5.5 Windows 4.5 Envelope	
<b>FY 10</b>	10.5M Windows 5.5M Envelope	<b>Core</b> <b>10.5M Windows</b> <b>5.5M Envelope</b>	<b>ARRA</b> <b>25M</b>
<b>FY 11</b>	10.5M Windows <b>8.5M Envelope</b>	<b>TBD – Not expected to exceed FY10 Continuing Resolution</b>	
<b>FY 12</b>	<b>25 M (9M BIPV)</b>	<b>TBD</b>	



# Integrated Programs to Reduce Price of Highly Insulating Windows

## Technical Support

Building America demonstrations/ production housing for easy markets

High-performance specs in LEED for Homes & NGBS

Production Engineering RFP – 50%  
Cost Share

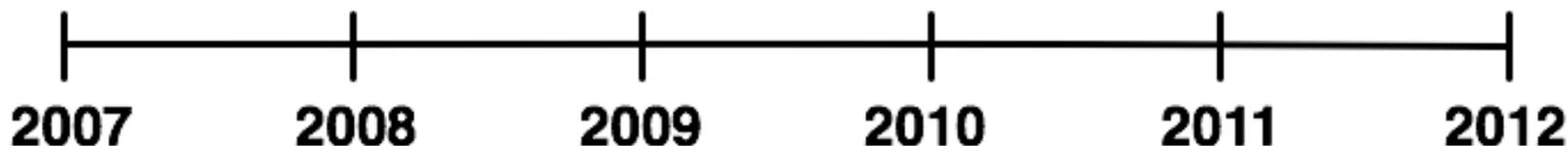
## Technology Procurement/Volume Purchases

Develop  
advanced utility  
program specs

Support utility programs for  
advanced windows

ENERGY STAR spec revision

ENERGY STAR Spec  
Development

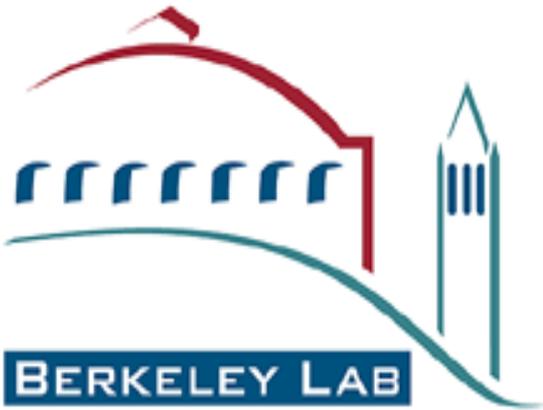


- **Highly Insulating Windows**
  - Goal is U-factor 0.10
  - Evaluate vacuum glazing
  - Advance dynamic glazing
- **Market-Based Approach**
  - Alternative to codes and standards
  - Technology specifications & procurement
  - Demonstrations



**Prototype – Concept Window  
Highly Insulating and Dynamic  
SHGC 0.04 – 0.34**

## DOE Assists with Technical Support Activities

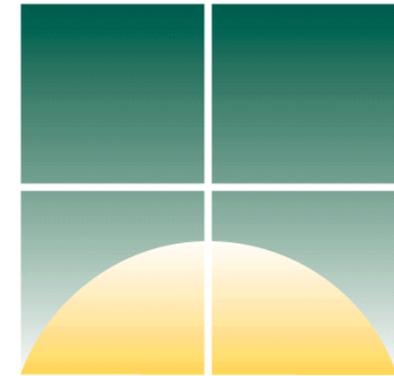


<http://windows.lbl.gov/software>



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

Efficient Windows



*Collaborative*

[www.efficientwindows.org](http://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 products

# Contact Information

P Marc LaFrance, CEM

Technology Development Manager

Building Technologies Program

Office of Energy Efficiency and Renewable Energy

US Department of Energy

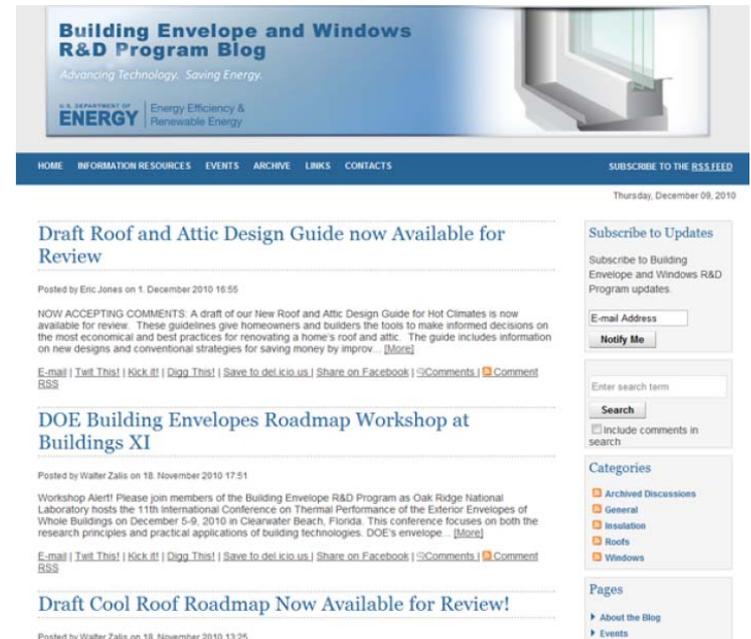
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Fax 1-202-586-4617

[www.eere.doe.gov](http://www.eere.doe.gov)

[www.eereblogs.energy.gov/buildingenvelope](http://www.eereblogs.energy.gov/buildingenvelope)



## Energy efficiency and the WVP Program products

Highly Insulating Windows

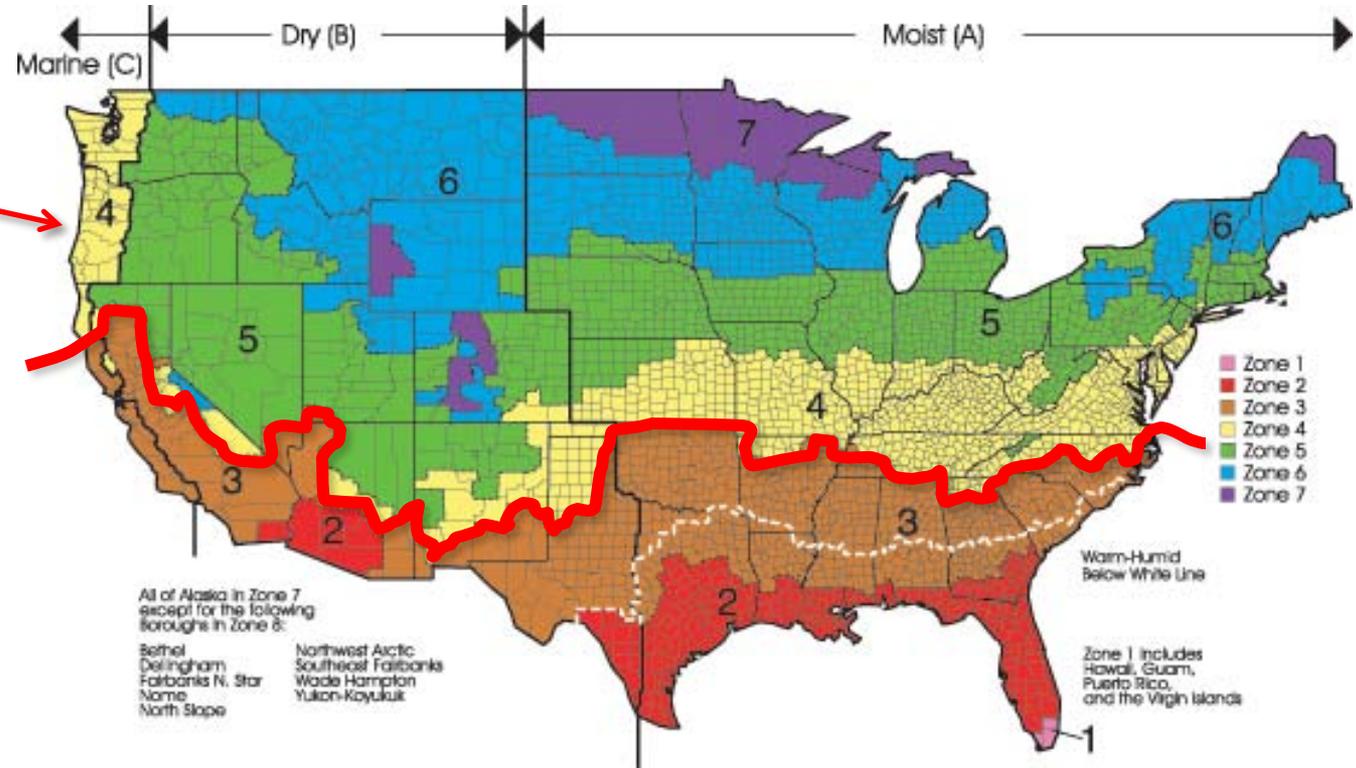


Low-E Storm Windows



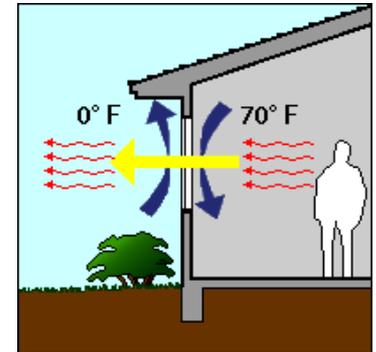
# DOE High Performance Windows Program: Focus on cold climates / U-factor

Focus on mixed and  
heating climates  
(Climate Zones 4-8)



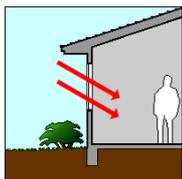
# Focus on U-factor

- U-factor measures insulating value  
lower = less heat loss
- For general reference: R-value is inverse of U-factor
  - e.g. if  $U = 0.2$ , then  $R = 1/0.2 = 5$
  - But test conditions differ btw. windows and walls
- Whole-window U-factors (including frames) are generally higher than glass-only U-factors
- Specify NFRC whole-window U-factor

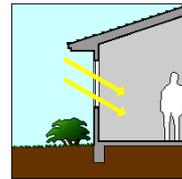


 National Fenestration Rating Council® CERTIFIED	World's Best Window Co. Millennium 2000+ Vinyl-Clad Wood Frame Double Glazing - Argon Fill - Low E Product Type: Vertical Slider	
	<b>ENERGY PERFORMANCE RATINGS</b>	
U-Factor (U.S./I-P)	Solar Heat Gain Coefficient	
<b>0.35</b>	<b>0.32</b>	
<b>ADDITIONAL PERFORMANCE RATINGS</b>		
Visible Transmittance	Air Leakage (U.S./I-P)	
<b>0.51</b>	<b>0.2</b>	
<small>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</small>		

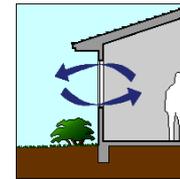
## Other window energy ratings:



Solar heat gain coefficient



Visible transmittance

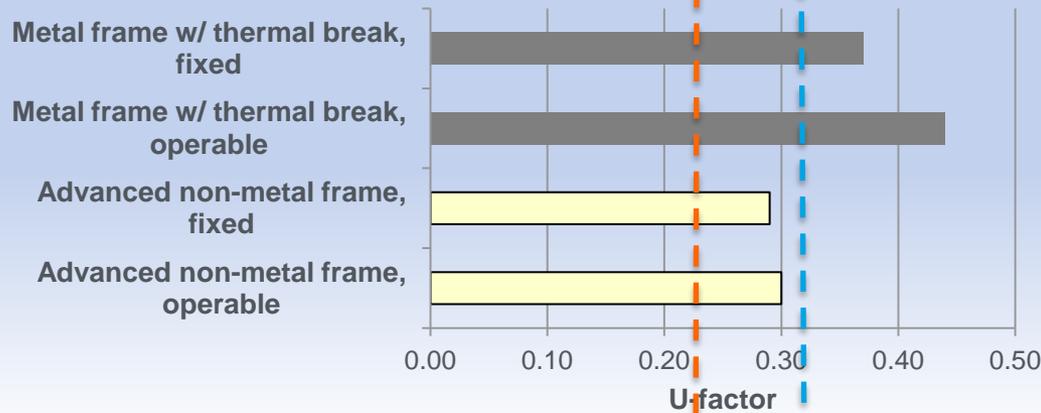


Air leakage

# Window U-factors in Perspective

## Representative U-factor with 2-pane Low-E Glass

Data from ASHRAE Handbook of Fundamentals



## Representative U-factor with 3-pane Low-E Glass

Data from ASHRAE Handbook of Fundamentals

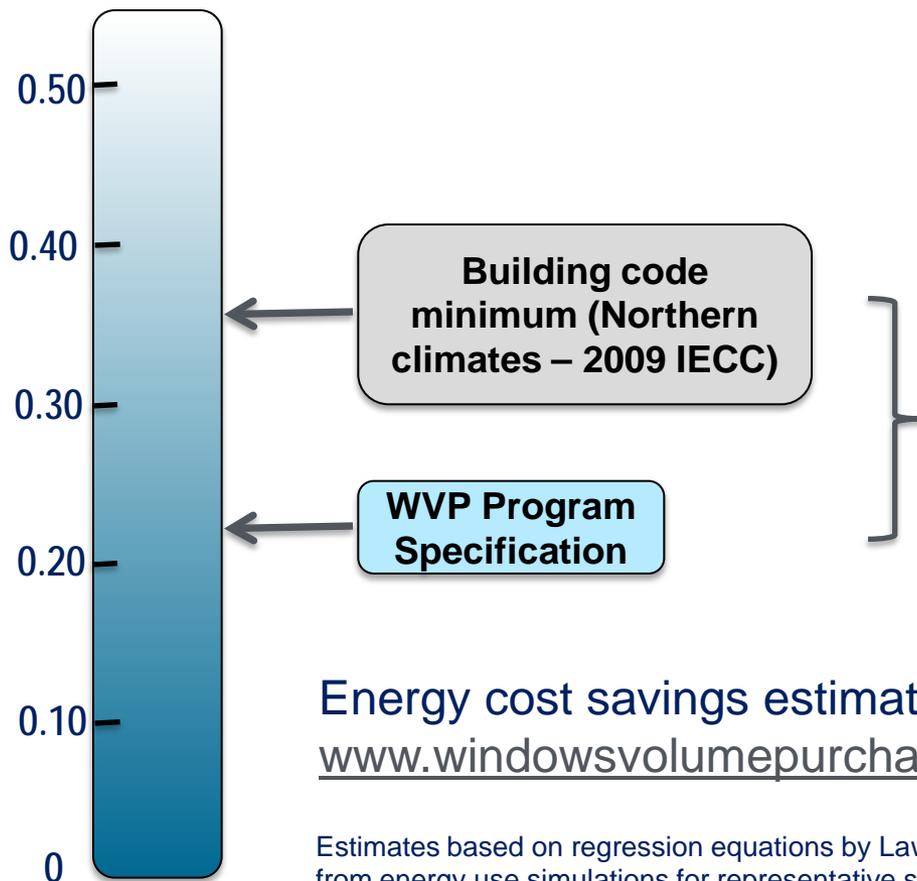


## DOE High-Performance Window U-factor Specs

Structural Performance	Operable	Fixed
<b>Residential &amp; light commercial</b>		
R or LC performance class	<b>0.22</b>	0.2
<b>Commercial</b>		
CW performance class	0.27	0.24
AW performance class	<b>0.32</b>	0.27

# Estimated Home Energy Savings – High Performance Windows

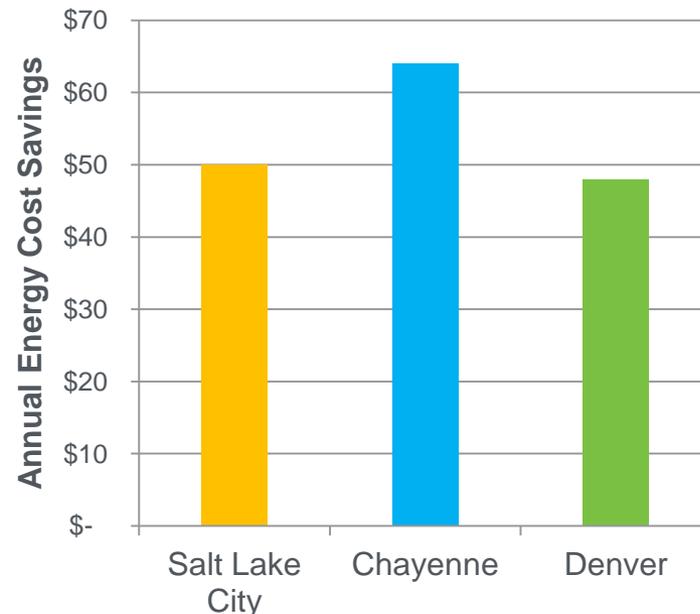
Savings depend on climate, building type and energy prices



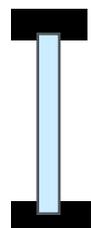
Energy cost savings estimator available for download at:  
[www.windowsvolumepurchase.org](http://www.windowsvolumepurchase.org)

Estimates based on regression equations by Lawrence Berkeley National Laboratory in 2008 derived from energy use simulations for representative single- and double-story homes in various U.S. locations. \$0.83-\$1.28/therm and \$0.07-\$0.10/kWh energy prices assumed (dependent on location).

Annual Energy Cost Savings  
Typical new home, 2250 sq ft

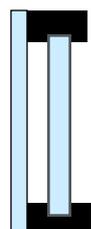


# Estimated Home Energy Savings – Low-E Storm Windows



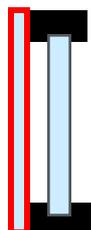
**Single pane**

U-factor: about 0.85



**Single pane + storm window**

U-factor: about 0.5

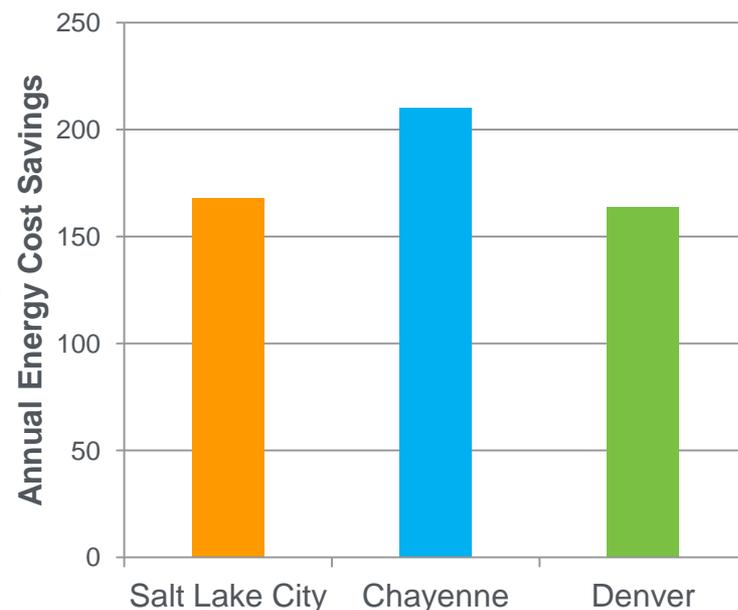


**Single pane + low-E storm**

U-factor: about 0.4



**Annual Energy Cost Savings**  
Typical Existing Home, 2000 ft<sup>2</sup>



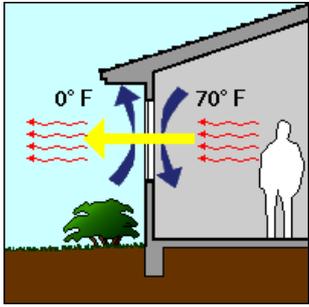
Energy cost savings estimator available for download at:  
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Fact sheets about low-E storm windows, window film, awnings, insulating shades, etc.

- Info about performance
- Tips and cautions
- Authors: LBNL and Building Green

**<http://www.windowattachments.org>**

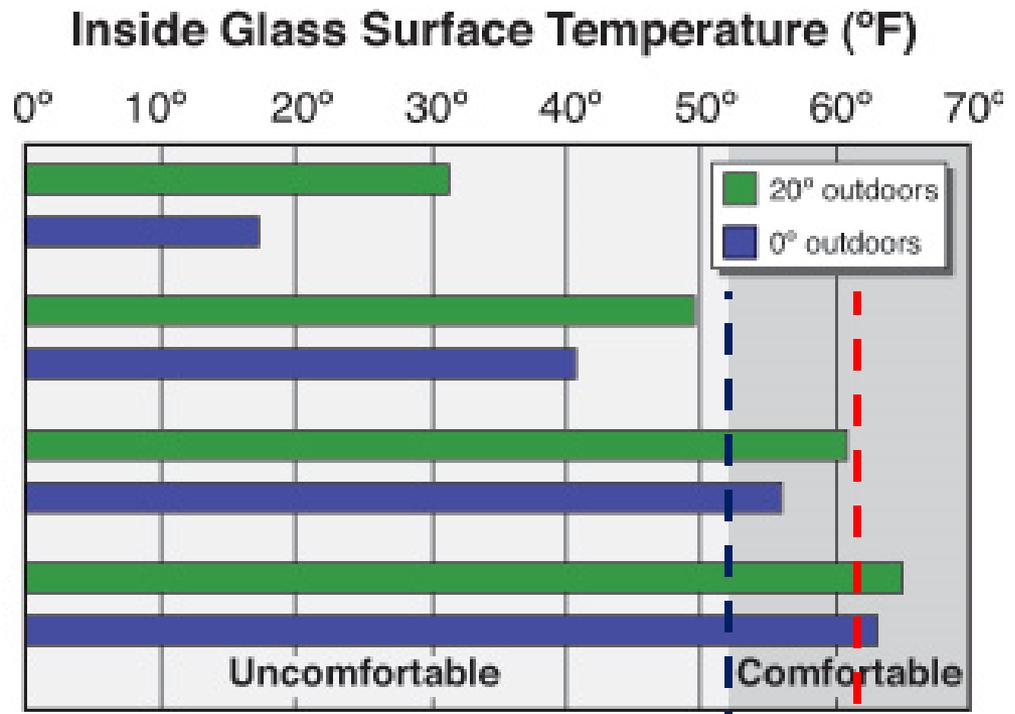


Single pane (U ~0.85)

Dual pane (U ~0.50)

Dual pane low-E, gas fill (U ~0.35)

Triple pane low-E, gas fill, insulated frame (U ~0.20)

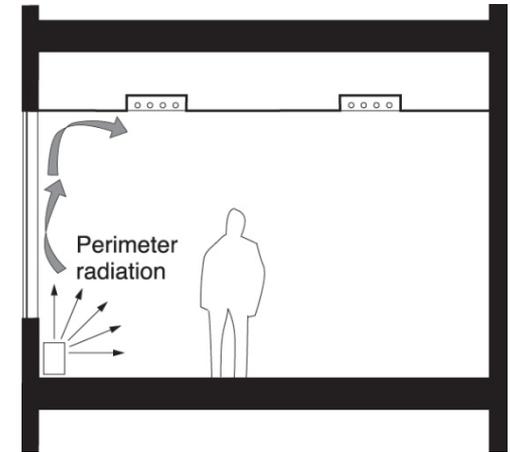


## Guidance provided by the PassivHaus Standard and ISO 7730:

If window surface temperature is no more than 7-9°F below average room temperature, heating registers near windows are not needed.

with heat near windows  
without heat near windows

- Cold window surfaces are a main cause of discomfort
- Conventional solution: perimeter heating near windows
- Perimeter heat may not be necessary with highly insulating windows



## Case in Point: Cambria Office Facility, Ebensburg, PA

- Triple-pane windows, U-factor 0.24-0.26
- Incremental cost of windows compared to dual pane: \$15,000
- No need for perimeter heating = \$25,000 up-front cost savings
- At 20°F outside, interior window surface remains at 62°F

Source: Carmody et al. 2004. *Window Systems for High-Performance Buildings*

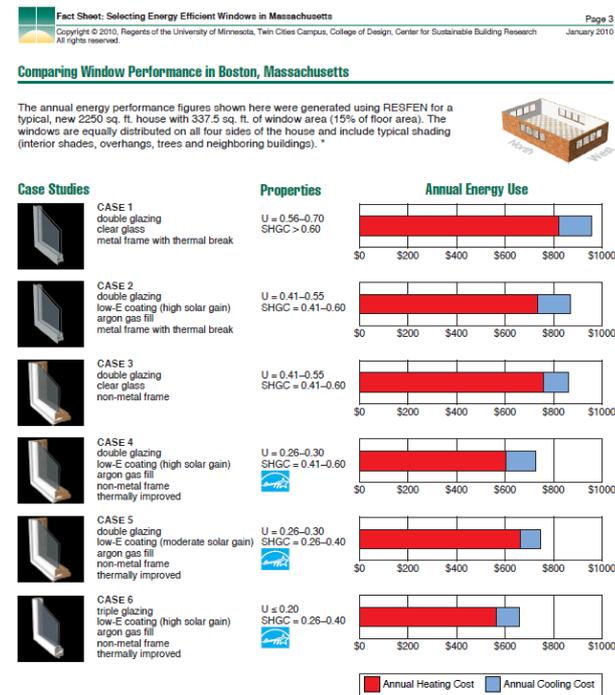
## Wisdom Way Solar Village, Massachusetts

- \$7,000-\$10,000 incremental cost for high-performance envelope
  - including \$1,500 for U-factor 0.18 windows
- \$4,000-\$4,500 mechanical system cost savings
- Up to \$1,000 annual heating cost savings from envelope improvements and south-facing orientation



Source: Rural Development Inc.

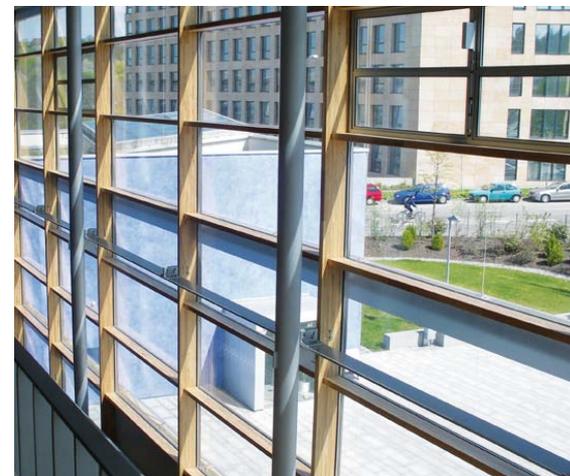
- Fact sheets and Window Selection Tool with pre-run simulations assuming typical houses:  
[www.efficientwindows.org](http://www.efficientwindows.org)
- Façade Design Tool and information for evaluation of commercial glazing options:  
[www.commercialwindows.org](http://www.commercialwindows.org)
- Contact us at [ewc@ase.org](mailto:ewc@ase.org)



## What is the WVP Program?

## What is the WVP Program?

- Market transformation program
  - Goal is to increase the availability of high performance products
- Website lists many manufacturers of high performance windows
  - Interested buyers can find products
  - Easier comparison of prices
  - Educate consumers about these products
- WVP staff does marketing, education and outreach about the products



## Final Windows and Low-E Storm Windows Specifications and Certifications

### High Performance Windows

- U-factor: (R,LC) **0.20/0.22**  
(CW) **0.24/0.27** (AW) **0.27/0.32**
- Air leakage: **≤ 0.30 cfm/ft<sup>2</sup>**
- Condensation Resistance: **≥50**
- Certifications: **NFRC/NAFS**
- Warranty (yr): **20 glass/10 non-glass**
- NAFS 05: **Performance Grade R25**



### Low-e Storm Windows

- Emissivity: **<0.22**
- Certifications: **ANSI/AAMA 1002.10-93**
- Registry: **IGDB (LBNL database)**
- Warranty (yr): **10 glass/non-glass**



## [www.windowsvolumepurchase.org](http://www.windowsvolumepurchase.org)

- Many homeowners are responding.
- Focus is now on contractors, builders, remodelers, institutions, and weatherization agencies.
- Sales through 10/2011:
  - ~8,000 windows
  - ~\$1.7M in sales

The screenshot shows the website's navigation bar with links for Home, Frequently Asked Questions, Complete Vendor Listing, and Utility Incentives. The main content area is titled "Welcome to the Windows Volume Purchase Products Website" and includes an "About this Website" section. The "Search for Windows" section features several dropdown menus for Window Type, Construction Type, United Inches (UI) or Door Size, Structural Class, Performance Grade, and Shipping Region, along with a "Submit Search" button. The "Contact Us" section provides an email address (windowsVP@pnl.gov) and a link to the webmaster. The "About this Website" section explains that highly insulating windows and low-e storm windows are available for new and retrofit construction. It also includes a "Purchasing Windows Products" section with a 7-step process for selecting windows. On the right side, there are three images: a modern building with large glass windows, a multi-story house with a red staircase, and a worker installing a window on a house.

Home   Frequently Asked Questions   Complete Vendor Listing   Utility Incentives

### Search for Windows

Window Type  
--Any Window Type--

Construction Type  
--Any Construction Type--

United Inches (UI) or Door Size  
--Any Size--

Structural Class  
--Any Class--

Performance Grade  
--Any Grade--

Shipping Region  
--Any Region--

Submit Search

### Contact Us

Questions?  
Contact us at:  
[windowsVP@pnl.gov](mailto:windowsVP@pnl.gov)  
Technical issues?  
Please contact the [webmaster](#)

### Welcome to the Windows Volume Purchase Products Website

#### About this Website

Highly insulating windows and low-e storm windows may be identified from qualified vendors through this website. The windows products listed for sale have all met the specifications and requirements of the U.S. Department of Energy's High Performance Windows Volume Purchase Program and are available for new and retrofit construction in residential and commercial buildings.

Finding and buying highly insulating windows from a choice of multiple vendors is now easier than ever using this website.

#### Purchasing Windows Products

A buyer interested in purchasing a minimum quantity of windows can identify vendors offering the desired window types at the listed prices using the "Search for Windows" feature. To locate these vendors, follow the steps below using the window selection menus. **If you do not know a feature of the search criteria, use the default value ("Any" or "All")**

1. Select the desired Window Type.
2. Select the Construction Type.
3. Select the desired window or door size—by United Inches (UI).
4. Select the Structural Class of the window.
5. Select the desired Performance Grade, if known.
6. Select the Shipping Region where you wish to have the windows delivered or where you wish to pick up the windows.
7. Click the "Submit Search" button.

A list of vendors offering the windows you selected and who deliver to the desired location will be shown. The base price per window offered by those vendors is also shown. The price per window from each vendor is based on the total quantity of windows selected. You may then click through to the vendors' website to place an order.

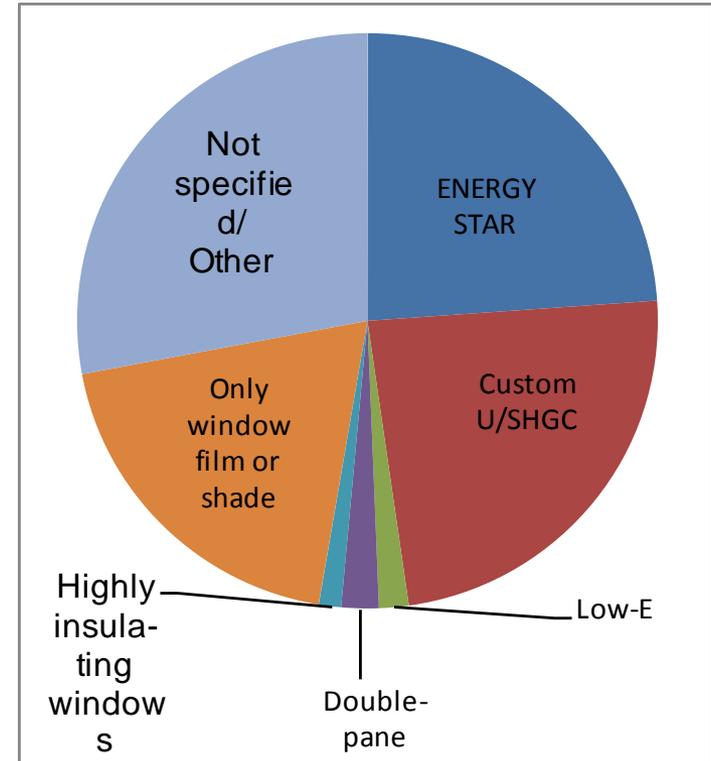
The images on the right side of the page show: 1) A modern building with a large glass facade. 2) A multi-story house with a red staircase. 3) A worker installing a window on a house.

## WVP Website:

- Database format allows for filtering by desired criteria
  - Window type and size
  - Structural performance class and grade
  - Shipping Region
- Discrete manufacturers' prices shown for each product

Vendor	CT	SC	WI	MI	IN	Price	Shipping
<a href="#">Ply Gem</a>	New	Residential	Double Hung	51-60	40	\$209	<a href="#">AL</a> , <a href="#">AK</a> , <a href="#">AZ</a> , ...
<a href="#">Bonded Insulated Products</a>	New	Residential	Double Hung	< 50	35	\$406	<a href="#">CT</a> , <a href="#">DE</a> , <a href="#">FL</a> , ...
<a href="#">Glazex</a>	All	Residential	Double Hung	120 +	70	\$4/UI	<a href="#">AL</a> , <a href="#">AZ</a> , <a href="#">CA</a> , ...
<a href="#">B.F. Bach</a>	All	Residential	Double Hung	< 50	45	\$578	<a href="#">CT</a> , <a href="#">DE</a> , <a href="#">GA</a> , ...
<a href="#">National Vinyl</a>	New	Residential	Double Hung	111-120	35	\$387	<a href="#">CT</a> , <a href="#">ME</a> , <a href="#">MA</a> , ...
<a href="#">Ply Gem</a>	New	Residential	Double Hung	< 50	40	\$209	<a href="#">AL</a> , <a href="#">AK</a> , <a href="#">AZ</a> , ...
<a href="#">Soft-Lite</a>	Retrofit	Residential	Double Hung	91-100	50	\$689	<a href="#">AL</a> , <a href="#">CA</a> , <a href="#">CO</a> , <a href="#">CT</a> , ...
<a href="#">Gorall</a>	Retrofit	Residential	Double Hung	< 50	30	\$557	<a href="#">AL</a> , <a href="#">AZ</a> , <a href="#">CA</a> , ...
<a href="#">Jactek</a>	New	Light Commercial	Double Hung	< 50	30	\$184	<a href="#">DE</a> , <a href="#">NJ</a> , <a href="#">NY</a>
<a href="#">Season and Keller</a>	All	Residential	Double Hung	120 +	45	\$4/UI	<a href="#">CT</a> , <a href="#">DE</a> , <a href="#">ME</a> , ...
<a href="#">B.F. Bach</a>	All	Residential	Double Hung	91-100	45	\$578	<a href="#">CT</a> , <a href="#">DE</a> , <a href="#">GA</a> , ...
<a href="#">Ply Gem</a>	New	Residential	Double Hung	120 +	35	\$2/UI	<a href="#">AL</a> , <a href="#">AZ</a> , <a href="#">CA</a> , ...
<a href="#">National Vinyl</a>	Retrofit	Residential	Double Hung	71-80	35	\$267	<a href="#">CT</a> , <a href="#">ME</a> , <a href="#">MA</a> , ...
<a href="#">National Vinyl</a>	Retrofit	Residential	Double Hung	101-110	35	\$332	<a href="#">CT</a> , <a href="#">ME</a> , <a href="#">MA</a> , ...
<a href="#">Jeld-Win</a>	New	Residential	Double Hung	51-60	25	\$325	<a href="#">AL</a> , <a href="#">AK</a> , <a href="#">AZ</a> , ...
<a href="#">Soft-Lite</a>	Retrofit	Residential	Double Hung	71-80	35	\$689	<a href="#">AL</a> , <a href="#">CA</a> , <a href="#">CO</a> , <a href="#">CT</a> , ...
<a href="#">Soft-Lite</a>	Retrofit	Residential	Double Hung	101-110	35	\$554	<a href="#">AL</a> , <a href="#">CA</a> , <a href="#">CO</a> , <a href="#">CT</a> , ...
<a href="#">Soft-Lite</a>	Retrofit	Residential	Double Hung	120 +	55	\$13/VI	<a href="#">AL</a> , <a href="#">CA</a> , <a href="#">CO</a> , <a href="#">CT</a> , ...

- Over 200 individual programs that provide rebates or low-interest loans for windows, window films, sun screens and/or storm windows.
- Most programs incentivize ENERGY STAR or similar, or shading only



List of utility programs available at: <http://www.efficientwindows.org/utilities.cfm>

# WVP Program Impacts and Achievements

Walt Zalis, Energetics  
Incorporated

- In 15 months, the program sold **over 5,000 windows** and achieved **~\$1.6 million in sales**
- Over 40 Phase I participants
- Over 30 Round II participants

*“We are glad to have been part of the R-5 Windows Volume Purchase program since its inception in 2010. The program has challenged B.F. Rich and our vendors to look at the development of new technologies .....at an affordable cost to the consumer .... We have grown our R-5 program at B.F. Rich in both triple and double glazed windows....”*

*--George Simmons*

President and CEO, B.F. Rich Windows & Doors

*“The value of the DOE High Performance WVPP has been in setting the table for future sales during a down market. My belief is that manufacturers such as JELD-WEN have seen only small incremental sales increases attributable to the launch of the program. However, heightened awareness of high performance windows during a lean time when industry design and construction professionals are slow will serve to grow sales once the market picks up....”*

*--Rob Worthington*

Market Development Director, JELD-WEN

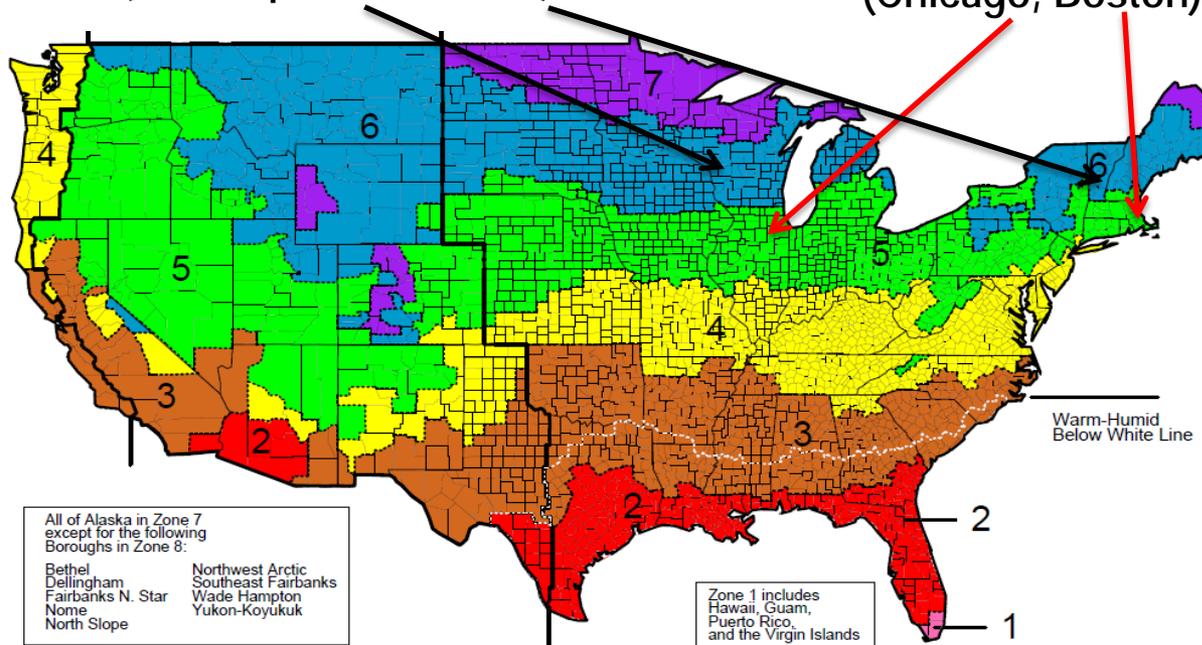
- WVP program has appeared in **85 articles** in top media and building industry publications **in less than 2.5 years**
  - **New York Times:** “DOE Aims to Make 'Low E' Windows a Must-Have for Home Construction,” June 2010
  - **Chicago Tribune:** “Government raising bar on windows,” January 2010
  - **Window and Door:** “Phase II Begins for DOE Volume Purchase Program,” May 2011
  - **Door and Window Manufacturer:** “Are you ready for Phase II?,” May 2011
- Window and Door magazine conducted a poll in September 2011 asking, **“Is Your Company Still Promoting R-5 Products”**
  - **Over 50% respond, “Yes, and it still works well for us”**
    - Only 5% respond, “We did, but we have stopped”
  - The author states “I know a lot of manufacturers liked the simplicity of DOE's R-5 rating. It was something they could hang their hat on in their marketing.”
- Obtained 23 letters of support from builders, weatherization agencies, non-profits and others

## BSC developed recommendations for window performance in Northern climates that are closely aligned with WVP requirements

*Based on Building America program experience – recommendations for homes with low energy needs that can be met by renewable energy sources*

U-factor for Climate Zone 6  
(Minneapolis, Vermont) = 0.18

U-factor for Climate Zone 5  
(Chicago, Boston) = 0.24



WVP Window  
= 0.22 U-factor

*The Building Science Corporation Report: Building America Special Research Project: High R-Value Enclosures for High Performance Residential Buildings in All Climate Zones*

< <http://www.buildingscience.com/documents/reports/rr-1005-building-america-high-r-value-high-performance-residential-buildings-all-climate-zones> >

# The Energy Trust of Oregon Aligns with WVP

- The Energy Trust of Oregon already provided incentives for ENERGYSTAR windows and needed a higher performance tier
- Current high performance tier aligns with the WVP program requirements, benefiting from increased product availability for incentive recipients
- **Applicable incentive**
  - Electric- and gas-heated homes: **\$3.50** per square foot of windows installed with **U-Value 0.22 or less**
  - No longer needs to be installed with second energy-saving improvement, though homeowners are encouraged to make further improvements



- A 2010 study completed by nationally recognized expert on green home design, Ann V. Edminster, reviewed popular energy improvement options, including R-5 windows
- "If I have \$15,000 to spend on my home to reduce energy use as much as possible, what gives the best bang for the buck?"
  - In the single-pane (R-1) window replacement scenario, the high R-value replacement windows were the top choice performance-wise with 38.4% energy savings improvement.
    - Compared to a whole house energy improvement package (12.4%) and installation of a PV solar system (12.1%)
  - Study results clearly indicate that high R-value replacement windows are competitive with other retrofit alternatives in various situations

"R-5 and above windows represent a game-changing entry into the residential replacement window market and into the broader realm of energy efficiency retrofit options. While in the past, window replacement was not typically viewed as offering a good return on investment from an energy perspective, it should now be considered routinely for home energy retrofit projects, with comfort improvements the icing on the cake."

**--Ann V. Edminster**  
M. Arch., LEED AP+ Homes

- Pennsylvania's state weatherization program priority list now includes low-E storm windows and highly insulating windows
  - WVP qualified windows recommended whenever windows must already be replaced
  - Low-E storm windows recommended as a cost effective measure when used over single pane or metal framed clear double pane windows.
- Changes to the priority list were due directly to the availability of products through the WVP program and through analysis provided by Energetics
  - Similar analysis can be requested by any state or similar program by contacting the WVP team

The screenshot displays the NEAT AUDIT software interface. The main window is titled "NEAT AUDIT" and contains several sections:

- Audit Information:** Includes fields for Audit Name (Audit 126), Client ID (Exposed Floor 1), Client Name, and Alt. Client ID.
- Conditioned Spaces:** Shows 2 spaces with a total Floor Area of 1600 sq ft.
- Comment:** "W/V Insulation throughout. Open Joint Airt. See foundation description of exposed floor components."
- Economics Summary:** A blue box containing:
  - Measures Recommended: 0
  - Total Initial Cost (\$): \$4,401.52
  - Cumulative SIPR: 1.32
- Libraries and Other Options:** Includes dropdown menus for Setup Library (Generic PA - updated storm win...), Fuel Cost Library (PA State except PM), Supply Library (Generic PA [LC457042]), and Weather File (HARRISPA.WX).
- AUDIT:** Search filters by Audit Name, Client ID, Client Name, and Alternate Client ID.
- REPORT:** Select Report (Recommended Measures) and buttons for Previous, Next, and Snapshot File.

## Low-E Storm Windows

- Selected as qualified measure with standard investment ratio (SIR) values substantially higher than 1.
  - SIR values over single pane wood frame windows with a furnace at 80% efficiency: 1.4-2.2 (Average= 1.7)
  - SIR values over metal frame double pane windows with a furnace at 80% efficiency: 1.3-2.1 (Average= 1.6)

## R-5 Windows

- “Necessary Replacement Scenario” SIR= 1.6-3.0 (Average= 2.3)
- Price point for high performance replacement: Installed Cost/ft<sup>2</sup> for SIR=1

City	Scranton	Harrisburg	Pittsburgh	Philadelphia
Single Pane Wood Frame	\$26.45	\$22.36	\$25.55	\$25.15
Metal Frame Double pane	\$25.45	\$21.50	\$24.55	\$24.35

- Coordinated 7 regional workshops across the country
  - Chicago, IL (September 2010)
  - Portland, OR (October 2010)
  - Philadelphia, PA (October 2010)
  - Columbus, OH (April 2011)
  - Clearfield, UT (May 2011)
  - Bozeman, MT (July 2011)
  - Golden, CO (October 2011)
- Facilitated 10 webinars with trade associations and non-profits
- Presented at 28 conferences and meetings



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# Questar Gas Windows Perspective

Bryan Taylor

*ThermWise Program Manager*

# NFRC Energy Ratings

Window Volume  
Purchasing—Mountain  
Region  
November 16, 2011

**Ray McGowan-Senior Program Manager**



# NFRC—Introduction & Overview

- Formed by industry in 1989
- To provide standardized *fenestration energy performance* ratings
- Educational non-profit public/private organization, not a trade association, 501 C3
  - 17 on staff in five states, HQ near Washington DC
  - 800 participants (manufacturers labeling product)
  - 250 members (vote at meetings, develop standards)
  - Members may be:
    - Fenestration and related building industry
    - State energy offices
    - Design professionals
    - Utilities, consumer organizations
    - Anyone with a fenestration interest



# NFRC is Widely Referenced

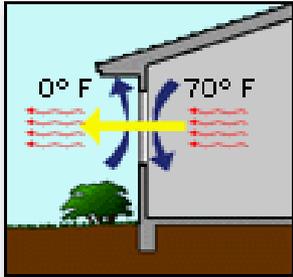
- **IECC**
- **ASHRAE 90.1**
- ***ENERGY STAR***®
- **USGBC's LEED program**



# NFRC Ratings

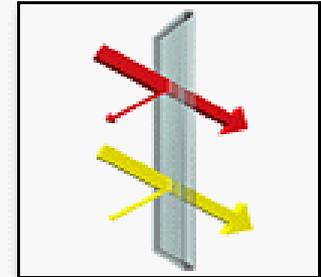
- Heat loss rating (*U-factor*)
- Solar Heat Gain rating (*SHGC*)
- Visible Transmittance rating (*VT*)
- Air Leakage rating
- Condensation Resistance rating (*CR*)

# NFRC Ratings



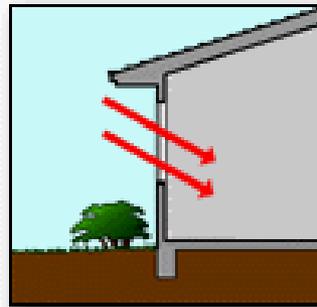
*U*-factor (thermal transmission)

NFRC 100



VT (Visible Transmittance)

NFRC 200



SHGC (Solar Heat Gain)  
NFRC 200

# NFRC Rating Determination



- Computer simulation is the basis of all ratings
  - 40 million labels/year
- Simulation performed at standardized sizes & environmental conditions
- Simulation generates a **whole-product rating**
- Simulated U-factors validated by physical testing
  - 4,000 tests/year

# NFRC & Code Compliance

- **Why the increased interest in compliance?**
  - Energy price increases
  - Enhanced code enforcement by states
- **State Energy Code requirements**
  - IECC and ASHRAE 90.1 requires NFRC 100/200
  - No alternative

# Two ways for fenestration to comply with ASHRAE 90.1 or IECC:

- Default
- NFRC Ratings
  - NFRC 100 governs U-factor
  - NFRC 200 governs SHGC and VT
  - Whole product only
    - COG not allowed

# NFRC 100/200 Satisfied by

- **Using WINDOW/THERM simulations plus NFRC certification for residential products**
  - 95% manufacturer participation
  - Required by ENERGY STAR
- **CMAST simulation for commercial products**
  - Almost no participation, about 150 certificates exist to date!!!
  - Reason: lack of enforcement and understanding

# NFRC In IECC 2009

## Refer to Chapter 3

**303.1.3 Fenestration product rating.** *U*-factors of fenestration products (windows, doors and skylights) shall be determined in accordance with NFRC 100 by an accredited, independent laboratory, and labeled and certified by the manufacturer. Products lacking such a labeled *U*-factor shall be assigned a default *U*-factor from Table 303.1.3(1) or 303.1.3(2). The solar heat gain coefficient (SHGC) of glazed fenestration products (windows, glazed doors and skylights) shall be determined in accordance with NFRC 200 by an accredited, independent laboratory, and labeled and certified by the manufacturer. Products lacking such a labeled SHGC shall be assigned a default SHGC from Table 303.1.3(3).

# NFRC in ASHRAE 90.1-07

**5.8.2.4 U-factor.** U-factors shall be determined in accordance with NFRC 100. U-factors for skylights shall be determined for a slope of 20 degrees above the horizontal.

**5.8.2.5 Solar Heat Gain Coefficient.** *SHGC* for the overall *fenestration area* shall be determined in accordance with NFRC 200.

# US Green Building Council's LEED Program

- **Energy and Atmosphere section requires ASHRAE 90.1-2007 as mandatory minimum**
  - NFRC 100 and 200 required by ASHRAE 90.1
  - LEED scores improve by beating this minimum
- **All LEED projects require NFRC ratings**
  - Poorly enforced
  - Recent activity indicating improved performance
- **Improved daylighting improve LEED score also**

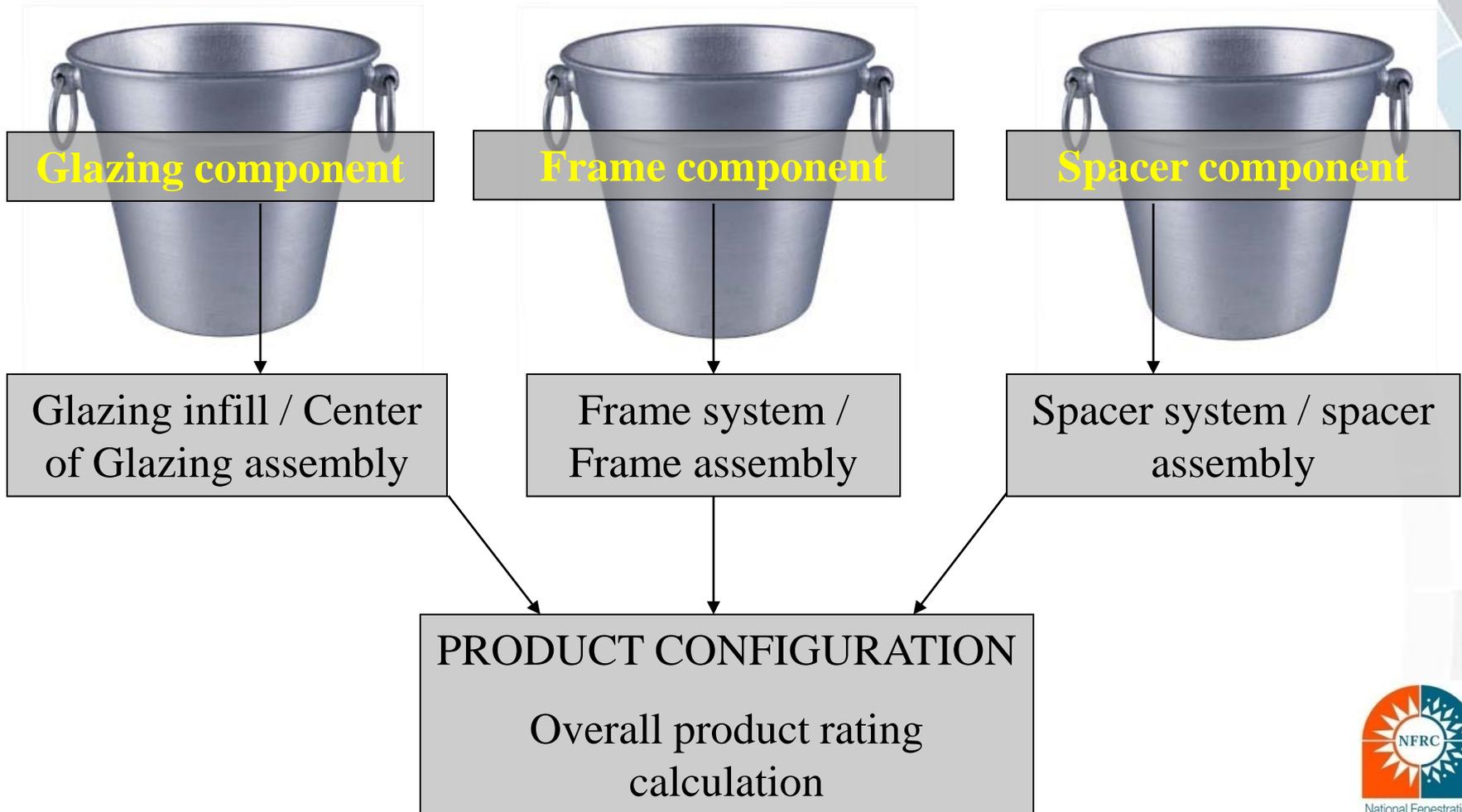


# Non-Residential Certification

## D. Overview of the *Component Modeling Approach* ('CMA') Program



# Non-Res. Certification: CMA



# Non-Res. Certification: CMAST

- CMA software tool (“**CMAST**”) can:
  - Maintain libraries of component data
  - Define projects
  - Assemble components, and
  - Calculate whole product ratings



Product Information

Server ID: ? Client ID: 9

Product Name: HED

Manufacturer: Frames Inc

Description:

Notes:

Frame Assembly: FA-ACE-A

Product Type: Glazed Wall/Sloped Glazing

Width: 78.74 in. Height: 78.74 in.

Status: Design

Component Selection for Individual Product

Framing

Frame Member:

Insulated Glazing Unit

Center Of Glazing: Clr-6 Krypton85 LoE270-6

Spacer Edge Seal Assembly: TPS 12.7 mm

Dividers:

Visibility

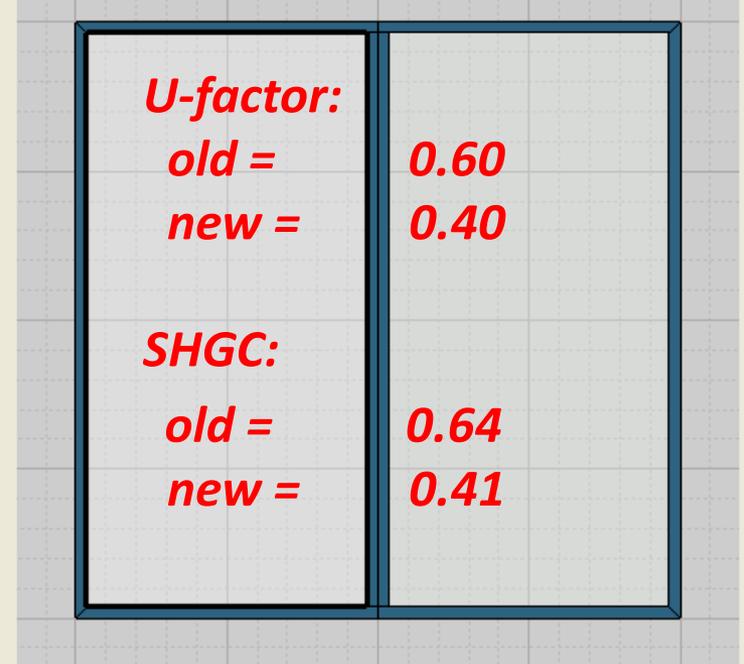
Myself Only Additional Persons & Companies

History Calculate EnergyPlus Report

	NFRC Size:	Actual Size:
	78.74 X 78.74 in.	78.74 X 78.74 in.
U Factor:	0.401	0.401 $\text{Btu/h}\cdot\text{ft}^2\cdot\text{F}$
SHGC:	0.407	0.407
VT:	0.608	0.608

**Unit U-factor & SHGC**

**dramatically improve!**



Edit Dims

OK



# NFRC CMA Label Certificate (page 2):



## NATIONAL FENESTRATION RATING COUNCIL LABEL CERTIFICATE

### PRODUCT LISTING

FOR CODE COMPLIANCE

LABEL CERTIFICATE ID: XYZ-001

Issuance Date: mm/dd/yyyy

#### NFRC CERTIFIED PRODUCT RATING INFORMATION:\*

The NFRC Certified Product Rating Information listed here is to be used to verify that the ratings meet applicable energy code requirements.

#### PRODUCT LISTING:

CPD ID	Total Area ft <sup>2</sup>	Name	Framing Ref	Glazing Ref	Spacer Ref	CERTIFIED Performance Rating at NFRC Standard Size		
						U-factor** Btu/ hr-ft <sup>2</sup> -F	SHGC**	VT**
P-PL-010	88.89	PL-2200 / PL-2210	FA-PL2210	GA-TT-001	SA-AM-001	0.53	0.58	0.66
P-PL-005	182.67	PL-3400 / PL-3401	FA-PL3401	GA-TT-001	SA-AM-002	0.56	0.57	0.65
P-PL-012	382.22	PL-5700 / PL-5720	FA-PL5720	GA-TO-002	SA-AM-001	0.52	0.21	0.30
P-PL-002	60.00	PL-1100 / PL-1152	FA-PL1152	GA-TT-001	SA-AM-001	0.42	0.51	0.62
P-PL-022	525.00	PL-9900 / PL-9915	FA-PL9915	GA-TO-003	SA-AM-002	0.45	0.15	0.19

#### FRAME, GLAZING and SPACER ASSEMBLIES:

##### FRAMING LISTING:

FRAMING REF	SUPPLIER ID	DESCRIPTION
FA-PL2210		Single Casement Thermally Broken Aluminum
FA-PL3401		Projecting (Awning) Thermally Broken Aluminum
FA-PL5720		Vertical Slider PVC reinforced with Steel
FA-PL1152		Vertical Slider Thermally Broken Aluminum
FA-PL9915		Fixed Thermally Broken Aluminum

##### GLAZING LISTING:

GLAZING REF	SUPPLIER ID	DESCRIPTION
GA-TT-001		1" Double Glazed, 1/4" HC Low-e, 1/4" Clear, Argon (90%), 1/2" gap
GA-TT-002		1" Triple Glazed, 1/8" Clear, Coated film, 1/8" SC, Argon (90%), 3/8" gap
GA-TT-003		1" Double Glazed, 1/4" Bronze, 1/4" SC Low-e, Argon (90%), 1/2" gap

##### SPACER LISTING:

SPACER REF	SUPPLIER ID	DESCRIPTION
SA-AM-001		250P Mill Finish Aluminum Low profile (1/2")
SA-AM-002		15A Polymer Spacer (3/8")



# NFRC CMA Label Certificate (optional pages): (project- specific sizes)



## NATIONAL FENESTRATION RATING COUNCIL LABEL CERTIFICATE

### SUPPLEMENTAL PRODUCT INFORMATION

For Informational Purposes Only

#### Non-Certified Product Information at Actual Product Size

Reference NFRC Label Certificate ID: XYZ-001 for Certified Ratings for Code Compliance:

*Individual product performance at actual size is listed in the table below and has been determined in accordance with NFRC technical procedures; however, these are not certified ratings. Certified ratings are determined at NFRC model sizes for comparative purposes and are listed on the actual Label Certificate referenced above. The actual size performance calculations below are for information purposes and use in calculations and energy simulation programs to estimate energy use, and are not intended for use in code compliance.*

#### PRODUCT LISTING:

CPD ID	Qty	Total Area ft <sup>2</sup>	Name	EnergyPlus Report File	NON-CERTIFIED Performance at Actual Size				
					Width in.	Height in.	U-factor Btu/hr-ft <sup>2</sup> -F	SHGC	VT
P-PL-010	2	48.00	PL-2200 / PL-2210	<a href="http://www.nfrc.org/CMAST/ipl2200-2210.bt">www.nfrc.org/CMAST/ipl2200-2210.bt</a>	48.00	72.00	0.48	0.59	0.66
P-PL-010	5	88.89	PL-2200 / PL-2210	<a href="http://www.nfrc.org/CMAST/ipl2200-2210.bt">www.nfrc.org/CMAST/ipl2200-2210.bt</a>	40.00	64.00	0.50	0.56	0.64
P-PL-005	6	192.67	PL-3400 / PL-3401	<a href="http://www.nfrc.org/CMAST/ipl3400-3401.bt">www.nfrc.org/CMAST/ipl3400-3401.bt</a>	88.00	88.00	0.49	0.58	0.65
P-PL-005	3	54.00	PL-3400 / PL-3401	<a href="http://www.nfrc.org/CMAST/ipl3400-3401.bt">www.nfrc.org/CMAST/ipl3400-3401.bt</a>	72.00	36.00	0.51	0.55	0.62
P-PL-005	5	167.22	PL-3400 / PL-3401	<a href="http://www.nfrc.org/CMAST/ipl3400-3401.bt">www.nfrc.org/CMAST/ipl3400-3401.bt</a>	86.00	56.00	0.48	0.59	0.67
P-PL-012	10	382.22	PL-5700 / PL-5720	<a href="http://www.nfrc.org/CMAST/ipl5700-5720.bt">www.nfrc.org/CMAST/ipl5700-5720.bt</a>	64.00	86.00	0.33	0.22	0.30
P-PL-002	3	60.00	PL-1100 / PL-1152	<a href="http://www.nfrc.org/CMAST/ipl1100-1152.bt">www.nfrc.org/CMAST/ipl1100-1152.bt</a>	48.00	60.00	0.52	0.53	0.60
P-PL-022*	21	525.00	PL-9900 / PL-9915	N/A	N/A	N/A	N/A	N/A	N/A

\* This product and/or its glazing system is a test-only specimen, and fenestration performance is only available at the NFRC standard test size and not actual size. Therefore, EnergyPlus report files are not available for test-only specimens.

# Additional Resources

- NFRC Webpage: [www.nfrc.org](http://www.nfrc.org)
- CMA Webpage: [http://nfrc.org/sb\\_aboutprogram.aspx](http://nfrc.org/sb_aboutprogram.aspx)
- Labs and Agencies: <http://nfrc.org/labsagencies.aspx>
- NFRC Staff, Residential Product Certification Program Support:  
Toni Stroud *PCP Associate, Product Certification Program,*  
[tstroud@nfrc.org](mailto:tstroud@nfrc.org)
- NFRC Staff, Commercial Product Certification Program Support  
Jen Padgett *CMA Technical Coordinator, [jpadgett@nfrc.org](mailto:jpadgett@nfrc.org)*  
Ray McGowan *Sr. Program Manager, [rmcgowan@nfrc.org](mailto:rmcgowan@nfrc.org)*
- *Call (301) 589-1776 and ask for anyone*

# Thanks!!!

Ray McGowan

*Senior Program Manager, National Fenestration  
Rating Council*

*240-821-9510, [rmcgowan@nfdc.org](mailto:rmcgowan@nfdc.org)*



National Fenestration  
Rating Council®



# A Very Brief Introduction to the SAVE Act

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Tom Simchak

Senior Research Associate

16 November 2011



ALLIANCE TO  
**SAVE ENERGY**

*Creating an Energy-Efficient World*



ALLIANCE TO  
SAVE ENERGY

*Creating an Energy-Efficient World*

# The SAVE Act

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- ‘Sensible Accounting to Value Energy’
- S. 1737, introduced in the Senate on 19 Oct. by Sens. Bennet (D-Co.) and Isakson (R-Ga.)
  - Referred to the committee on Banking, Housing, and Urban Affairs
- Discussions are ongoing re: introduction of comparable legislation in the House
- Broad support, including US Chamber of Commerce, Appraisal Institute, NRDC





ALLIANCE TO  
SAVE ENERGY

*Creating an Energy-Efficient World*

# The SAVE Act

---

- Would direct HUD to update its underwriting and appraisal guidelines to ensure that federal agencies and entities account for energy costs
  - Mortgage standards from Fannie Mae & Freddie Mac would thus account for efficiency; because of their dominant position on the secondary mortgage market, efficiency regulations applied to them would be applied to the vast majority of mortgages nation-wide





ALLIANCE TO  
SAVE ENERGY

*Creating an Energy-Efficient World*

# The SAVE Act

---

- Loan-to-value ratio adjusted to reflect value of efficiency upgrades
  - Would allow larger loans for more efficient homes
- Affordability cap (debt-to-income adjustment) adjusted to reflect to reflect lower household expenses in efficient home
  - Homeowners with lower utility bills can pay more on their monthly mortgage payments
  - Normally accounts for principal, interest on principal, property taxes, and home insurance
    - Would add energy costs, which are normally greater than all but the principal



ALLIANCE TO  
SAVE ENERGY

*Creating an Energy-Efficient World*

# The SAVE Act

---

- Would use HERS or other approved rating system
  - If no home rating is available, estimate based on RECS data for size & region would be used.
- More info: [www.ase.org/resources/save-act](http://www.ase.org/resources/save-act)

