



Cost-Effective Triple Pane and Low E Storm Windows - Available Now

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Question and Answer Session

Questions will be submitted electronically and
answers will be provided verbally

To submit a question, select Q&A on the top bar, click in the top box, type
your question, click Ask

Today's slides are available at www.buildings.energy.gov/webinars.html.
A video of the presentation will be posted in the next week.

Today's Speakers



Marc LaFrance is the Manager for Building Envelope and Windows R&D programs at the U.S. Department of Energy (DOE) Building Technologies Program. In this role, Mr. LaFrance leads development of the next generation of highly insulated windows, dynamic windows, attic/roof systems, high-R walls with thermal mass effects (phase change material), cool roofs, and the next generation of materials development.



Jason Bogovich is the Intergovernmental Deployment Policy and Partnership Development Manager at Energetics Inc. He has several years of experience of providing outreach/grassroots coordination on economic, housing, and energy related issues with government agencies and private sectors. At Energetics, he manages federal, state, and local building deployment and partnership coordination.



Christian Kohler is a researcher at Lawrence Berkeley National Laboratory. He has been studying highly insulating windows and energy simulation software for nearly 15 years at the Windows and Daylighting Research Group.



Nils Petermann is a Project Manager at the Alliance to Save Energy. He performs analysis and outreach for the Efficient Windows Collaborative, a joint effort between Alliance to Save Energy, the University of Minnesota, and Lawrence Berkeley National Laboratory to promote energy efficiency strategies for windows in residential and commercial buildings



Graham Parker is Senior Staff Engineer at the Pacific Northwest National Laboratory with 37 years of experience in the design, conduct, and analysis of field demonstration and data collection projects. Currently, he is the lead engineer for the commercial and residential equipment energy conservation standards program for DOE and works to introduce new and emerging technologies into the market, most recently focused on highly insulating windows and low-e storm windows.



Terry Mapes is an Engineer at the Pacific Northwest National Laboratory. Before PNNL, he was with a consulting firm specializing in sustainability and energy efficiency. He was an energy modeler for commercial buildings and was involved in LEED certification, ASHRAE and Title 24 code compliance, building commissioning, and the design and implementation of numerous energy conservation measures.



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

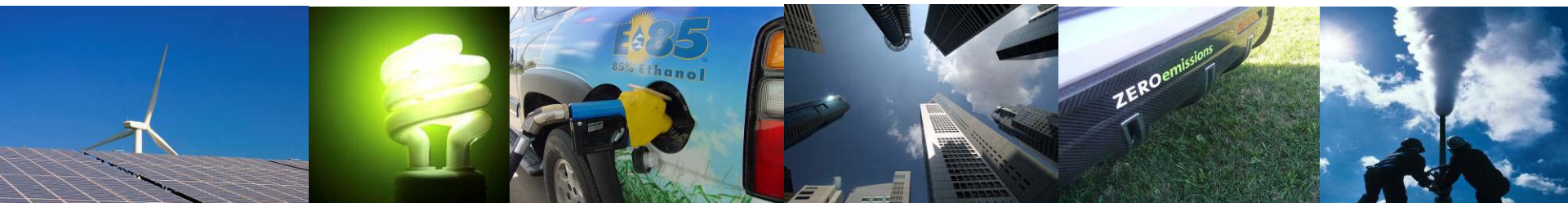
Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

DOE Windows R&D Program Highly Insulating Windows Webinar

22 June 2010

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

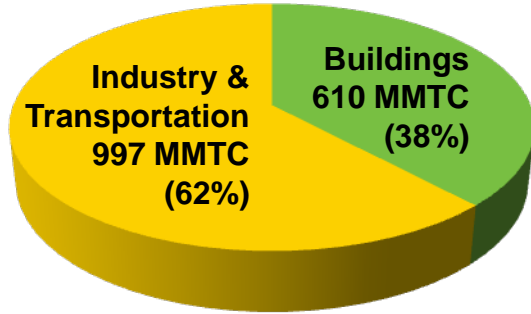
Christian Kohler
Windows and Daylighting Research Group
Lawrence Berkeley National Lab



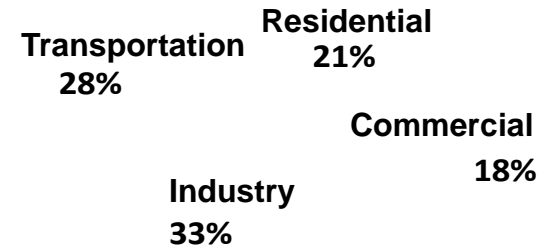


US Building Energy Use and Carbon Emissions

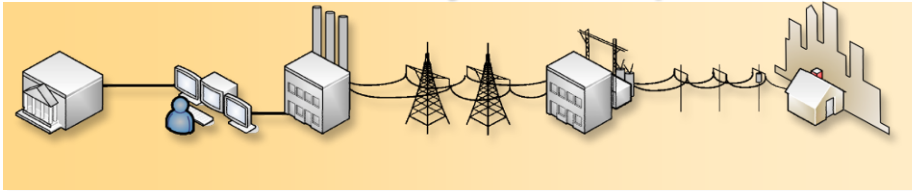
38% of U.S. Carbon Emissions



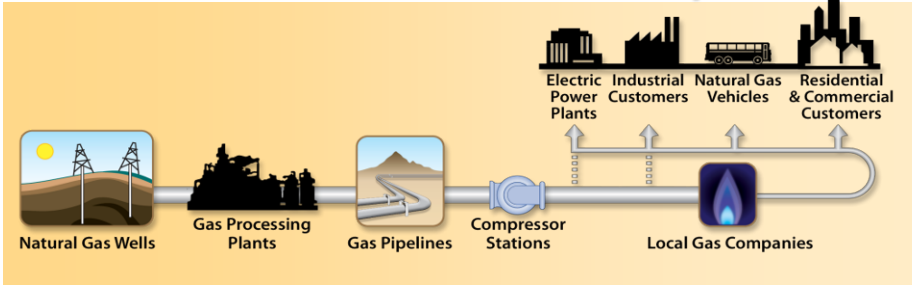
39% of U.S. Primary Energy Consumption



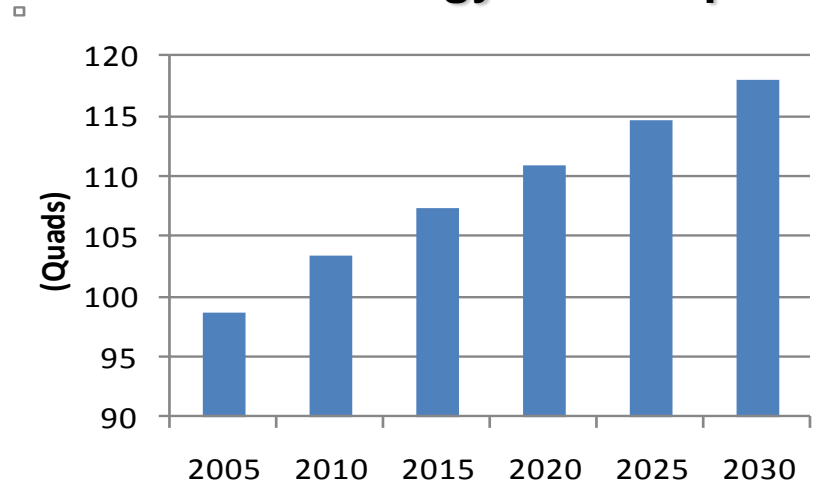
72% of U.S. Electricity Consumption



54% of U.S. Natural Gas Consumption



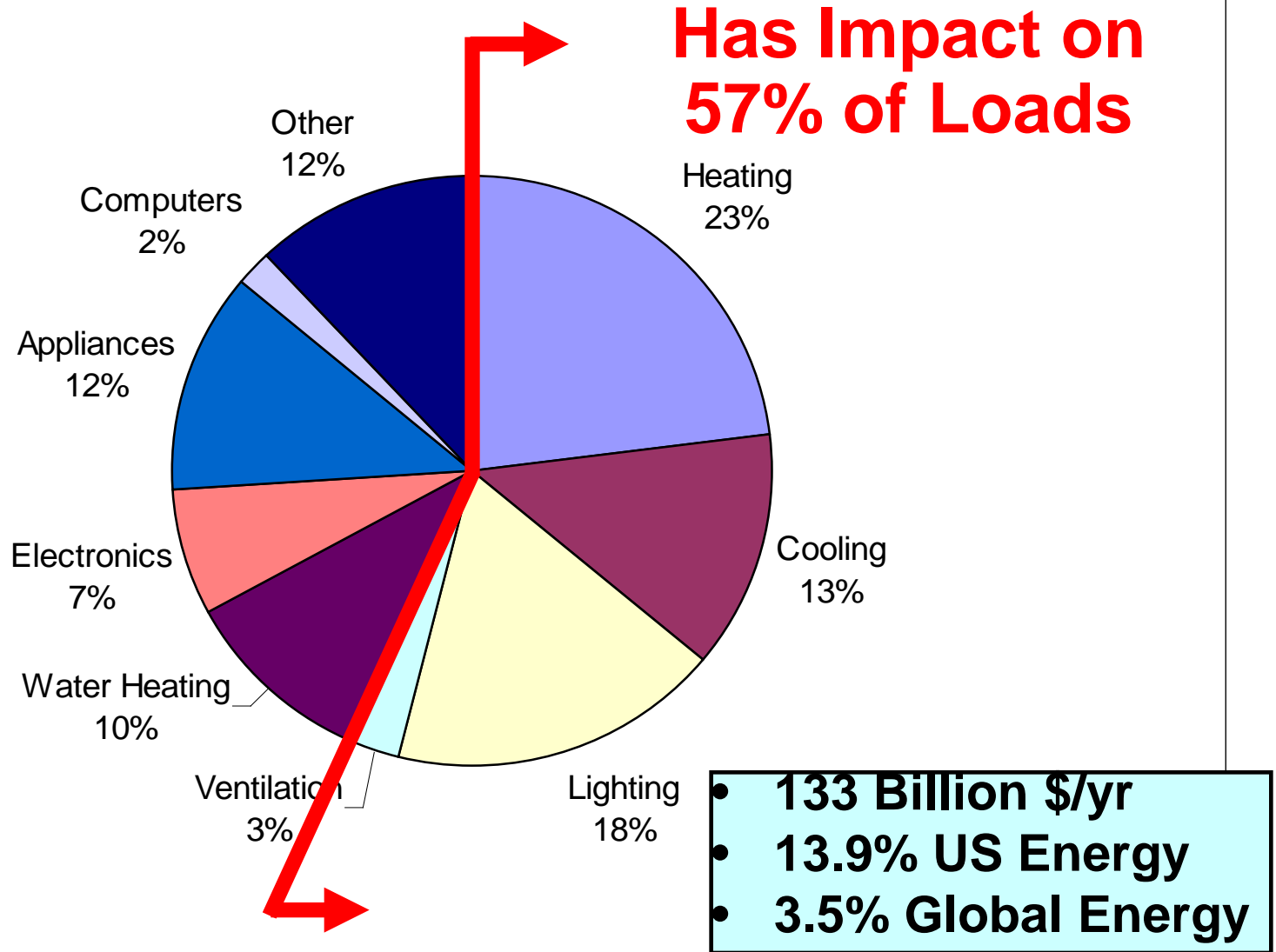
Total U.S. Energy Consumption



Sources: BED 2009; AEO 2010



Building Consumption – Envelope Relationship





Next Generation of Windows

- **Highly Insulating**
 - Goal U value 0.10 (SI U factor 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 factor 0.18 (SI U value 1.0)
SHGC 0.04 – 0.34)
Low cost unsealed center lite



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**

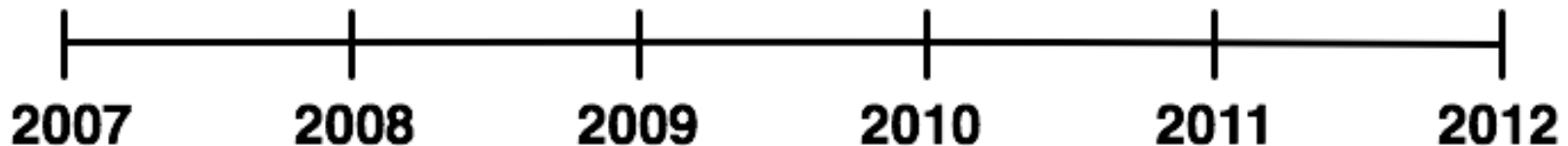
**Technology Procurement/Volume Purchases
– Multifamily/Public Housing/Condo, Builders, etc**

**Develop
advanced utility
program specs**

**Utility programs for advanced
windows**

**ENERGY STAR spec
revision**

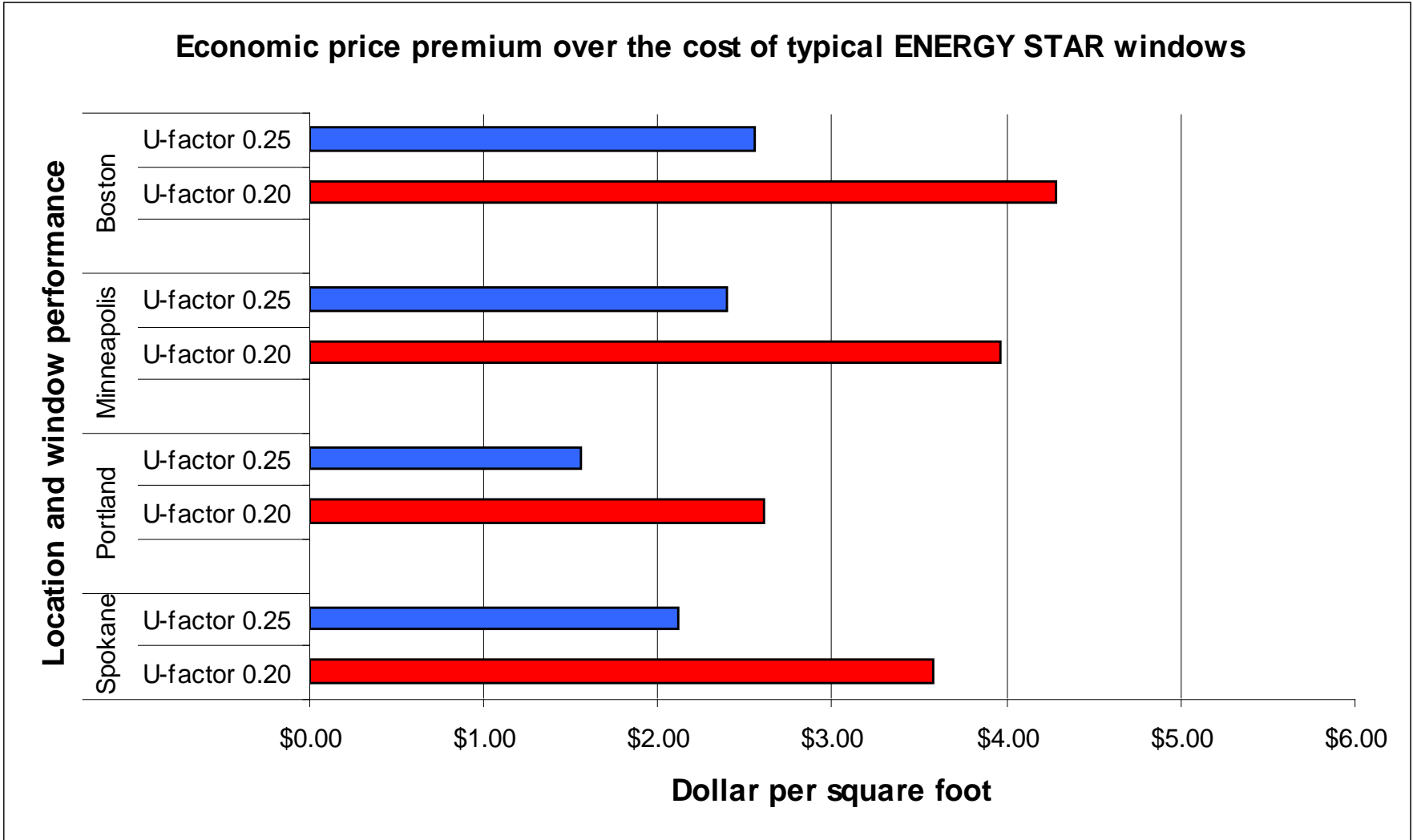
New ENERGY STAR / Phase II





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/ft² 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
- Traco selected for commercial product





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



- 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 factor of 0.2 to 0.24 for Northern Climates with SHGC > 0.35 in the 2013 to 2014 timeframe



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 factors (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 factors for mixed and cold climates); could be extended to dynamic glass for significant impact in hot and mixed climates, SHGC < 0.10



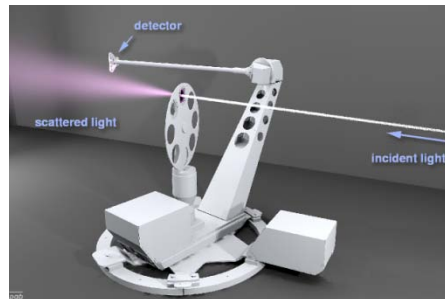
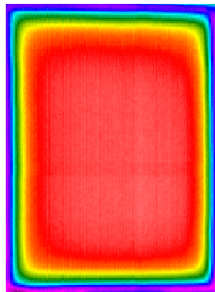
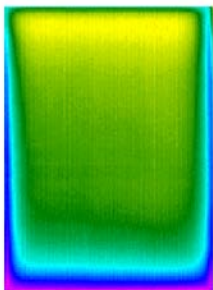
R value vs U factor

- DOE has used R value for non technical audiences for many years (e.g. Congressional Budget Requests)
- Window energy performance should only be specified as NFRC whole window U factors
- For general reference R is the inverse of U factor
- We use R5 as a general program name and to get the attention of consumers that understand R values better. We have R10 - R20 walls and R30 – R50 attics for code in some locations but window performance is generally around R2 - R3
- While there are many technical measurements concerns, there is a huge difference in performance
- We also know some window companies have advertised very high R values such as R15 but they are referring to center of glass performance, thus if DOE thinks R5 is a big step forward there needs to be more examination of center of glass claims



LBL Windows and Daylighting Group

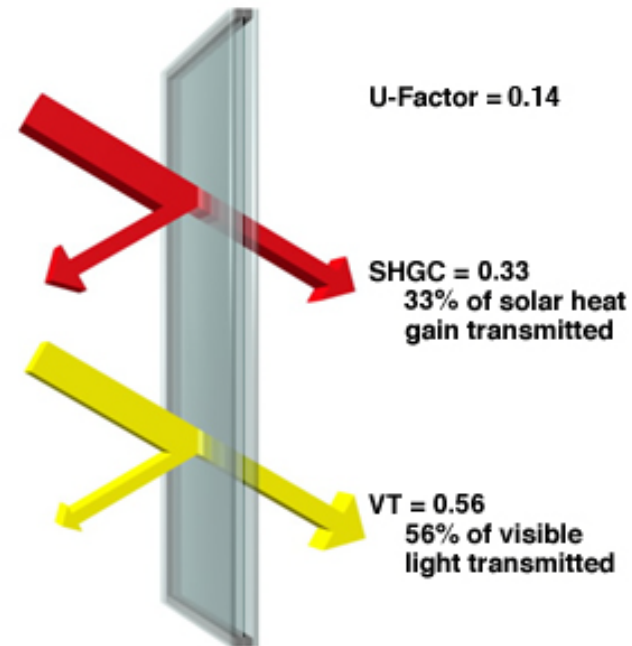
- 10-15 researchers dedicated to windows research. Mostly DOE funded.
- Engaged with industry since 1976
- State-of-the-art user facilities for testing and evaluation
- Software used by over 8,000 users worldwide





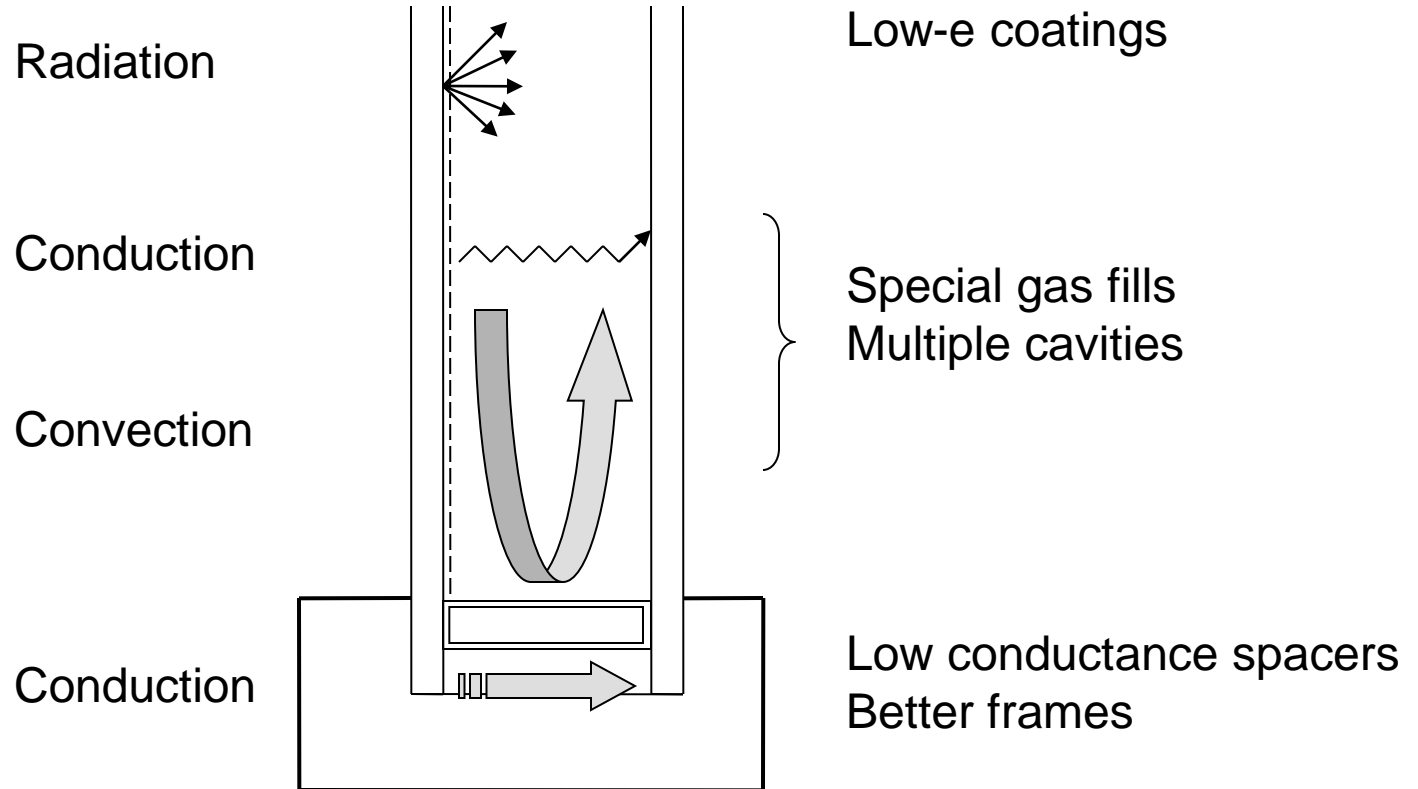
Performance Indices

- Key performance indices
 - **U-factor**
 - Thermal resistance
 - Units Btu/hr-ft²-F
 - R-value is inverse, $U=0.2$, $R=1/0.2 = 5$ hr-ft²-F/Btu
 - **SHGC**
 - Solar Gains
 - Ranges from 0-1, higher means more solar gains
 - **VT**
 - Visible Transmittance
 - Ranges from 0-1, higher means more daylight





Heat Transfer in Windows

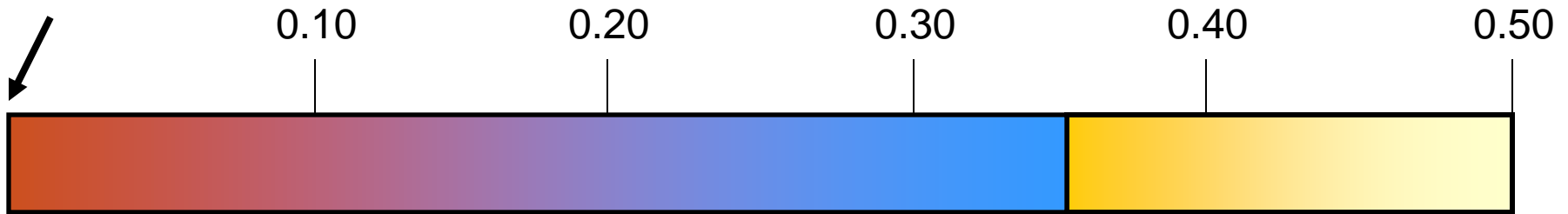




Highly Insulating Windows - range

Whole window U-factor

No heat transfer



Highly insulating windows

Typical windows

- Building Code
- Double pane Low-E
- EnergyStar

Standard double-pane windows





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Low-e storm windows

- Pyrolytic Low-e coating (hard coat)
- Does not degrade in non-sealed cavity
- Identical installation cost to clear storms





Savings

- Simple payback for Chicago
 - Low-e coated storms: 4-5 years
- Whole house heating energy savings over a winter season in Chicago for new storms:
 - Clear storm windows 8-18%
 - Low-e storm windows 19-27%



Solar Heat Gains

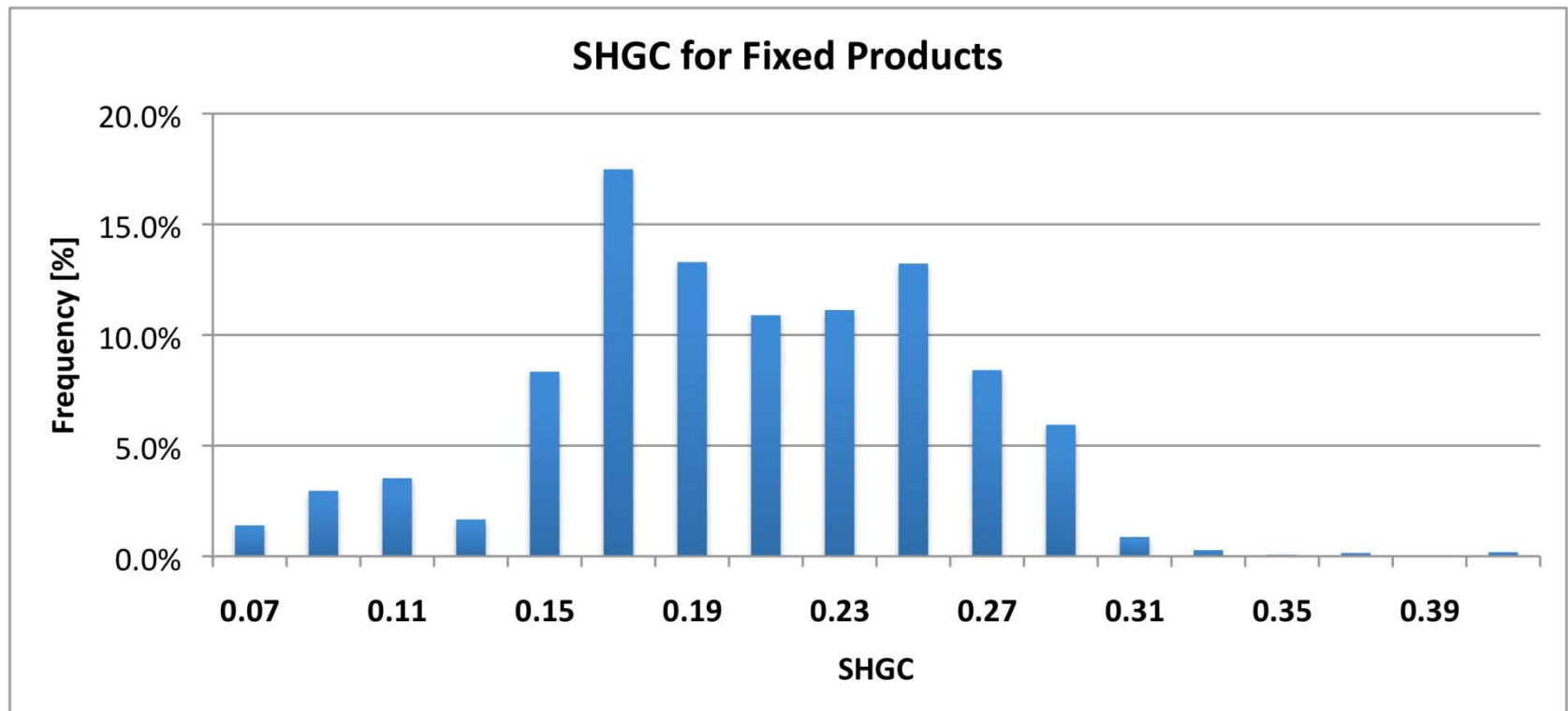
- The right Solar Heat Gain Coefficient (SHGC) depends strongly on climate and house design:
 - Solar Heat Gain through windows can help offset heating (East and South facing windows)
 - Can increase your cooling load (West facing window)





Solar Heat Gains

- Range of products available for Volume Purchase Program triple glazed windows (SHGC=0.15 – 0.30)





Final Remarks

- The availability of affordable triple pane windows is a major milestone in the commercialization of highly insulating windows
- Integrated policies can play a major role in transforming the market place
- Accurate whole window performance is a significant element to allow for program effectiveness
- The DOE, LBNL, and private industry research partners will play a major role in the future availability of the next generation of window technology



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Lawrence Berkeley National Lab

Energy Efficiency Opportunities with Highly Insulating Windows

DOE Highly Insulating Windows Webinar
June 22, 2010



Nils Petermann
npetermann@ase.org
Alliance to Save Energy
www.ase.org



ALLIANCE TO
SAVE ENERGY
Creating an Energy-Efficient World

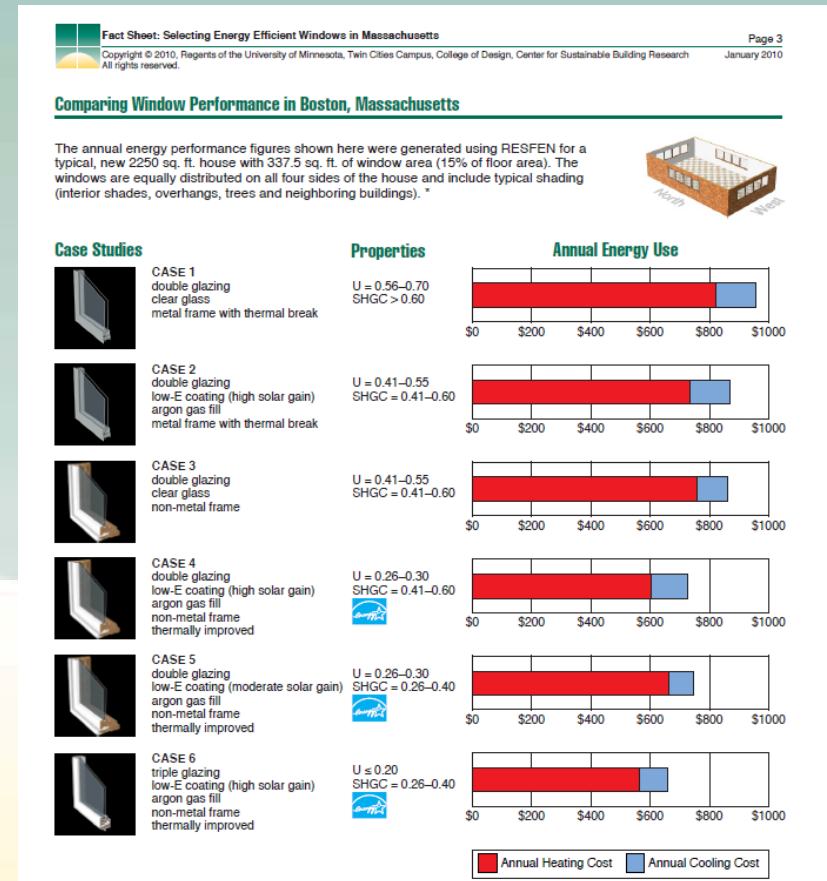
Efficient Windows Collaborative Resources

www.efficientwindows.org

Information on energy-efficient windows by:

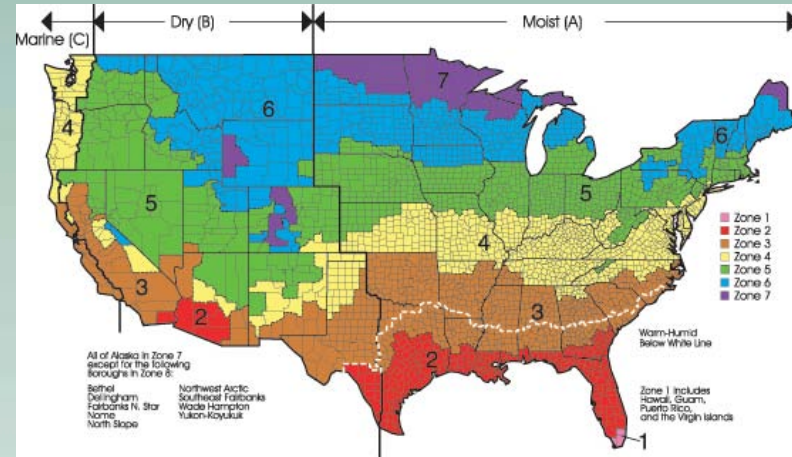
- Alliance to Save Energy
- University of Minnesota
- Lawrence Berkeley National Laboratory
- More than 80 industry and non-profit members

Funding from DOE
plus EWC member contributions



Criteria for Efficient Windows - Cold and Mixed Climates

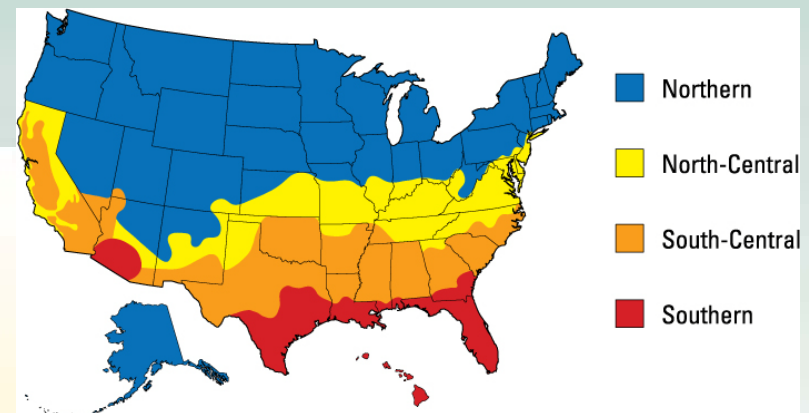
Good: 2009 International Energy Conservation Code (IECC)
Northern climate zones (4-8):
U-factor 0.35 or less, any SHGC



Better: ENERGY STAR
Northern Zone:
U-factor 0.30 or less

U-factor 0.31 qualifies if SHGC \geq 0.35

U-factor 0.32 qualifies if SHGC \geq 0.40



Best: DOE Volume Purchase Program: U-factor 0.22 or less, any SHGC

Energy Cost Savings

compared to conventional dual-pane windows (U-factor 0.5)

Typical new 2,400 ft² detached home

Massachusetts:

- U-factor 0.35 (=code requirement): \$60-\$100/year savings
- U-factor 0.22: \$150-\$200/year savings

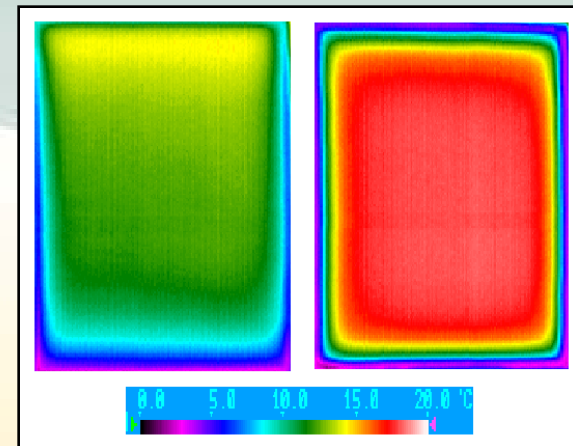
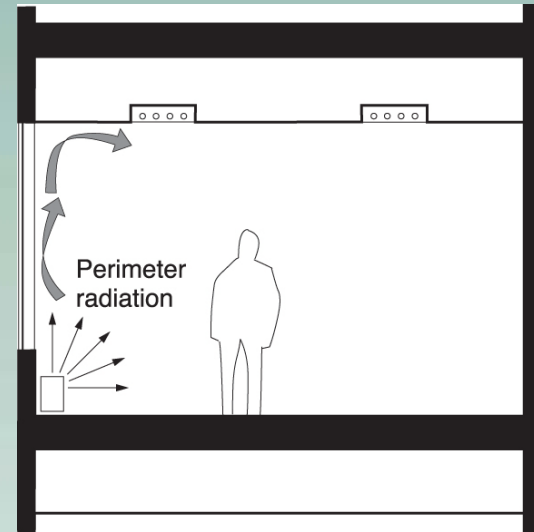
Texas (Dallas):

- U-factor 0.35 and SHGC 0.25: ~\$140/year savings
- U-factor 0.22 and SHGC 0.25: ~\$180/year savings

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.

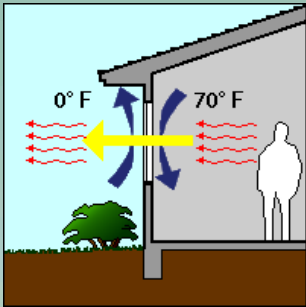
Comfort Benefits of Well-Insulating Windows

- Areas near windows are often places of great temperature variation and discomfort
- Conventional practice to avoid discomfort is to provide perimeter heating near windows
- Perimeter heat may not be necessary with highly insulating windows



Thermograms comparing a conventional dual-pane with a highly insulating window

U-factor and Winter Comfort

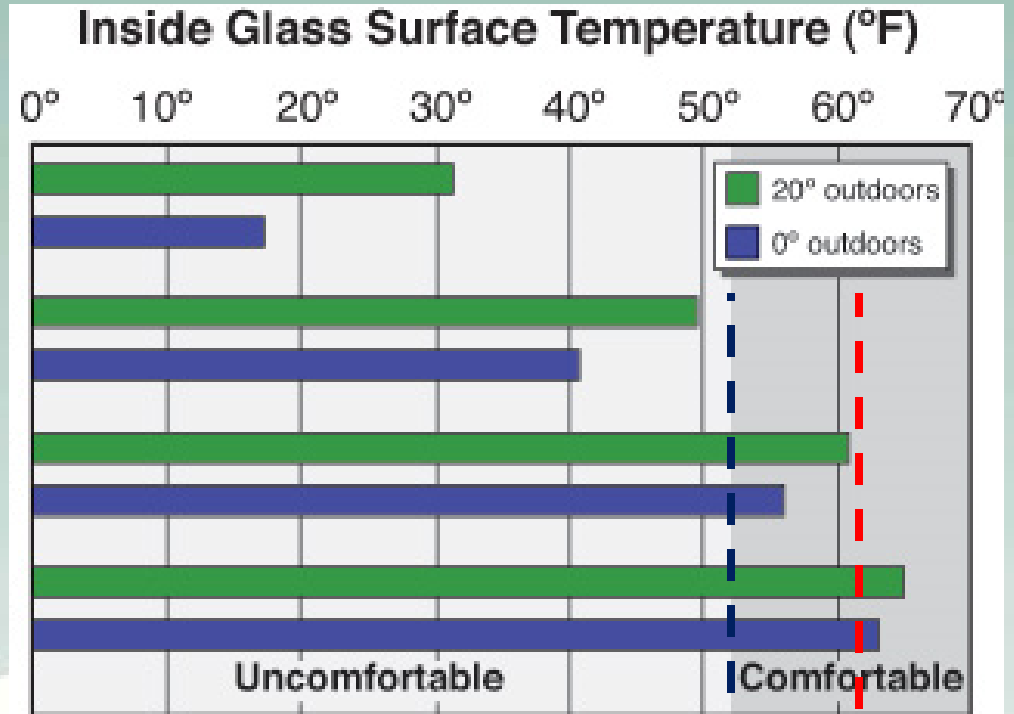


Single pane (U ~0.85)

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)



Strict comfort criteria (ISO 7730, Passiv Haus):

If window surface temperature is no more than 5-9°F below average room temperature, heating registers near windows are not needed.

with heat near windows

without heat near windows

Compact Heating Systems

1998 study on minimized duct design:*

- With moderately sized, highly insulating windows, perimeter heating not needed even with design temperatures below -15°F
- 10-15% heating energy savings due to improved duct delivery system
- Fan electricity savings
- 20-25% duct system cost savings (\$500 for 1,200 ft² house)



Source: Rural Development Inc.

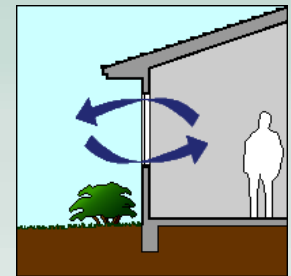
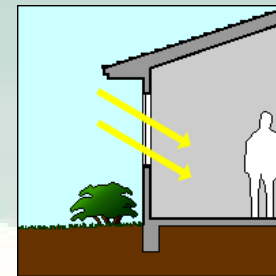
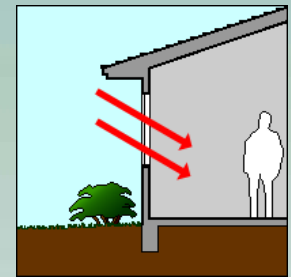
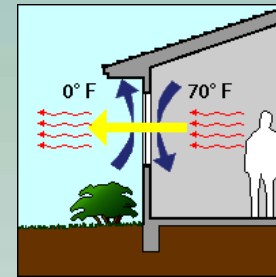
Wisdom Way Solar Village, Massachusetts

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

* Hawthorne, W. and Reilly, S. (Enermodal Engineering), Anderson, R. (NREL), Hancock, E.

U-factor is Just Part of the Story

- Orientation
- Solar Heat Gain Coefficient
- Air Leakage
- Visible Light Transmittance
- Installation
- Durability
- Acoustic performance



Thank You!

Questions?

Let us know through
the chat function

Efficient Windows Collaborative resources:

www.efficientwindows.org

www.commercialwindows.org

Efficient Windows Collaborative

Contacts

Alliance to Save Energy

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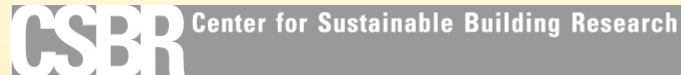
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Cost-Effective Triple Pane (R-5) and Low-E Storm Windows – Available Now

Volume Purchase Solicitation & Products Website

Terry Mapes

Research Engineer

Pacific Northwest National Laboratory

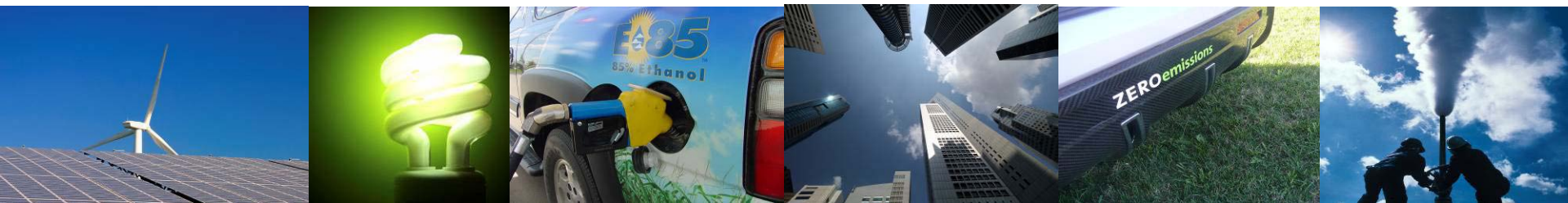
Graham Parker

Senior Staff Engineer

Pacific Northwest National Laboratory

U.S. Department of Energy Webinar

June 22, 2010





Timeline of Volume Purchase Solicitation – Phase I

- July, 2009
Highly insulating windows/low-e windows volume purchase program concept described at industry events.
- September - November, 2009
Industry input to specifications.
- December 17, 2009
Solicitation issued.
- February 19, 2010
Deadline for proposals.



Final Windows and Low-E Storm Windows Specifications

High Performance Window (R-5) Specifications		Certification Requirements									
Thermal Performance	<table border="1"> <tr> <th>Requirement</th> <th>Value</th> </tr> <tr> <td>U-factor</td> <td>0.20-0.22</td> </tr> <tr> <td>SHGC</td> <td>0.25-0.30</td> </tr> </table>	Requirement	Value	U-factor	0.20-0.22	SHGC	0.25-0.30	Testing and Certification	<p>Documentation of certification is provided for the following:</p> <ul style="list-style-type: none"> ANSI 98-001 Standard Specification for Marking Non-Insulating Glass Units (Non-Insulating Glass Units) ANSI 98-002 Standard Specification for Marking Insulating Glass Units (IGUs) ANSI 98-003 Standard Specification for Marking Low-E Coated Glass Units 	Air Leakage (AL)	<p>The following methods and procedures are the only ones for testing and certification:</p> <ul style="list-style-type: none"> ANSI 98-001 Standard Specification for Marking Non-Insulating Glass Units (Non-Insulating Glass Units) ANSI 98-002 Standard Specification for Marking Insulating Glass Units (IGUs) ANSI 98-003 Standard Specification for Marking Low-E Coated Glass Units
Requirement	Value										
U-factor	0.20-0.22										
SHGC	0.25-0.30										
Air Leakage	<table border="1"> <tr> <th>Requirement</th> <th>Value</th> </tr> <tr> <td>U-factor</td> <td>0.20-0.22</td> </tr> <tr> <td>SHGC</td> <td>0.25-0.30</td> </tr> </table>	Requirement	Value	U-factor	0.20-0.22	SHGC	0.25-0.30				
Requirement	Value										
U-factor	0.20-0.22										
SHGC	0.25-0.30										
Water and Air Infiltration	<table border="1"> <tr> <th>Requirement</th> <th>Value</th> </tr> <tr> <td>Water Infiltration</td> <td>0.05</td> </tr> <tr> <td>Air Infiltration</td> <td>0.05</td> </tr> </table>	Requirement	Value	Water Infiltration	0.05	Air Infiltration	0.05				
Requirement	Value										
Water Infiltration	0.05										
Air Infiltration	0.05										
Operating Costs	<p>Operating costs are the sum of the following:</p> <ul style="list-style-type: none"> Energy costs Water costs Replacement costs Maintenance costs Other costs 										
Other Notes	<p>1. All windows must be tested and certified in accordance with the following requirements:</p> <ul style="list-style-type: none"> ANSI 98-001 Standard Specification for Marking Non-Insulating Glass Units (Non-Insulating Glass Units) ANSI 98-002 Standard Specification for Marking Insulating Glass Units (IGUs) ANSI 98-003 Standard Specification for Marking Low-E Coated Glass Units 										
Site Categories	<p>See Site Categories and Window Specifications</p>										
Minimum Order	<p>See Site Categories and Window Specifications</p>										
Other Reporting Requirements	<p>See Site Categories and Window Specifications</p>										

High Performance Windows

- U-factor: **0.20-0.22**
- Air leakage: **≤ 0.30 cfm/ft²**
- Certifications: **NFRC/NAFS**
- Warranties: **20 glass/10 non-glass**

Low-e Storm Windows

- Emissivity: **<0.22**
- Glass thickness: **3 mm minimum**
- Structural test: **ANSI/AAMA 1002.10-93**
- Registry: **IGDB (LBNL database)**
- Warranties: **10 glass/non-glass**



High Performance Window Certification Programs

Thermal – NFRC

Label to appear on window

Structural – NAFS '05

Performance Grade=R25+



Authorized Certification Organizations

AAMA, Keystone, NAMI, WDMA





Low-E Storm Window Requirements

- Structural: ANSI/AAMA 1002.10-93
- Registration in International Glazing Database (LBNL)
<http://windows.lbl.gov/materials/IGDB/>
 - Used to verify emissivity value of 0.22
- No certification programs required
 - Thermal value verified by glass type.
 - Structural value not as important for secondary (storm) window.



Minimum Requirements for Responding to Solicitation

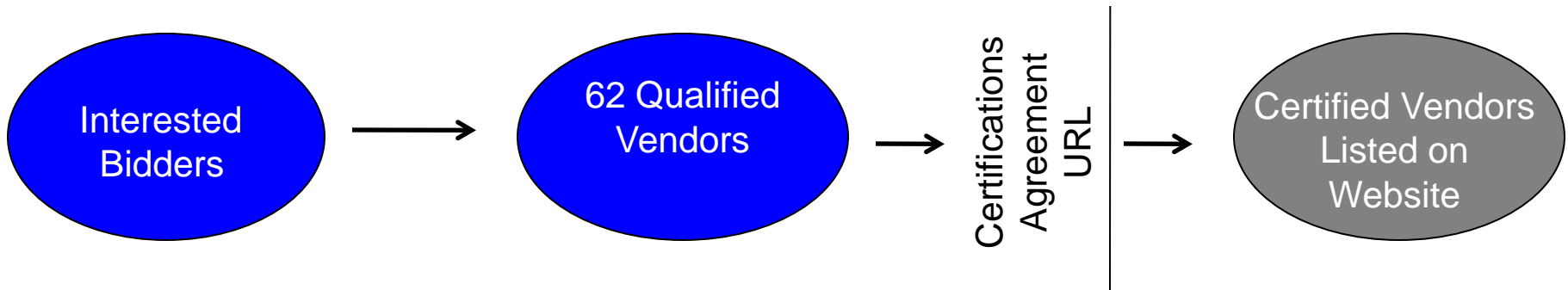
Requirements to qualify were intentionally kept minimal including:

- Meet deadline of Feb 19, 2010 to submit responses.
- Meet the minimum specifications.
 - Not based on bid prices for windows products.
- Submit at least one window product meeting minimum specifications.
 - Additional window products can be added throughout the program period.
- Submit a compliance letter.



Response to Solicitation

- 62 vendors submitted bids meeting minimum requirements. These became ‘qualified’ vendors.
 - 37 identified themselves as regionally-based.
 - 25 identified themselves as nationally-based.
 - 20 capable of delivering products to Canada.
 - 11 entered bids for low-e storm windows.
 - 9 of the top 16 window manufacturers by sales.





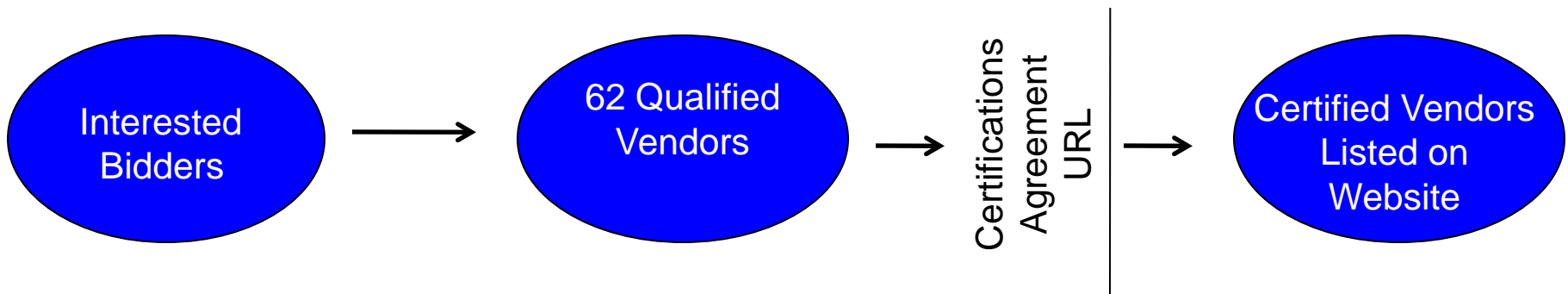
After Bids Submitted

- Checklist of items required to become a 'certified' vendor listed on the website
 - Provide warranty
 - Provide URL address
 - Provide signed agreement letter
 - High Performance Windows: Thermal and structural certification reports
 - Low-E Storm Windows: Listing in IGDB and provide ANSI/AAMA test reports



After Vendor Certification

- When all criteria are met, and the Agreement is signed, qualified bidders products are listed on the website with the vendor's URL, and the vendors become **certified** vendors.
- There are currently nearly 40 certified vendors listed on the website.



www.windowsvolumepurchase.org



Products and Prices

www.windowsvolumepurchase.org

- Minimum order of 15/20 for retrofit/new construction windows.
- Minimum order of 1 for sliding glass doors.
- Minimum order of 20 for low-e storm windows.
 - Vendors are expected to honor all requests which meet the minimum order requirement.
- Prices shown are maximum bid by each vendor for each united inches (UI) category.
- Prices are not listed by vendor and may not be increased over the period of the program—but may be decreased.
 - Price is for window frame type & color listed.
 - Price does not include shipping, installation or added features.
- List of vendors and window products they sell is posted on site.
- Delivery area in North America for each vendor is given.



Notes to All Purchasers

www.windowsvolumepurchase.org

- Anyone meeting the minimum order requirements is welcome to purchase products from the website.
 - Vendors may however choose to sell less than the minimum quantity but are not bound by the bid price if they do so.
- Since prices are not listed by vendor, buyers will need to explore vendors' URLs for selling prices.
 - Per agreement with the vendors, DOE cannot release the bid prices by vendor.
- Vendors may offer other window frame or frame color for the window product bid into this program.
 - The price for alternative frame material or color is not set by the program and thus is negotiated between the buyer and vendor.



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Product Website

Website Demonstration

www.windowsvolumepurchase.org



Future Program Activities

- Phase II Volume Purchase Program
 - Engage industry in fall 2010 to discuss results of Phase I and scope and products for Phase II.
 - Consider adding additional window types.
 - Consider windows for commercial applications.
 - Consider specifications changes
 - U-factor
 - Include regional solar heat gain coefficient (SHGC)
 - Raising structural performance grade
 - Others as suggested by industry and buyers.

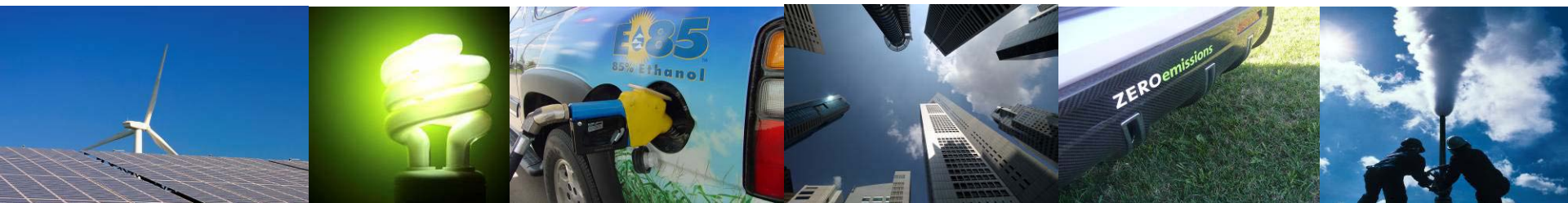


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“Window of Savings” Highly Insulating (R-5) and Low-e Storm Windows Volume Purchase Program Grassroots Marketing Campaign

Jason Bogovich/Walt Zalis
Energetics Incorporated

U.S. Department of Energy Webinar
June 22, 2010





- R-5 and Low-e Storm Windows: A Great Candidate
- Grassroots Marketing Campaign
- Regional Workshops
- Marketing Material





Great Products at the Right Time

R-5 and Low-E Storm Windows offer both superior cost and energy savings and are arriving on the mainstream market at the right time:

- The American Recovery and Reinvestment Act (ARRA)
 - HUD's Neighborhood Stabilization Program (NSP)
 - DOE's Weatherization Program
 - DOE's Increased R&D Funding for Windows
- The White House Middle Class Task Force
 - "Recovery through Retrofit" Initiative
- Focus of the White House
 - President Obama wants to weatherize one million homes annually
- The Energy Tax Credit
 - \$1,500 tax credit for qualified products
- The Homestar Program (still under consideration)
 - Instant \$1,500 or \$3,000 tax rebate
- The Green Edge the public is looking for





Our Message

Our message will be consistent and memorable to the public:

The Windows Volume Purchase Program offers a “Window of Savings” with new ways for consumers to save money and energy.





“Boots on the Ground”

A strong grassroots organization will be crucial so that our message is delivered to the decision makers at the local level. This “Boots on the Ground” strategy will consist of national, state, local partnerships with key stakeholders.



Over the past year, the Volume Purchase has developed strong working relationships with various stakeholders that represent key buyer groups. These key stakeholders will help develop our “boots on the ground” strategy with their members, partners, and stakeholders.



Our Partners

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



Our Audience: Buyer Groups

- Homebuilders
- Contractors
- Weatherization agencies
- Apartment owners/operators
- Non-profit agencies
- State/local governments
- Light commercial building owners
- Public and private education facility managers
- Public housing authorities



Working with Partners to Host 3 Regional Workshops

- 3 regional workshops will take place in targeted regions: Midwest, Northeast, Mid-Atlantic
- Each facilitated workshop will include:
 - Key presenters
 - Industry partners
 - Marketing partners
 - Buyer Groups
 - A press conference
- An effort will be made to educate the local media through multiple press releases and contacts
- Each event will be documented and updated to the Volume Purchase web site
- Current cities under consideration
 - Chicago
 - Boston
 - Harrisburg





Products to Grab Attention from Consumers

- **Fact Sheets**
 - Getting the Most Bang for your Buck from the Windows Volume Purchase Program
 - A Success Story: Supporters of the Volume Purchase Program
 - Windows Cost-Effective piece for weatherization agencies
- **Web sites** (www.windowsvolumepurchase.org and <http://www1.eere.energy.gov/buildings/windowsvolumepurchase>)
 - Continued updates and announcements
 - Continued enhancement for further educate our audience
- **Regular updates with media and trade publications**
 - Articles and cross-links to Volume Purchase web sites
 - Publications Partners include: National Building Institute (NBI), American Architectural Manufacturers Association (AAMA), Earth Advantage Institute, BuilderOnline, eBuild, Door and Window Manufacturer Magazine, CleanEfficientEnergy.org , MEEA, NWDA, NFRC, and IGMA
 - Press releases for important Volume Purchase Events

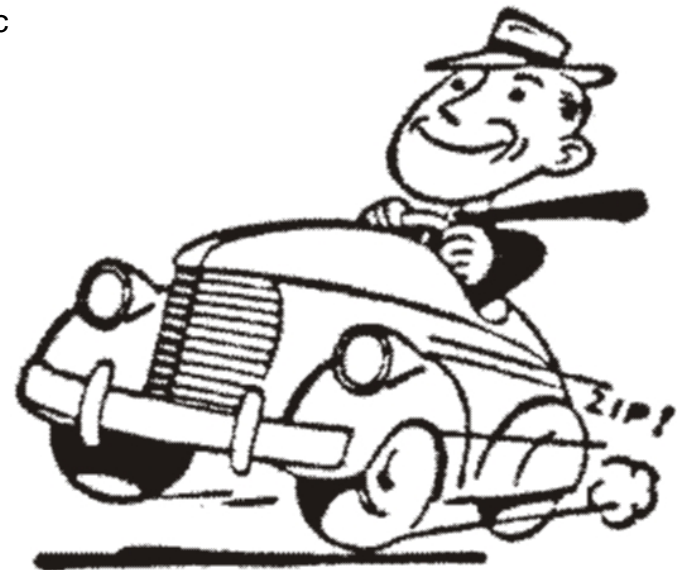




Marketing on the Road

The Volume Purchase Team will be attending important workshops and conferences for targeted audiences:

- American Homeowner Association
- American Institute of Architects
- Apartment Building Owners and Managers Association of Illinois
- Apartment and Office Building Association of Metropolitan Washington
- National Association of Counties
- Associated Builders & Contractors
- Association for Homeowners Across America
- Association of Condominium, Townhouse, and Homeowners Assoc
- Association of College and University Housing Officers
- Council of Large Public Housing Authorities
- International City/County Management Association
- National Association of Home Builders
- National Association of Residential Property Managers
- National Governors Association
- National League of Cities
- National Multi Housing Council
- National Property Management Association
- Public Housing Authorities Directors Association





Using RESFEN and NEAT to Support Weatherization

- Pennsylvania has shown significant interest in window retrofits, accelerating the adoption of energy efficiency window systems into its Weatherization Assistance Program.
- Lawrence Berkeley National Laboratory (LBNL) and Energetics Incorporated provided detailed analyses using the RESFEN and NEAT (ORNL approved weatherization tool) programs.
- Analyses include upgrading all single pane and metal framed clear double pane windows with low-e storm windows and updating to an R-5 window when a window must be replaced due to health, safety or structural concerns (Analyses derived a maximum average incremental cost of \$8.90 per ft² when using an R-5 window in this scenario).
- Price points were also derived for the replacement of an existing single pane wood frame or metal frame clear double pane window with an R-5 window.



Results: Low-E Storm Windows

- Parameters
 - Same pricing as the LBNL analysis (average \$7.85 per ft², plus \$15 per window for other installation costs) across Scranton, Harrisburg, Philadelphia and Pittsburgh
 - Glass emissivity = 0.22
 - Center-of-glass SHGC = 0.74
 - 15 year lifetime
 - Both furnace efficiencies of 94.7% and 80%
 - Natural Gas Heating
- For all cases in 37 homes modeled across four cities, low-e storm windows were selected as a qualified measure with SIR values substantially higher than 1.
 - SIR values over single pane wood frame windows with a furnace at 80% efficiency ranged from 1.4 to 2.2, with an average of 1.7.
 - SIR values over metal frame clear double pane windows with a furnace at 80% efficiency ranged from 1.3 to 2.1, with an average value of 1.6.



Results: R-5 Windows

- Parameters for replacing a degraded window with an R-5 window
 - \$5 incremental cost over a basic code window across Scranton, Harrisburg, Philadelphia and Pittsburgh, 94.7% Furnace Efficiency, Natural Gas Heating, 20 year lifetime
 - U-factor = 0.22, SHGC = 0.3
- For all cases in 37 homes modeled across four cities, R-5 windows were selected as a qualified measure with SIR values substantially higher than 1.
 - SIR values ranged from 1.6 to 3.0.
- Price Point for SIR of 1 and upgrade to R-5 Windows over Single Pane Wood Frame Windows for worst case homes

City	Scranton	Harrisburg	Pittsburgh	Philadelphia
Installed Window Cost \$/ft2	\$26.45	\$22.35	\$25.55	\$25.15

- Price Point for SIR of 1 and upgrade to R-5 Windows over Metal Frame Double Clear Pane Windows for worst case homes

City	Scranton	Harrisburg	Pittsburgh	Philadelphia
Installed Window Cost \$/ft2	\$25.45	\$21.50	\$24.55	\$24.35



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Want to help? Please contact us!

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Cost-Effective Triple Pane (R-5) and Low-e Storm Windows — Available Now

Thank you for attending the Webinar

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