

# Why Utilities and Market Transformation Programs Need to Move Beyond Lighting and Equipment: A Highly Insulating Windows Incentives Argument

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- ▶ Background on the Evolving Utility & Energy Efficiency
- ▶ Why Care About Windows?
- ▶ Today's Windows Incentives Programs
- ▶ Today's Windows Market: Highly Insulating Windows are Entering the Market.
- ▶ Considerations for Incentives for Highly Insulating Windows

# 2008: International Energy Agency (IEA) on Energy Efficiency

“Using energy-efficient equipment is the most cost-effective short-term path to greater energy security and lower greenhouse gas emissions to combat climate change. It reduces pressure on energy resources”.

April 1, 2008. IEA Implementing Agreement for a Co-operating Programme on Efficient Electrical End-Use Equipment. [www.iea-4e.org](http://www.iea-4e.org)

**2011: NOTHING HAS CHANGED.....**



Pacific Northwest  
NATIONAL LABORATORY

# 2011: Once Again the Utility is Facing 'Sea-Changes'

“The importance of energy efficiency has never been greater than now as a utility resource helping to achieve multiple economic and environmental objectives.

Energy efficiency lowers costs to energy customers and utility systems. It promotes job growth and local economic development. It also reduces negative environmental impacts by reducing fossil fuel use.

Finally, energy efficiency is increasingly an important tool in addressing and maintaining electric system reliability.

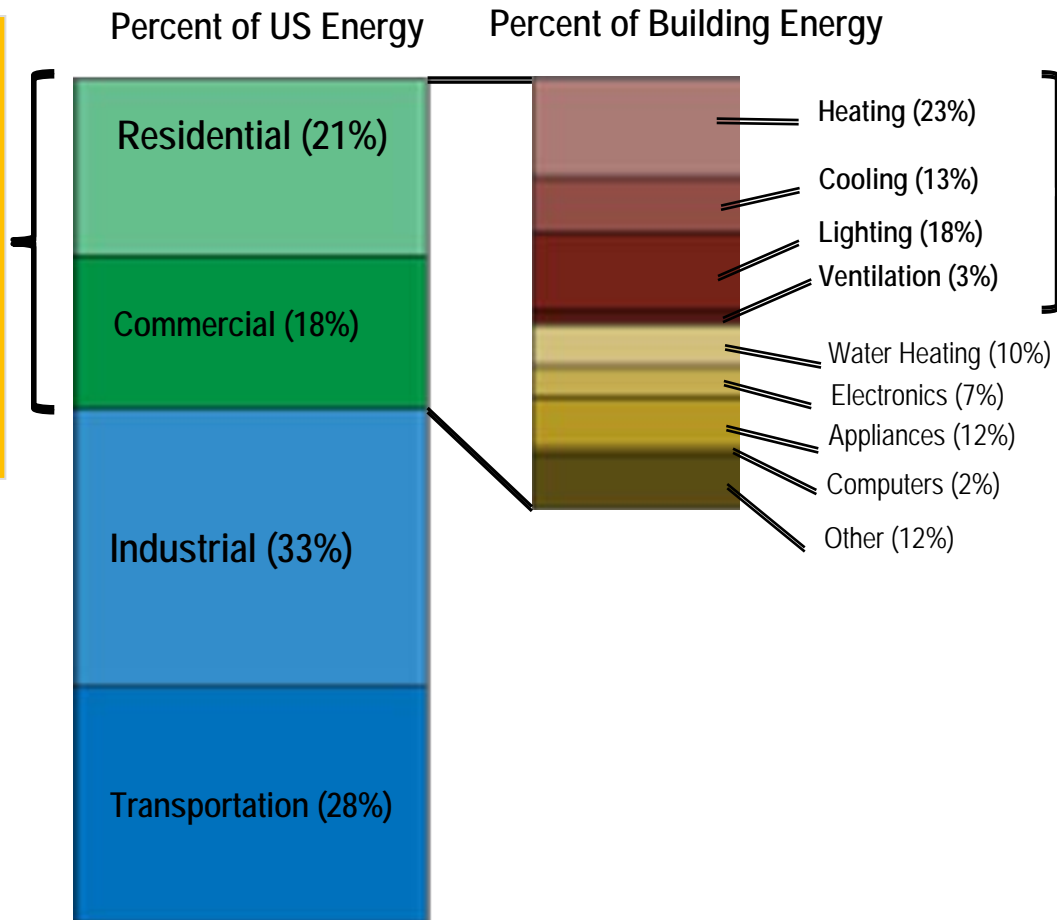
Unless we change the fundamental utility regulatory model to meet 21<sup>st</sup> century needs, we are destined to continue to achieve 20<sup>th</sup> century results—more and more power plants.”

***The Old Model Isn't Working:  
Creating the Energy Utility for the 21<sup>st</sup> Century***  
An ACEEE White Paper  
September 2011

# Windows Impact on U.S. Energy Consumption

## Why worry about windows and envelopes?

Buildings are responsible for about 40% of U.S. primary energy consumption



More than 50% of the energy used in a building falls in an end use impacted by windows and envelope choices.

# Why Residential Windows?

According to the Environmental Protection Agency's (EPA) ENERGY STAR Program:

- ▶ “Windows typically comprise 10 to 25 percent of the exterior wall area of new homes. Research studies report that windows in heating-dominated climates account for up to 25 percent of a typical house's heating load and that in cooling-dominated climates, windows account for up to 50 percent of the cooling load.”

# Today's Incentives for Windows\*

- ▶ 41 states with incentives
  - 169 utilities
    - 101 utilities offer rebates for windows or storm windows (\$0.48 - \$8/ft<sup>2</sup>).
      - ◆ Many offer rebates+loans
    - 74 utilities offer only loans for windows or storm windows.
    - 10 utilities offer only loans for just storm windows.
  - 19 State/public program offerings
    - Primarily loans and/or tax credits/incentives
    - 2 offer only to the commercial/institutional sector.

**Only 1 Incentive Program for U-factor 0.22**



# Highly Insulating Windows Utility–Based Incentive Program

## Energy Trust of Oregon (ETO) ([www.energytrust.org](http://www.energytrust.org))

- ▶ Public purpose non-profit providing services and cash incentives to customers of Portland General Electric (PGE), Pacific Power, Northwest Natural and Cascade Natural Gas.
- ▶ Cash incentives for all sectors across a broad range of technologies.
- ▶ Offer single technology and package incentives for customers of their member utilities, including high performance windows for residential customers.
  - U-factor of 0.22 or less—receive a cash incentive of \$3.50/ft<sup>2</sup> of windows installed in electric or gas heated homes.
  - U-factor of 0.30 to >0.22—receive \$2.25/ft<sup>2</sup>.
  - \$100 bonus if combined with a second energy saving measure.



# Other Current or Planned Offerings Beyond ENERGY STAR Windows

- ▶ Minnesota Power ([www.mnpower.com](http://www.mnpower.com))
    - \$300 window upgrade on new residential construction (electric heat) for windows with U-factor  $\leq 0.28$ .
  - ▶ Puget Sound Energy ([www.pse.com](http://www.pse.com))
    - Upgrade single-pane or double-pane metal frame windows to a U-factor  $\leq 0.25$  in electrically-heated 5+ attached units building (condo or multifamily) AND with specific insulation levels to receive rebate of \$8/ft<sup>2</sup>.
  - ▶ Northwest Energy Efficiency Alliance ([www.neea.org](http://www.neea.org))
    - Considering a 3-tier utility incentive for owner-occupied residential retrofits to offset price differentials for highly insulating windows, and exploring rental and second homes for eligibility for incentives.
- .....and, don't forget the \$200 Federal tax credit for windows that expires 12/31/11.

# Today's Residential Windows Market is Changing

Home Depot  
Major manufacturers  
of residential products



Over **85%**  
ENERGY STAR in Product Comparison  
most markets



**ENERGY STAR**  
approaching  
the baseline for  
many regions

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 Seller

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 / 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 Seller

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, 24 in. x 3/2 in. White with LowE3 Insulated Model 3000

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 Seller

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

Here are the products you have to compare:

	Model 3000	Model 8500	Model 3000	Model 8500
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
Brand Name	American Craftsman, an Andersen Company	American Craftsman, an Andersen Company	American Craftsman, an Andersen Company	American Craftsman, an Andersen Company
Manufacturer	Silver Line Building Products Corp.	Silver Line Building Products Corp.	Silver Line Building Products Corp.	Silver Line Building Products Corp.
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

# Highly Insulating Windows are More Widely Available Today Through a DOE Program

## ► High Performance Windows Volume Purchase (WVP) Program

- Market transformation program with the goal to increase the availability of high performance windows products
- Windows for sale by qualified vendors meeting program specifications.
- Nearly 30 national and regional vendors offering residential/light commercial windows and low-e storm windows and low-e storm windows in volume pricing.
- Searchable data base of products.
- Residential and commercial grade (punch-out) available.

**3x5 single hung as low as \$205**

**www.windowsvolumepurchase.org**

High Performance R-5<sup>+</sup> Windows & Low-E Storm Windows Volume Purchase Products

Frequently Asked Questions Complete Vendor Listing Utility Incentives Learn more about Windows Volume Purchase

Order Windows

- Optional Open Bid Request
  - New Construction R-5 Windows (Minimum order: 20)
  - Retrofit Construction R-5 Windows (Minimum order: 15)
  - R-5 Patio Doors (No minimum order)
  - Low-E Storm Windows (Minimum order: \* 20)

Contact Us  
Questions? Contact us at: windowsVP@nrl.gov

High Performance Windows: Advancing Technology. Saving Energy.

About this Website

You have accessed this website because you are interested in purchasing high performance windows or low-e storm windows that are available from qualified vendors as part of the U.S. Department of Energy (DOE) Highly Insulating (R-5<sup>+</sup>) Windows and Low-E Storm Windows Volume Purchase Program. Buyers interested in purchasing a minimum quantity of windows from this site can:

- start by selecting new construction windows, retrofit construction windows, patio doors, or low-e storm windows from the menu on the left.
- select the desired window type and window size offered by the listed vendors (with their URL) at the range of maximum base price shown.
- determine the regions in North America where a vendor will deliver selected windows
- fill out and submit an Optional Open Bid request Form to obtain bids from multiple vendors for desired window products.

Buyers should be aware that the prices shown for the window products do not include applicable taxes, delivery, installation, and other features such as grids.

Highly Insulating and Low-E Storm Windows Energy Savings Estimator

An energy savings estimator is provided for buyers to evaluate the energy cost savings benefits of selecting highly insulating windows or low-e storm windows relative to common window or storm window options and, if applicable, relative to existing windows. A document giving an explanation of the functions and assumptions for using this estimator is also provided.

Window Sales

Total Sales To-Date:  
2071 Windows @ \$469,787.71

Top Seller for 4th Qtr.:  
BF Rich Windows & Doors

Site Updates

03/2011 - Frequently Asked Questions Updated

09/2010 - Optional Open Bid Request Form

High Performance R-5<sup>+</sup> Windows & Low-E Storm Windows Volume Purchase Products

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New Construction R-5 Double-Hung Windows

Please select the United inches (UI) range\* of the New Construction R-5 double-hung window you are interested in purchasing. You will then see a listing of all vendors offering a double-hung window in UI range.

The price range given is the lowest maximum price to the highest maximum price that is offered. Click on the price range and you will see a listing of all the minimum prices by the vendors that offer this window product. The prices do not include installation, shipping, alternative frame materials/colors or additional window features (e.g., grids).

Also shown is the region within North America where the vendor will ship this window product.

For your convenience, a link has been provided to each vendor's website for purchasing this window product.

UI Range*	Maximum Price Range
Up to 50	\$116 - \$850 [full price list]
51-60	\$129 - \$850 [full price list]
61-70	\$142 - \$850 [full price list]
71-80	\$152 - \$850 [full price list]
81-90	\$163 - \$850 [full price list]
91-100	\$170 - \$898 [full price list]
100+	100 UI base price plus \$1.68 - \$10.05 per UI unit over 100. [full price list]

\*United States (US) = Length x Width

\*For a breakdown of shipping regions by state, please visit the Shipping Regions page on this website. Please note: shipping may not be available for all states within the region. Please refer to the individual vendor website for specific location.

Contact Us  
Questions? Contact us at: windowsVP@nrl.gov

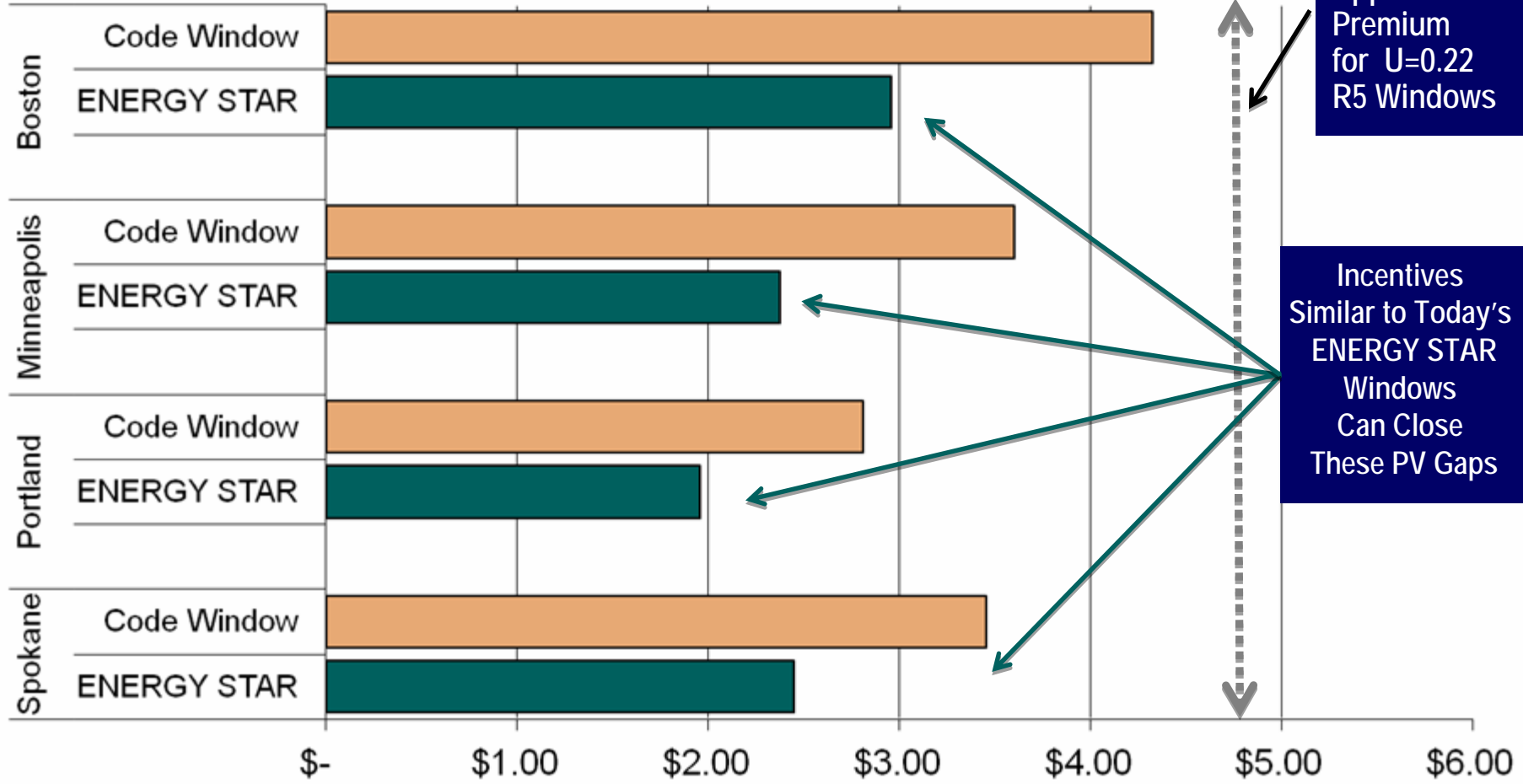
Technical Issues? Please contact the webmaster

# Greater Affordability of Highly Insulating Windows: 4 City Present Value Analysis

## Present Value (PV) of 20 Year Energy Savings, U=0.22 Windows

*over typical ENERGY STAR (U=0.30)  
or typical code-compliant (U=0.35) windows*

Compared to:



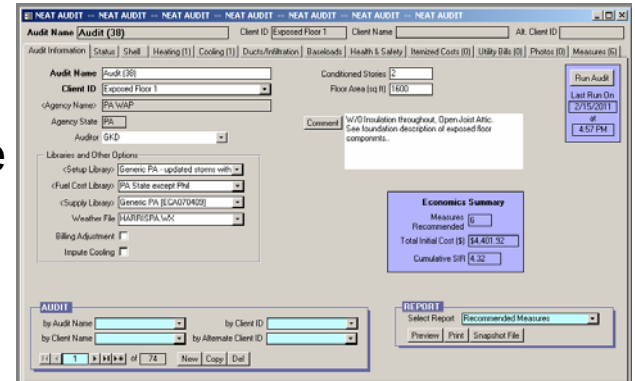
Approx. Price Premium for U=0.22 R5 Windows

Incentives Similar to Today's ENERGY STAR Windows Can Close These PV Gaps

Present Value Energy Savings (\$ per square foot window area)

# One State Agency Choosing Highly Insulating Windows

- ▶ Pennsylvania's state weatherization program priority list now includes highly insulating windows and low-e storm 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 the WVP team.
  - Similar analysis can be requested by any state, utility or similar program by contacting the WVP team.



# Considerations for Going Beyond/Above ENERGY STAR Windows Incentives

- ▶ Unlike many appliances (that have/are incentivized), windows stay with the home when residents move.
- ▶ The chief barrier to consumer adoption of highly insulating windows for their homes is the perceived significant cost premium\*.
- ▶ Price premiums between ENERGY STAR and high performance windows continue to decrease making high performance windows a viable option, particularly if a decision is made to retrofit windows. Modest utility incentives can help narrow the price gap as noted.

# Considerations for Going Beyond/Above ENERGY STAR Windows Incentives

- ▶ ENERGY STAR is the 'baseline' retrofit window in many regions of the country and is near or at the cost of code windows; so why continue to incentivize?
  - Or more specifically, why incentivize ENERGY STAR @ \$5-\$8/ft<sup>2</sup>?
- ▶ Future federal/national tax credits for windows are ending and future is problematic.
- ▶ Regional and local Building codes are increasingly moving to ENERGY STAR windows with future IGCC and green codes moving beyond ENERGY STAR to highly insulating windows for even mild climates.



# Consider Other Benefits of High Performance Windows in New Construction

## Reduce HVAC system size and eliminate perimeter heating with highly insulating windows:

### ▶ Per a 1998 study by Hawthorne et al.:

- With moderately sized, highly insulating windows, perimeter heating not needed even with design temperatures below  $-15^{\circ}\text{F}$
- 10-15% heating energy savings due to improved duct delivery system.
- Fan electricity savings
- 20-25% duct system cost savings (\$500 for 1,200 ft<sup>2</sup> house)



Source: Rural Development Inc.

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

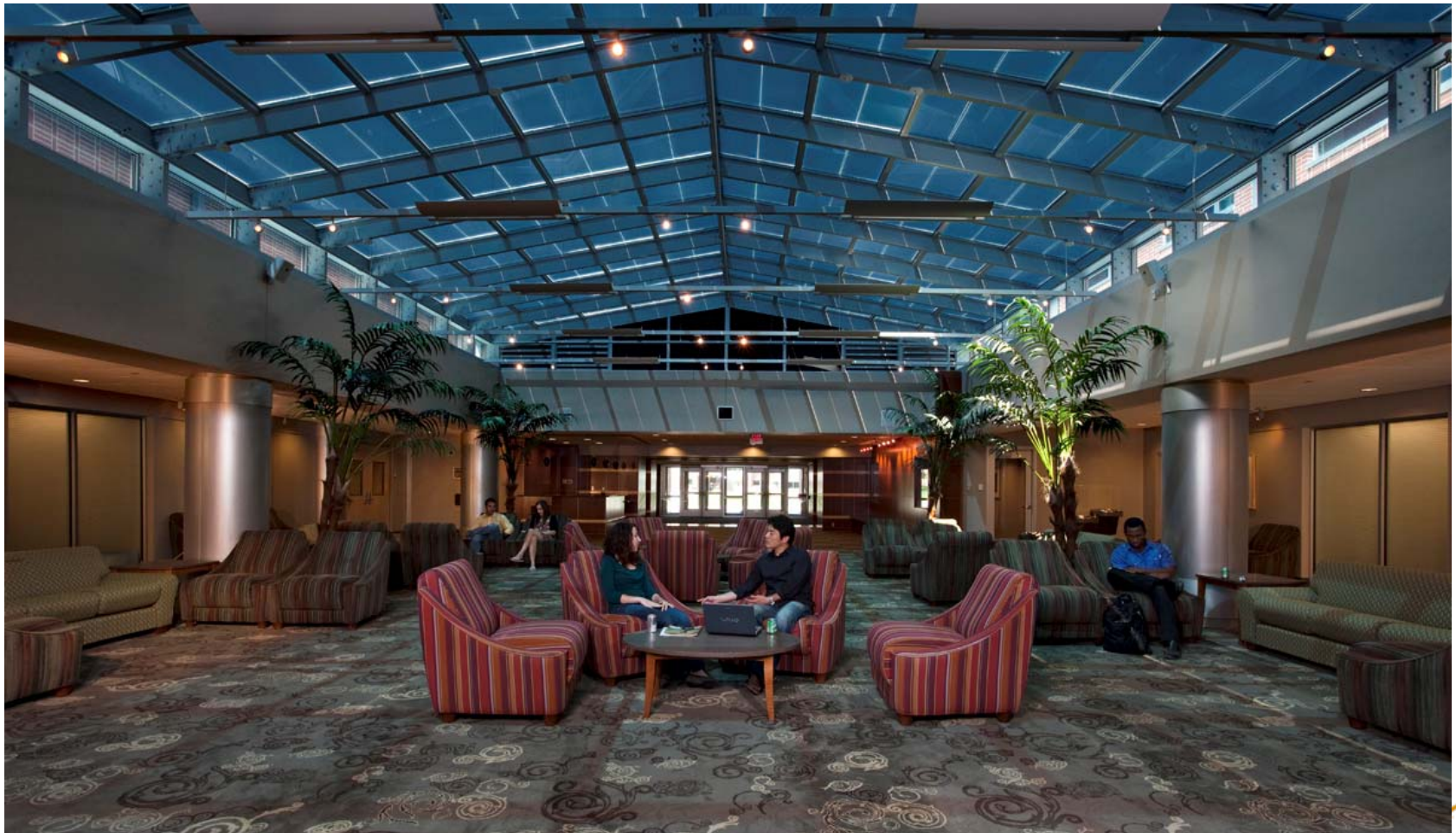
If window surface temperature is no more than  $5-9^{\circ}\text{F}$  below average room temperature, heating registers near windows are not needed.

\* Savings estimates from 1998 study by Hawthorne, W. and Reilly, S. (Enermodal Engineering), Anderson, R. (NREL), Hancock, E.



# Advanced (Smart) Windows are Here! Dynamic Windows – Cost Neutral within 5 Years and Ready for Incentives?

## DeHority Hall, Ball State University, Muncie, IN



Courtesy of Sage – DO NOT USE WITHOUT SAGE PERMISSION

SAGE NATIONAL LABORATORY