

# Better Buildings Residential Network Peer Exchange Call Series:

Window Treatments: The Undervalued, Highly Efficient Energy Efficiency Measure
November 14, 2019



# **Agenda and Ground Rules**

- Agenda Review and Ground Rules
- Opening Poll
- Residential Network Overview and Upcoming Call Schedule
- Featured Speakers:
  - Erika Burns, D+R International
  - Stacy Lambright, Hunter Douglas
  - Katherine Cort, Pacific Northwest National Laboratory
  - Doug Anderson, U.S. Environmental Protection Agency
  - Todd Stratmoen, Larson Manufacturing
- Open Discussion
- Closing Poll and Announcements

#### **Ground Rules:**

- 1. Sales of services and commercial messages are not appropriate during Peer Exchange Calls.
- 2. Calls are a safe place for discussion; please do not attribute information to individuals on the call.

The views expressed by speakers are their own, and do not reflect those of the Dept. of Energy.





# Better Buildings Residential Network

### Join the Network

#### **Member Benefits:**

- Recognition in media and publications
- Speaking opportunities
- Updates on latest trends
- Voluntary member initiatives
- One-on-One brainstorming conversations

#### **Commitment:**

Members only need to provide one number: their organization's number of residential energy upgrades per year, or equivalent.

### **Upcoming Calls (2<sup>nd</sup> & 4<sup>th</sup> Thursdays):**

Dec 12: Electrification – What Does It Mean for Energy Efficiency?

Peer Exchange Call summaries are posted on the Better Buildings website a few weeks after the call For more information or to join, for no cost, email bbresidentialnetwork@ee.doe.gov, or go to energy.gov/eere/bbrn & click Join







Erika Burns
D+R International





# Window Treatments – The Undervalued Highly Efficient Energy Efficiency Measure

November 14, 2019

Presenters: Erika Burns (AERC), Stacy Lambright (Hunter Douglas), Katie Cort (Pacific Northwest National Laboratory), and Todd Stratmoen (Larson Manufacturing)



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## **Webinar Objectives**

- We hope webinar participants will learn:
  - The variety of window attachments in the market today
  - The energy savings potential of window attachments and automation strategies
  - Product certifications with the AERC and ENERGY STAR programs
  - Research and efforts other stakeholders have taken in this space
  - Considerations for adopting window attachments as a measure

## **Agenda**



- Part I: Introduction to Window Attachments
- Part II: Attachments Energy Rating Council
- Part III: Shade Automation 101
- Part IV: Research and Energy Savings Potential
- Part V: ENERGY STAR Storm Windows Program
- Part VI: Market Impact and Utility Pilots
- Q&A



# Part I. Introduction to Window Attachments



### The Problem

of U.S. homes have non-low-e single or double pane windows

Windows make up

30%

of a typical home's heating and cooling energy



Most household heat is lost through the windows and roof.

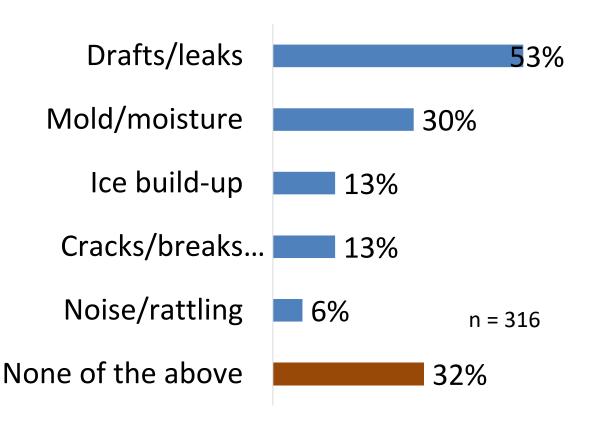






### **Window Concerns**

68% of respondents had a concern with their existing windows, with 31% having more than one concern.



Q10. What, if any, of the following concerns do you have with the windows in your home?

Efficiency Vermont. Low-E Storm Windows Market Characterization Study. November 2016.



# **Interior Window Attachments**













# **Exterior Window Attachments**







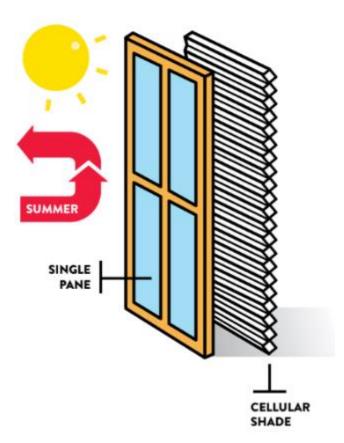




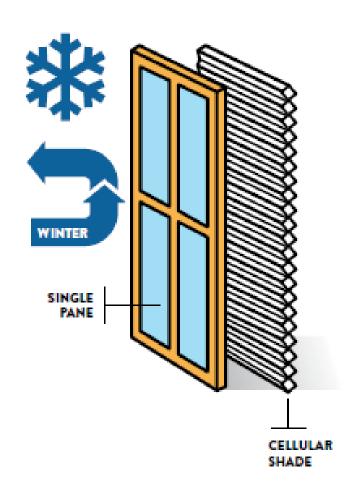


## **How Do they Save Energy?**



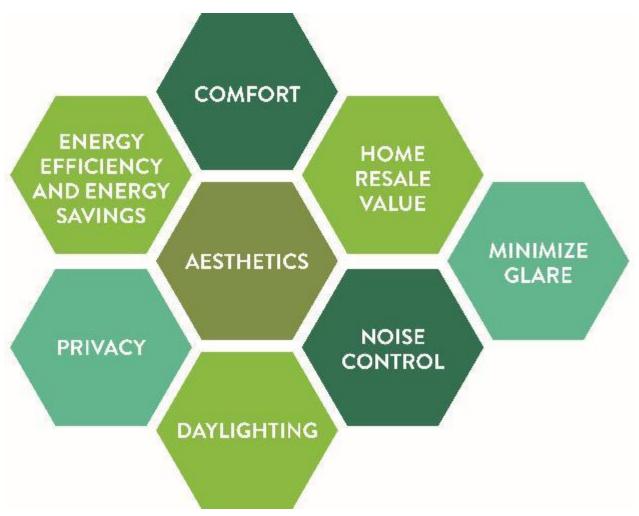






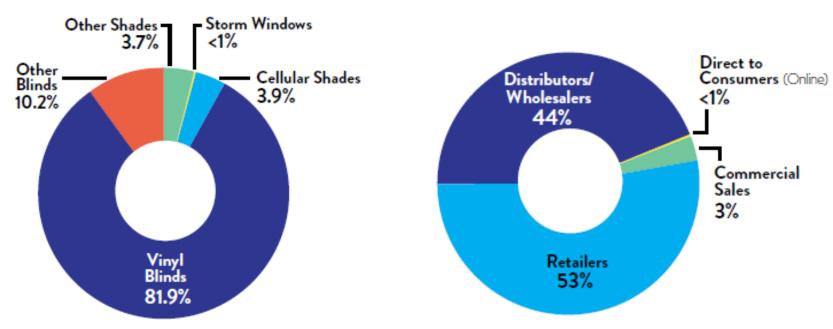


### **Window Attachments Value**



# Market Size and Share

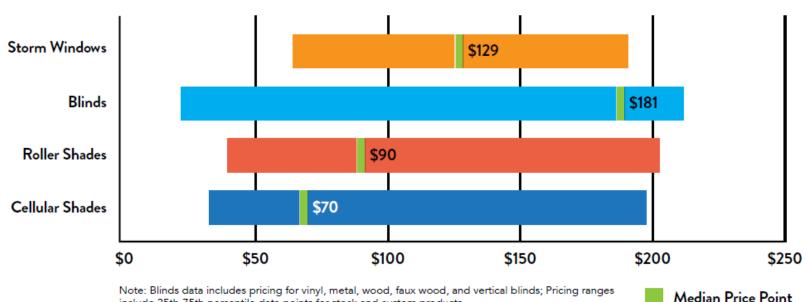
Annually 150-225 million residential interior units shipped in US



Attachments Energy Rating Council. Window Attachments: Call to Action. June 2019.

# Residential Market Pricing

### **Product Pricing: Low (Stock) – High (Custom) Price Points**



include 25th-75th percentile data points for stock and custom products



# **Customer Sectors**





# **Project Types**





### **Smart Home and Automation**

- 35% of US consumers have two or more smart home devices
- 84% have heard of smart or connected home devices
- 58% think the smart home will change their lives in the next few years
- 24% of homes use smart home devices
- Over 50% plan to buy an additional smart speaker
- 65% of consumers control appliance or lights in more than one room





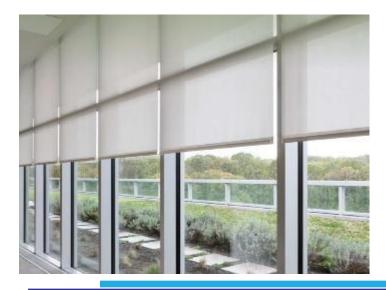
# Part 2. Attachments Energy Rating Council



# What is the AERC?

The Attachments Energy Rating Council is a public interest organization whose mission is to provide consumers with credible, relevant, and comparable information about window attachments and their performance.







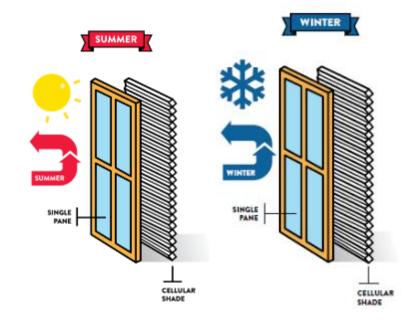
### **AERC** members include:

- Public Interest Groups
- National Labs
- Commercial Labs
- Product Manufacturers
- Component Manufacturers
- Utilities



# Why is AERC Necessary?

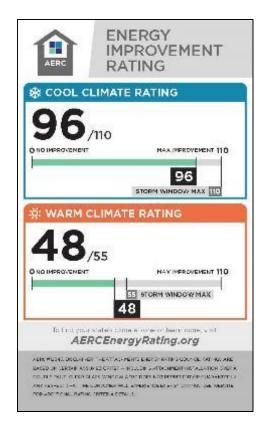
- Window attachments can save energy and improve occupant comfort
  - Many consumers are unaware of their energy-saving capability
- Consumers have no way to compare the energy performance of attachments
- Energy efficiency program managers and other stakeholders also benefit from ratings and energy performance information

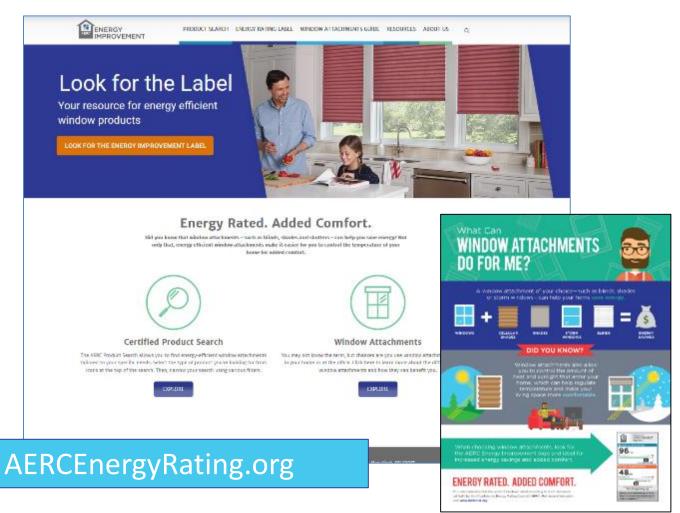


The AERC rating allows consumers to make more informed decisions.



# Residential AERC Program







# **Additional Technical Ratings**

### **U-factor**

- Measures heat loss
- Low numbers are better

# Solar Heat Gain Coefficient

- Measures heat gain
- Low numbers are better

### Visible Transmittance

- Measures light transfer
- High number means more light passes through window

### Air Leakage

- Measures air passing through window
- Lower numbers are better



### The Road Ahead



Residential automation ratings

# Additional residential products

- Roller Shutters
- Awnings





Commercial secondary window ratings



Stacy Lambright Hunter Douglas





# Part 3. Shade Automation 101



### **Shade Automation 101**

### **Ways to Operate Window Attachments**



Manual



Motorized



**Automated** 

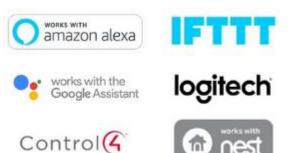


### **Motorization and Automation**

- Many manufacturers/retailers offer motorization on almost all window attachment types
  - Operated with remote control
- More limited number offer automation
  - Draper
  - Hunter Douglas
  - Lutron
  - Mechoshade
  - Rollease Acmeda











# **Automated Shading System Overview**





# **How Do You Power The Shades?**









# **Battery Powered Shades**



#### **Pros**

- Convenient installation in existing home structure
- Power pack is hidden from view
- Cost effective to motorize shades
- Easy planning

#### Cons

- Will have a limited life so consumer will have to change batteries
- Not applicable to some larger shade applications



# **Plug-In Shades**



#### **Pros**

- Use the home's 120 volt outlets to power the shades
- Can power larger windows and vertical application shades
- Consistency of power to the shades

### Cons

- Must have an electrical outlet close to the window
- Will have to plan on hiding the cord from the window to the outlet, either under draperies or a valance or installing the outlet within a shade pocket
- Power is subject to your electrical outcome



## **Hard Wired Motorized Shades**



#### Pros

- If planned during construction is ideal way to provide power to shades
- Can power multiple shades and larger sizes
- Clean look to the interiors

#### Cons

- On existing home can be costly to tear into walls
- Construction involved prior to installation for existing home
- In some states would require an electrician to do the wiring



# How do you control the shades?

Programmed Scheduling

Smart Thermostat Integration

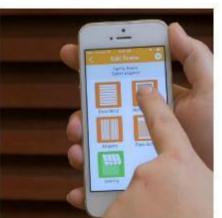
**Voice Command** 

Sensor-Driven







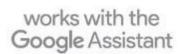














Apple HomeKit





Katie Cort
Pacific Northwest National Laboratory





# Part 4. Window Attachments Research and Energy Savings Potential



## **AERC** DOE Savings Potential Study (2013)

- Comprehensive energy-modeling study that examined 11 different typical residential window attachments
  - Baseline with 4 types of houses, 3 types of windows, in 12 climate zones
  - Operation assumptions based on empirical study
- For most attachments examined, energy savings significant
  - Results depend on type of attachment, season, climate, and operation
- In heating-dominated climates, low-e storm panels and cellular shades are the most effective at reducing HVAC energy use

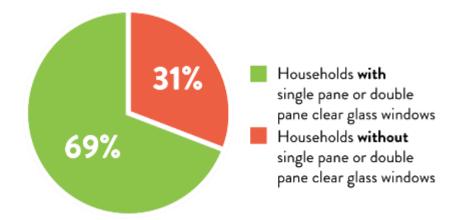




## Savings Potential X Market Potential

Technology	Application	Energy Savings
High-R Window Replacements	New and existing homes	7-16% (total energy savings)*
Low-e Storm Windows	Existing homes	10-33% (annual HVAC savings)
Insulated Cellular Shades	New and existing homes	10-34% (annual HVAC savings)
Exterior Shades	South- and west-facing windows	12-25% (Cooling HVAC savings)**

<sup>\*</sup>Hart et al (2019)



Large market opportunity for improving window performance:

- Applicable to new and existing homes in all climate zones
- Over 80% of homes and small commercial buildings have some form of window attachment
- Over 80% of window attachments that are in place are relatively low-performing vinyl blinds (horizontal slatted)

<sup>\*\*</sup>Not annualized and based on preliminary cooling season savings from 2019 Lab Homes study currently underway.



### **PNNL Lab Homes Research**

- Specified to represent existing manufactured and stick-built housing
- 3 BR/2 BA, ~1500 ft2, double-wide
- All-electric with 13 SEER/7.7 HSPF heat pump central HVAC + alternate Cadet fan wall heaters throughout
- R-22 floors, R-11 walls & R-22 ceiling with composition roof
- 195.7 ft2 (13%) window area
- All double-pane and aluminum framed clear glass windows







## Low-e Storm (LES) Windows Savings Potential

Study	Experiment	HVAC Savings (%)
Lab Homes Exterior LES (2014)	Over double-pane clear glass	10.1% ±1.4 (annual)
Lab Homes Interior LES (2015)	Over double-pane clear glass glass, covering 74% of the window area	7.8±1.5 (annual)
Philadelphia Multi-Family Field Study (2013)	Interior LES over single-pane metal frame	20% heating use 9% cooling use 10% reduction in leakage
Chicago Case Study (2007)	Exterior over single- pane wood-framed windows	21% heating and 7% reduction in leakage



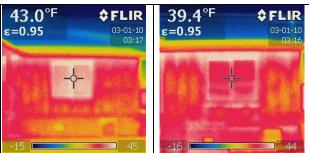
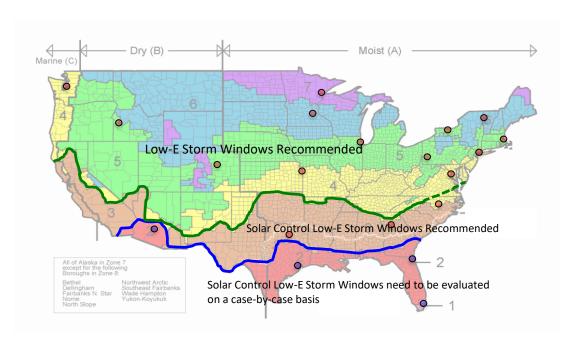


Figure 6. Baseline home master-bedroom exterior (left), experimental home master-bedroom exterior (right). Pictures were taken on February 2, 2015, when average temperature was 34°F with a low of 17°F and a high of 40°F.



## Low-e Storm Windows Market Potential

- Applicable to Existing Homes in all Climate Zones
- Always cost-effective over single pane windows and double-pane metal-framed windows



- Meets Weatherization (WAP) and most Utility cost-effectiveness criteria (e.g., SIR 1.2 – 3.2 in climate zones 3-8)<sup>1</sup>
- Year-round savings and permanent installation
- Savings coincident with daily and seasonal peaks

<sup>1</sup> Culp, et. al. 2014



#### Cellular Shades

- Description: Honeycomb or cellular structure that can be operated manually or automated
- **Lifetime:** 8-10 years
- Target Market
  - Residential, multi-family, and small commercial
  - Provides heating and cooling benefits
  - New construction or retrofit projects
- Non-Energy Benefits: Occupant comfort, glare reduction, property value, privacy, aesthetics, and security (automated system)
- Pricing:
  - Non-motorized: \$35-\$200
  - Motorized: \$260-\$300

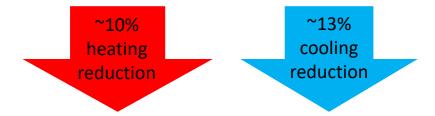




### **Cellular Shade Energy Savings**



In field studies, insulated cellular shades outperformed traditional vinyl blinds under all operating scenarios and settings.



Petersen et al. "Evaluation of Cellular Shades in the PNNL Lab Homes." November 2016. PNNL. PNNL-24857, Rev2. and Cort et al., "Testing the Performance and Dynamic Control of Energy-Efficient Cellular Shades in the PNNL Lab Homes." August 2018, PNNL-27663



### **Cellular Shades Savings Potential**



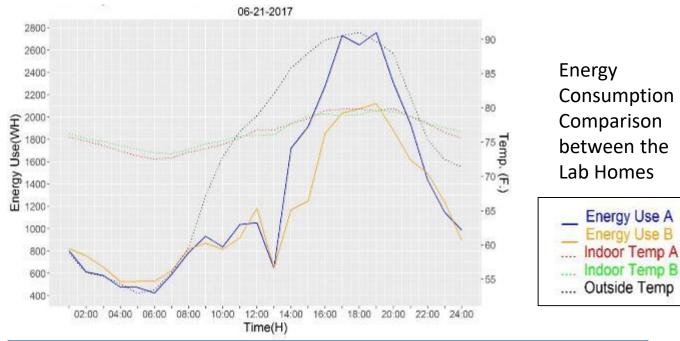
Thermal Performance of Cellular Shades compared to the most Common Window Coverings (horizontal slatted blinds)

Semi-opaque double-cell shade pulled down (left) allows filtered natural light into north-side bedroom. Close-up view of same shade (right).

Lab Homes Experiment	Season	HVAC Savings % (+/- 95% confidence)	Average W-hr/day Savings
All Shades Down: Cellular Shades	Cooling	13.3 (±1.3)	2,650
versus Vinyl Venetian Blinds	Heating	9.3 (±1.9)	7,011
Typical Use: Cellular Shades versus Vinyl Venetian Blinds	Cooling	5.8 (±0.5)	1,487
	Heating	2.0 (±1.3)	1,505
HD Green Schedule: Cellular Shades versus Vinyl Venetian Blinds	Cooling	10.4 (±6.5)	
	Heating	16.6 (±5.3)	45



## Cellular Shades Reduce Daily Peak Energy Consumption

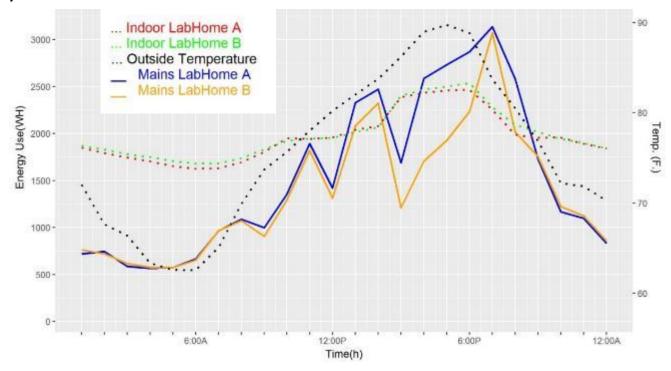


Experimental Home	Baseline Home	HVAC Savings % (+/- 95%	Average W- hr/day Savings
Cellular shades always down	No shades	24.8% (±8.6%)	3,359
Typical Use with Cellular Shades	No shades	4.7% (±1.3%)	1,808



## Demand Response (DR) – Combining Thermostat Adjustments with Shading

Both homes participating in DR (i.e., thermostat setback during peak period), but only Lab Home B pulls down cellular shades in living room during peak event. HVAC savings = 3,936 W-hrs with cellular shades on this day.





### Automated and Integrated Shading Control Strategies: Summer Cooling Season Experiments

Experimental Home	Baseline Home	HVAC Savings % (+/- 95% confidence)	Average W-hr/day Savings	Average Max Peak Demand Reduction (Watts)
HD "Green Mode": Cellular shades operated on schedule to minimize heat gain through windows while allowing views during the day	Vinyl Blinds, Typical Use	15.1% (±2.0%)	3,287	
Typical Use with Occupancy Override: Cellular shades pulled down when occupant goes to work (9AM-5PM), typical use all other hours		15.2% (±2.2%)	3,814	
shades pulled down in common areas during 4-hr peak period (3PM-7PM) and 4°F thermostat increase (typical use settings	Vinyl Blinds, Typical Use	15.7 (±2.2%)	4,060	1600
	Vinyl Blinds, Typical Use with 4°F thermostat increase at peak	16.6 (±2.94)	2,998	700

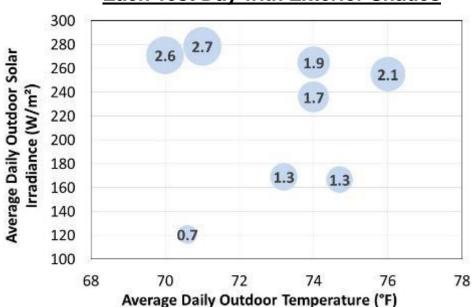


## **Experimental Results: Interior Vinyl Shades vs. Exterior Shades**

- Black fabric exterior shades with 1% openness factor
- Experimental Results are shown as HVAC
   Energy Reduction (kWh) for Space Cooling
   at Lab Home with Exterior Shades
- Results are shown with respect to Average Outdoor Solar Irradiance (W/m²) and Average Outdoor Temperature (°F)
- Across experimental days, HVAC Energy Savings ranged from 0.7 to 2.7 kWh with Usage of Exterior Shades compared to Interior Vinyl Shades in Baseline Home
- Internal Loads not simulated in Lab Homes for Exterior Shades project. Existing Cooling Load resulted in energy savings ranging from 9% to 25%.



HVAC Energy Reduction (kWh) for Each Test Day with Exterior Shades





## **ORNL Interior Shades Testing**

- Building location: Knoxville, Tn
- Two parallel test rooms (Room A and B)
- Identical orientation, dimension and window size

Rooms Properties	Description
Floor	2 <sup>nd</sup>
Туре	Bedroom
Orientation	East
Window dimension (w*h)	(70" x 60.25")
Window area (sf)	29.3





Room A and B is Bedroom#2 and #3 in the figure



# ORNL Energy Modeling of Window Attachment Controls in Commercial Buildings

- Challenge: Lack of generic modeling data on impact of automated shading systems
- Objective:
  - Analysis of different shading systems impact
  - Energy-savings, cost, and comfort benefits data generation
  - The data will be used to
    - Inform building owners/architects
    - Inform purchasing decisions
    - Enables utility program opportunities



## Design parameters: Variables

More than 500 simulations: 3 vintage\*6 climate\*buildings\*controls

#### **Vintage**

- Pre-1980
- Post-1980
- New-2016

#### City

- Chicago, IL
- Washington, DC
- Houston, TX
- Los Angeles, CA
- Seattle, WA
- Minneapolis, MN



#### Climate Zone

- 5A
- 4A
- 2A
- 3B Coast
- 4C
- 6A

**Shades** 

Manual

**Automated** 

Not operable

Interior

Roller shade

Roller Shade

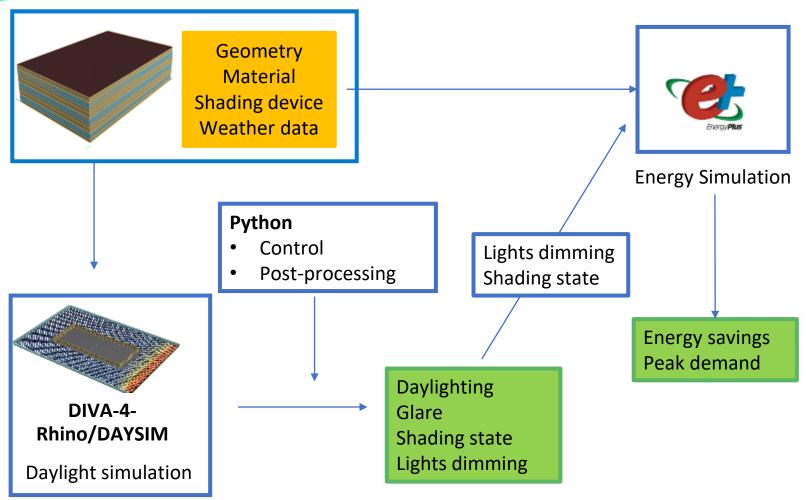
Venetian Blinds Secondary glazing

Exterior

Roller Shade



## **Modeling Framework**





## **ORNL Energy Modeling Summary**

- Cooling and lighting energy savings up to 40 % and 25 % respectively
- Higher energy savings on older vintage and hotter climate
- Automation important for daylighting condition and visual comfort



Doug Anderson
U.S. Environmental Protection Agency





## Part 5. ENERGY STAR Storm Windows Program

12/9/2019



## **ENERGY STAR for Exterior and Interior Storm Windows**

#### **Program Overview for BBRN Webinar**

Nov 14, 2019

Doug Anderson – US EPA ENERGY STAR Storm Windows Program Manager





## **New ENERGY STAR Product Category**

#### **ENERGY STAR Certified Storm Windows**

- Uses low emissivity glass (reflects heat)
- Lower cost than replacement of windows
- 2 Zones: Northern Zone (high gain) and Southern Zone (low gain)
- Available from big box retailers or installation companies

Web Site: www.energystar.gov/stormwindows

External
Storm
Windows





Internal Storm Windows





## **Final Specification**

- Issued Sept 5, 2018
- Eligible products: exterior and interior low-e storm windows
- Performance metrics: Emissivity, Solar Transmittance, Air Leakage

Climate Zone	Emissivity	Solar Transmittance
Northern	≤0.22	>0.55
North-Central	≤0.22	ANY
South-Central	≤0.22	≤0.55
Southern	≤0.22	≤0.55

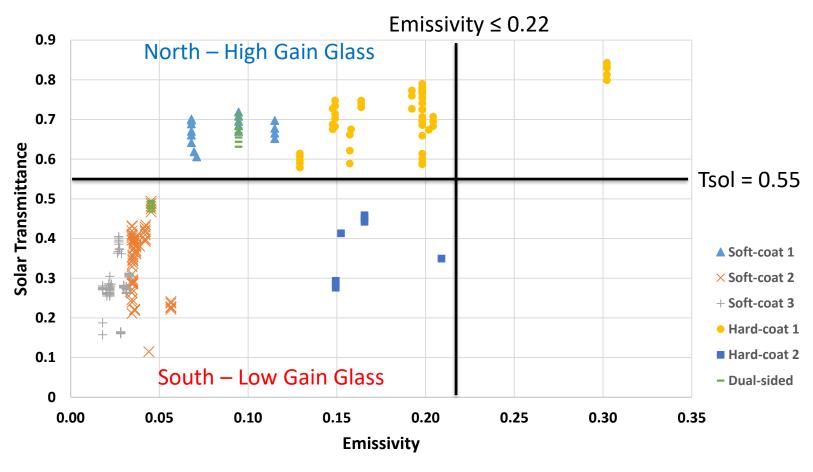
- Air Leakage
  - Exterior storm window: ≤1.5 cfm/ft²
  - Interior storm window: ≤0.5 cfm/ft²





### **Emissivity and Tsol Glass Distribution**

#### For about 400 coated glazing options

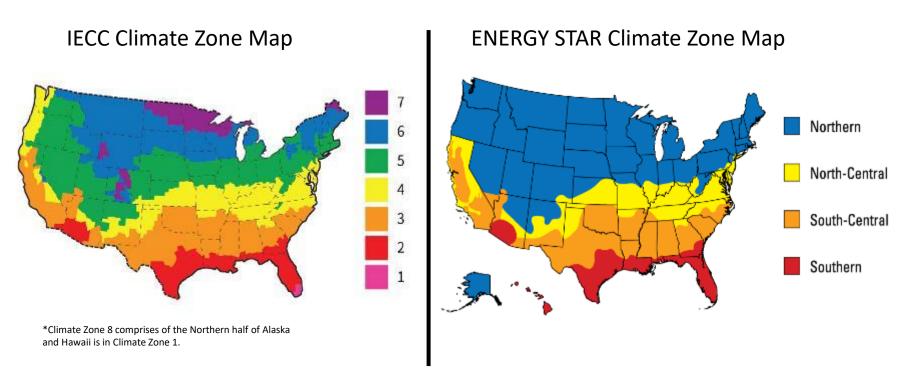




From: ENERGY STAR Window Technology Pathways White Paper, Jan 2017



#### **IECC and ENERGY STAR Climate Zones**



- EPA averaged energy savings for one-story and two-story householders in all cities in each zone to calculate the average climate zone savings
- ENERGY STAR climate zones roughly map to IECC zones: Northern Zone (IECC zones 5-8), North-Central Zone (4), South-central Zone (3), Southern Zone (1-2)





#### **ENERGY STAR Storm Window Labels**







NOTE: Overlap with most of IECC Climate Zone 4 (ES North Central Zone)



#### STORM WINDOWS

For Partners

OVERVIEW

SPECIFICATION

**BUYING GUIDANCE** 

ENERGY STAR certified storm windows use "low emissivity" or low-e glass to improve the energy performance of your home compared to clear glass storm windows. ENERGY STAR certified storm windows are designed to allow the right amount of solar heat through your windows to keep your home cool in the summer and warm in the winter, and help you save on energy bills. ENERGY STAR certified storm windows are an affordable option for homes where full window replacement may be difficult, such as lower-income households, low-rise multi-family households, households working with HUD or weatherization programs, or households in historic preservation districts.

Exterior Storm Window



Interior Storm Window



#### PRODUCT FINDER



Looking for a specific ENERGY STAR certified product model?

START HERE

#### REBATE FINDER



ENERGY STAR partners sponsor rebates on certified products. Enter a zip code below to find deals near you!

SUBMIT

#### DID YOU KNOW?



ENERGY STAR certified low-e storm windows perform better than clear

glass storm windows improving your home's comfort and helping you save on energy bills.





#### Find and Compare Products

Access to ENERGY STAR API, Data Set or Excel File



Find product models that have earned the ENERGY STAR and compare features, savings and more to optimize your purchase.

- Select a product category of interest to you.
- Get details on specific qualifying
- Make informed purchasing decisions.

**ENERGY STAR Certified** Storm Windows Visit the Storm Windows page for usage tips and buying guidelines.



Share Your Results

Sort by: 11 Records Found Emissivity Filter Your Results Larson Manufacturing Company: Larson - I500E Q filter by keyword Product Type: Interior Storm Window ENERGY STAR Storm Window Zone: Northern Operator type: Fixed/Stationary/Picture Emissivity: 0.15 Solar Transmittance: 0.69 ENERGY STAR Partner® Larson Manufacturing Company (11) Larson Manufacturing Company: Larson - I200E ENERGY STAR Storm Window Zone: Northern Product Type: Interior Storm Window Brand Name® Operator type: Vertical Slider/Single-Double Hung ☐ Larson (11) Emissivity: 0.15 Solar Transmittance: 0.69







## **Contact Information:**

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**D+R International** 

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**ENERGY STAR Windows and Storm Windows Questions** 

windows@energystar.gov







Todd Stratmoen, Larson Doors
Erika Burns, D+R International in support of AERC





## Part 6. Market Impact and Utility Pilots



## MARKET IMPACT – STORM WINDOWS



#### **Storm Window Evolution**

1940s and earlier



Seasonal Storm and Screen Panels

1950s, 1960s & 1970s



Self-Storing Combination Storm Windows

#### Today





High Performance Exterior and Interior Storm Windows with low-E Glass



## **Exterior and Interior Applications**



Traditionally, exterior storm windows have been and still are most prevalent...





...but interior storm windows are growing in popularity due to ease of installation and performance





## **Beyond Residential Applications**







**Multi-Family** 

Institutional

**Post Office** 





Military





Courthouse

Hospital

**Federal Building** 



#### Benefits of Low-E Storm Windows



#### Comfort

Reduce drafts, manage heat gain from the sun, and prevent heat loss to the exterior

Reduce exterior noise – traffic, sirens, trains, airplanes, construction machinery, and yard equipment



#### **Savings**

Cut heating costs

Reflect radiant heat better than clear glass

Air Sealing



**Design**Improve home's visual appeal
Operable



### **Cost Effectiveness**

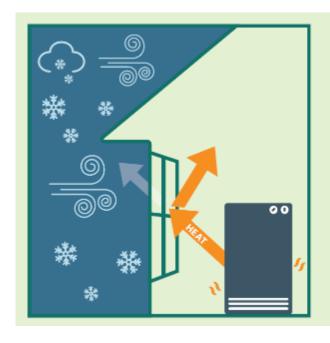
- Including installation, most double pane low-e sash replacements cost \$400-\$600/window or more
- Adding storm windows costs \$100-\$200/window
- 80% of storm windows are installed DIY
- 1/4 to 1/3 cost of replacement windows
- Payback in 4-14 years







Low-E storm window glass has an extremely thin (1/100<sup>th</sup> the thickness of a human hair) low-emissivity (low-E) metal oxide coating that acts as a heat mirror

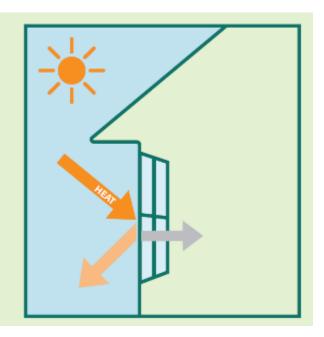


#### **◆ WARMER IN WINTER**

- Improves window performance by reflecting heat back into the home and reducing energy transfer through the window opening
- Reduces heating energy costs

#### **COOLER IN SUMMER ▶**

- Allows less sun-generated heat to enter your home
- Helps keep interiors cooler
- Reduces cooling energy costs





IR field images show obvious improvement in reduced heat loss:

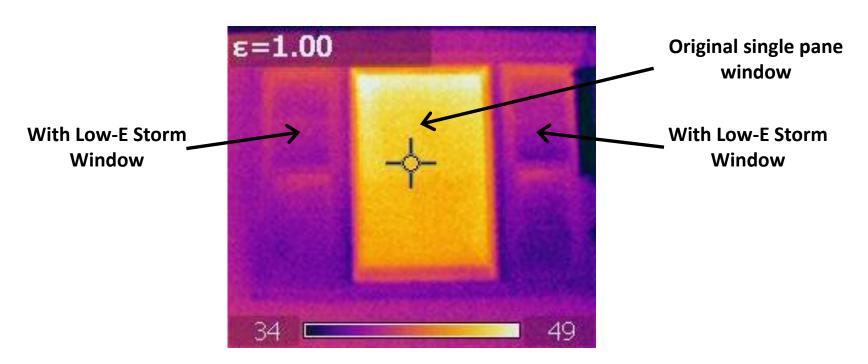
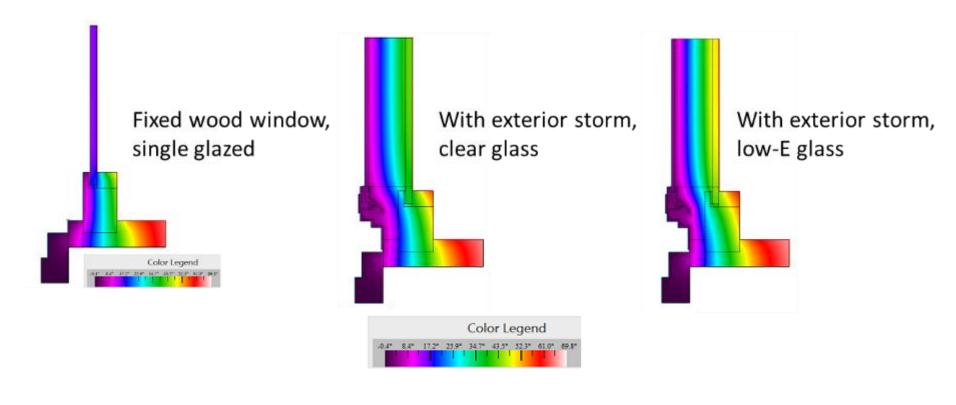


Image taken from the exterior. Light colors show heat loss.



#### Low-E Glass

Computer simulation shows a low-E storm window can raise the interior surface temperature of a single glazed window significantly due to reduced heat loss, increasing occupant comfort:





# Window Performance Comparison

	<u>U-factor</u>	<u>SHGC</u>
Single pane window	0.88	0.61
Single pane + exterior low-e storm	0.36	0.46
Single pane + interior low-e storm	0.34	0.50
Double pane window	0.51	0.57
Double pane + exterior low-e storm	0.28	0.42
Double pane + interior low-e storm	0.26	0.47

**Source:** Thermal and Optical Properties of Low-E Storm Windows and Panels. Pacific Northwest Laboratory on behalf of the U.S. Department of Energy. July 2015.

Baseline window is wood framed, double hung.



## AERC and Energy Star Market Impact

#### **Impact to Consumers and Purchasers:**

- Ability to understand and compare product performance on an apples-to-apples basis
- Increased confidence that performance claims will be realized due to certification by independent third party
- Product innovation and improvement arising from market competition

#### **Impact to Manufacturers:**

- Method of communicating product performance
  - Differentiate from competitors' products
  - Distinguish products within own product line, move customers to better performing products
- Means to demonstrate eligibility and appropriateness for efficiency programs, incentives, tax credits, etc.









### **LOW-E STORM WINDOW PILOTS**



# Pilot Design and Partners

	Efficiency Vermont	Focus on Energy
Location	All of Vermont (5 store locations)	Milwaukee (28 store locations)
Timeline	Aug. 17 – Oct. 12, 2015	Sep. 15 – Nov. 15, 2017
Manufacturer Partners	Larson Manufacturing	Larson Manufacturing Quanta Panel (multi-family)
Retail Partners	LOWE'S	Dedicated to Service & Quality
Markdown	Full product markdown of Low-E storm window incremental cost to clear glass (20-35%)	25% customer discount
Incentive Budget	\$7,500	\$55,000



# Pilot Marketing

Branding and Messaging of Product Benefits

**In-store Displays** 

Utility Communications

Digital
Marketing and
Social Media Ads













# Low-E Storm Window Utility Pilot Results

Pilot (year)	Overall Storm Window Sales Increase	Low-E Sales Increase	Low-E Market Share
Efficiency Vermont (2015)	37%	337%	2014 - 22% 2015 - 70%
focus on energy.  Partnering with Wisconsin utilities  (2017)	9.6%	125%	2016 – 30% (Milw.) 2017 – 62% (Milw.) 2017 – 41% (State) 2018 – 53% (State) 2019 – 61% (State)



# Low-E Storm Window Approved Measures

State	Manual	Product Category	Status
Idaho	BPA Impl. Manual	Low-E Storm Windows	Now
Oregon	BPA Impl. Manual	Low-E Storm Windows	Now
Washington	BPA Impl. Manual	Low-E Storm Windows	Now
Montana	BPA Impl. Manual	Low-E Storm Windows	Now
Minnesota	State TRM	Low-E Storm Windows	Now
Wisconsin	State TRM	Low-E Storm Windows	Now
Michigan	State TRM	Low-E Storm Windows	eff. 2020
Massachusetts	State TRM	Low-E Storm Windows	Submitted
New York	State TRM	Low-E Storm Windows	Submitted
Rhode Island	State TRM	Low-E Storm Windows	Submitted



# **SHADING PILOTS**



# Baltimore Gas & Electric Automated Shades Pilot

Location	BG&E Service Area
Timeline	Pilot to take place in 2020
Manufacturer Partners	HunterDouglas 🛟 👓
Number of Participants	10-20 residential homes
<b>Goal of Pilot</b>	Evaluate energy savings potential of automated shading systems in residential buildings
Markdown	Manufacturers to cover cost for customers to upgrade from manual to automated shading systems
	James Core Core Core Core Core Core Core Core



# **AERC** Xcel Energy Cellular Shade Rebate



Location	Xcel Energy Service Area in Colorado
Effective Date	2019-2020
Customer Requirements	Customers must have central air conditioning in the residence to qualify for rebate
Rebate Value	\$1.33/ sq. ft.
Qualifying Equipment	AERC certified cellular shades with a Warm Climate Rating of $\geq$ and a Cool Climate Rating of $\geq$ 35 qualify for a rebate



# **Thank You!**

https://aercenergyrating.org/

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