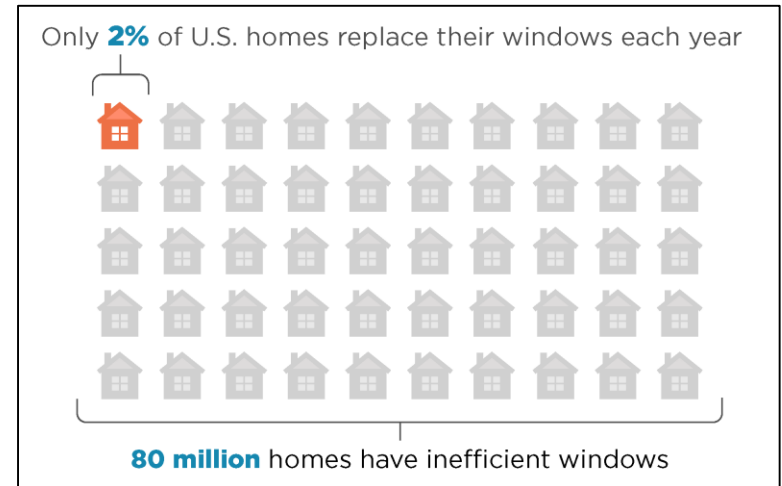
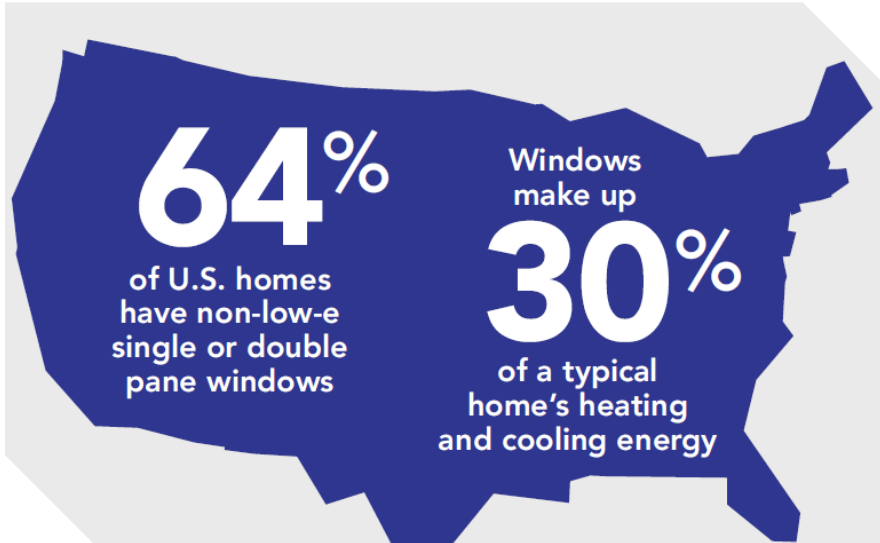


Enhancing Window Performance with Energy-Efficient Attachments

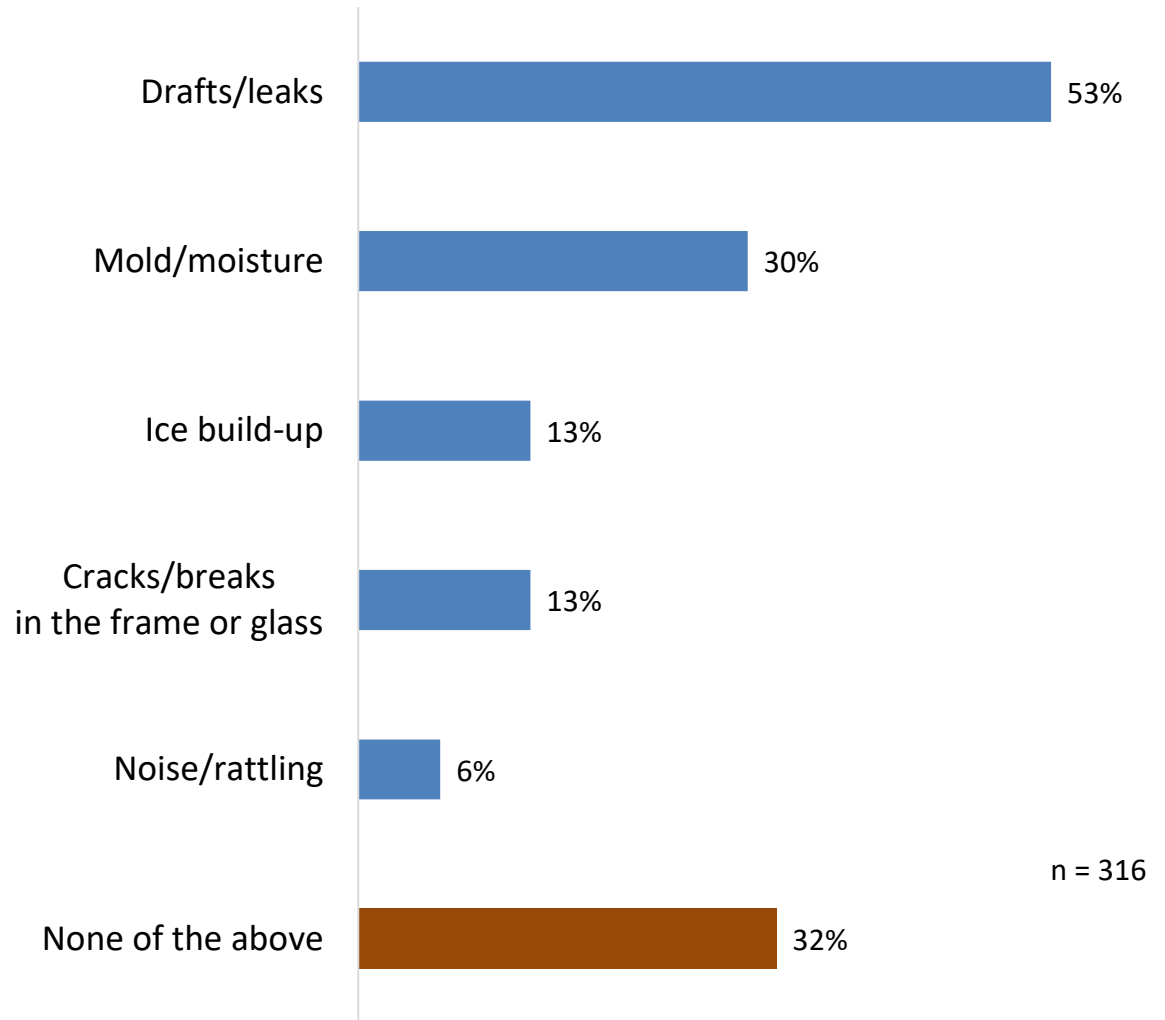
- Introduction to Window Attachments
- Market Information
- Energy Savings Potential
- Attachments Energy Rating Council
- Low-E Storm Window Pilots
- Automated Shading Pilot

Introduction to Window Attachments



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?

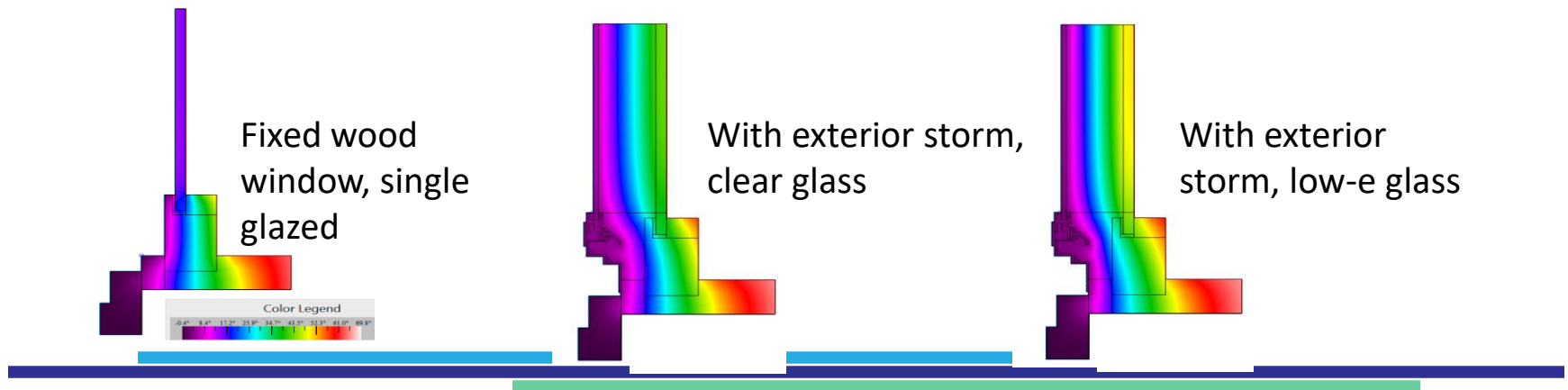
- **Technology Description:**
 - Window pane added to interior or exterior of existing window
 - Low-emissivity (low-e) coating minimize infrared energy that can pass through
 - Reduces air infiltration
- **Target Market:**
 - Buildings with single or non-low-e double pane windows
 - Ideal for retrofit projects
- **Cost:**
 - \$60-\$180
- **Lifetime:**
 - 10-20 years
- **NEBs:**
 - Occupant comfort, improved health, noise reduction, security



Low-E Storm Windows: Concept

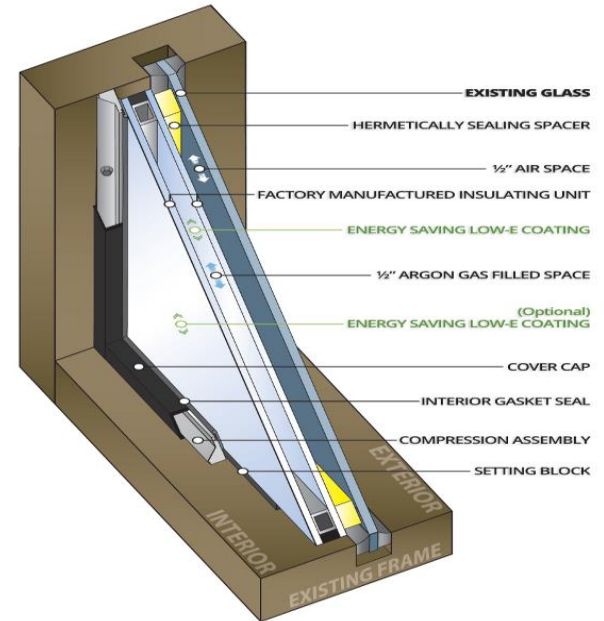
Low-e storm windows are a cost-effective **insulating** and air **sealing** measure for existing windows:

- Air Sealing of Prime Window
 - Case studies show 10% reduction in overall home air leakage
- Creation of “Dead Air Space”
 - Reduce conduction and convective losses across prime window
- Reflection of Radiant Heat: Low-E Glass
 - 35% increased performance over clear glass



Secondary Glazing Systems

- **Technology Description:**
 - Window IGU added to interior of existing window
 - Low-emissivity (low-e) coating minimize infrared energy that can pass through
 - Reduces air infiltration
- **Target Market:**
 - Multi-family/commercial high-rise buildings with single or non-low-e double pane windows
 - Ideal for retrofit projects
- **Cost:**
 - \$35 - \$50/sq. ft. including installation
 - Depends on size, location, and existing conditions
- **Lifetime:**
 - 20+ years
- **NEBs:**
 - Occupant comfort, noise reduction, improved health, greater productivity



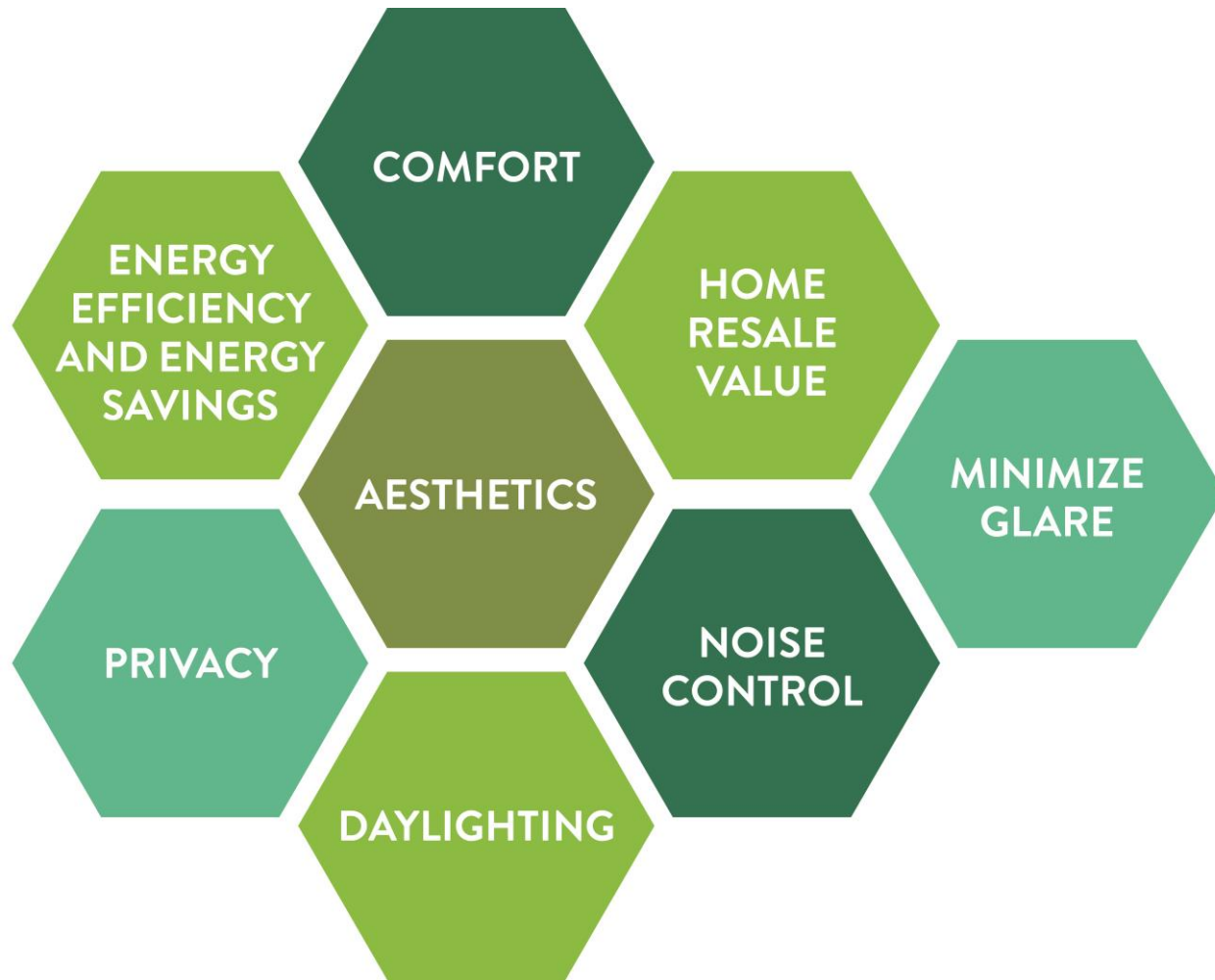
- **Technology Description:**
 - Honeycomb or cellular structure
 - Can be automated
- **Target Market:**
 - Good option for new construction and retrofit
 - Provides heating and cooling benefits
- **Cost:**
 - \$35-\$200
- **Lifetime:**
 - 8-10 years
- **NEBs:**
 - Occupant comfort, glare reduction, property value, privacy



- **Technology Description:**
 - Exterior or interior
 - Can be automated
- **Target Market:**
 - Good option for new construction and retrofit
 - Provides cooling benefits
- **Cost:**
 - \$40-\$200
- **Lifetime:**
 - 6-10 years
- **NEBs:**
 - Occupant comfort, glare reduction, privacy, daylighting



Window Attachments Value



- **DOE/EPA**

- Attachment Energy Rating Council (AERC)
- Emerging Technologies windows research
- Building America research, testing, and technical assistance
- ENERGY STAR® program for storm windows

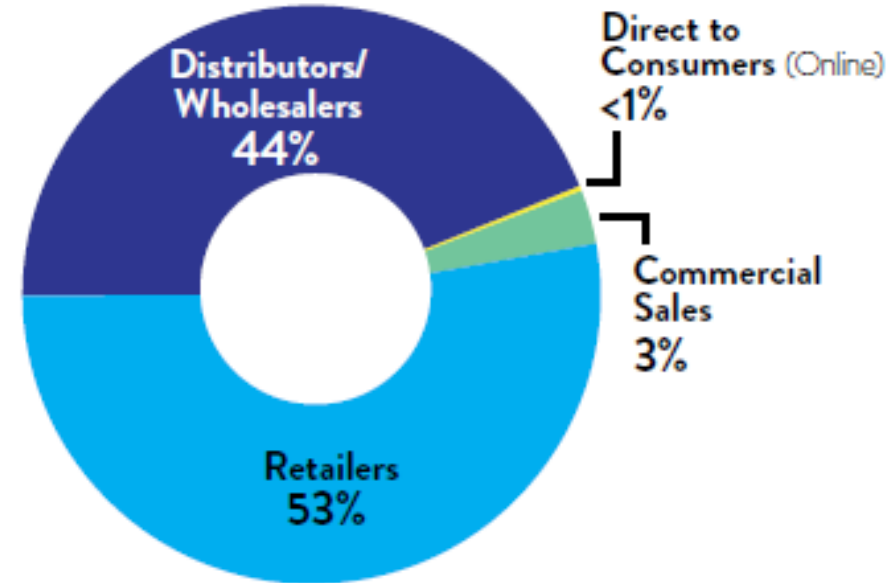
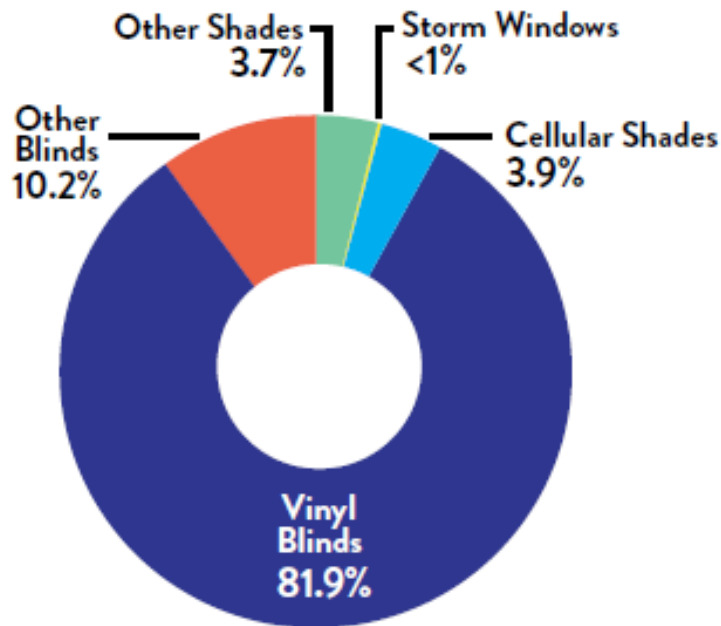
- **Utilities**

- Consortium for Energy Efficiency
- BPA and NEEA
- Silicon Valley Power (with assistance from the American Public Power Association)
- Efficiency Vermont
- Focus on Energy Wisconsin



Window Attachments Market Information

- Annually 150-225 million residential interior units shipped

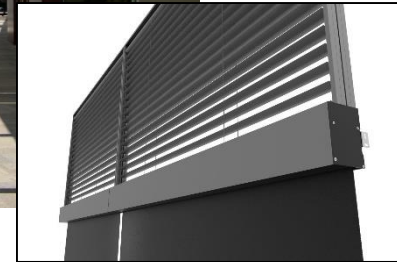
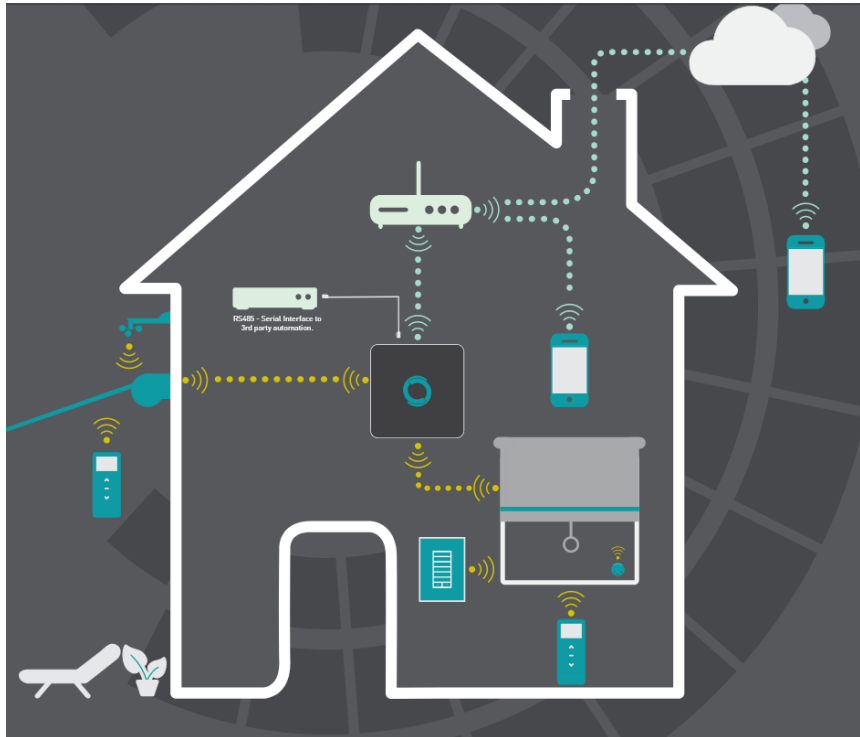


Low-E Storm Windows

Multi-Family Pricing

- Product cost: \$7-\$12/sq. ft.
- Installation cost: \$3-\$8/sq. ft.
- Pricing will depend on window package and architectural requirements
- Ordering:
 - Typically ship initial test unit
 - Depending on size of order 4-6 weeks
- Building owner/manager responsible for installation
 - Typically installed by general contractor

Automated Shading Systems



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

THE HEARTBEAT OF YOUR MOTORIZED SHADES

The Automate™ PULSE hub provides the heartbeat of the Automate smart home experience.

With wi-fi built in, simply plug in where convenient and connect to the local wireless network. Automate shades can be then controlled from your smart phone/tablet or integrated within a whole home control system.



Somfy myLink™

The myLink™ puts you in control, so that you can operate your motorized solutions whether you're home or not. At work and realized you forgot to close your shades for the day? Not a problem. With a simple tap of the myLink app you can close all your shades.

amazon alexa

Channel Control

The myLink now features 14 channels so you can control up to 14 individual or 16 groups of motorized solutions with one myLink. This provides an ideal zone control and allows you to mix and match motorized solutions with ease. It's scalable so you can always use multiple myLinks together if additional channels are needed.

Draperies Blinds Shades Screens Shutters Awnings

Sunlight Control

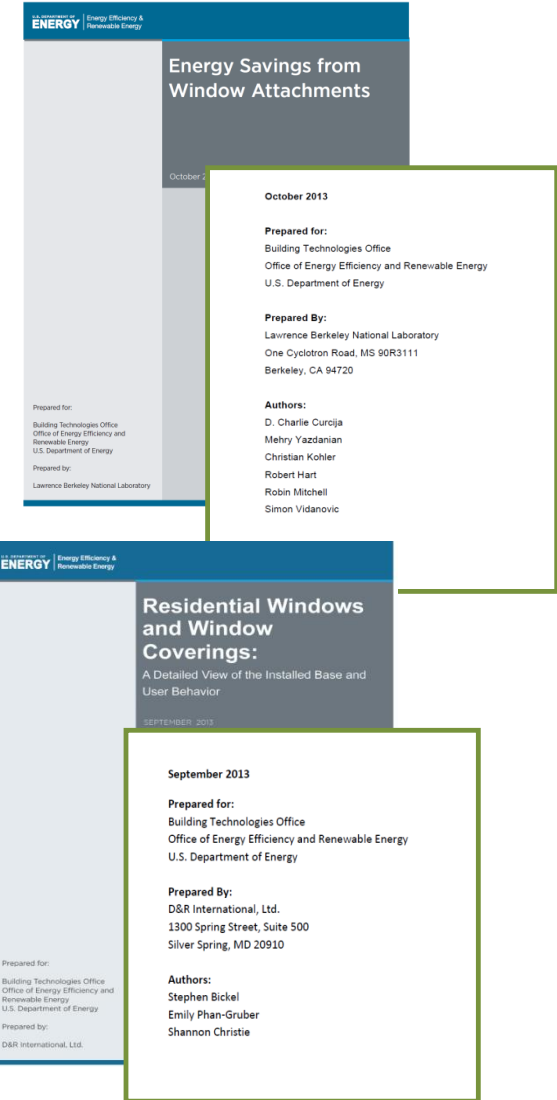
The myLink provides convenient and effortless sunlight control to create your optimal living environment. Its robust capabilities allow you to spend your time doing what you enjoy most and maximize the benefits that your Somfy-powered products provide, such as energy savings, privacy, and convenience.

The Somfy myLink plugs directly into any standard wall outlet and communicates over your home's Wi-Fi network.



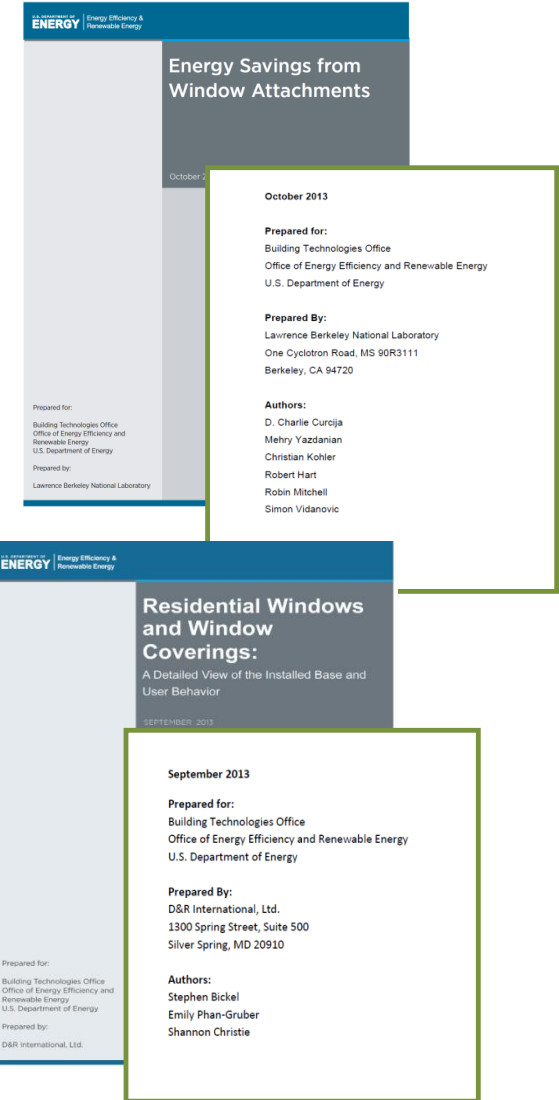
Energy Savings Potential of Window Attachments

- Comprehensive energy-modeling study that examined 11 residential window attachments
 - Baseline with 4 types of houses with 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*



Major Findings:

- People rarely move or adjust their window coverings throughout the day.
- People tend to keep their window coverings closed in areas where they would like privacy and more open in common areas.
- There is some variation in the position of the window coverings that appears to be based on climate/weather (e.g., warmer climates kept more window coverings closed in the summer months).



Cellular Shade Modeling and Field Results

Modeled Annual Energy Savings Estimates

Washington, DC – Climate Zone 4A

	HVAC Energy Use (kWh/yr) Based on Cellular Shade Performance Level			Percent Savings Compared to No Shades	
Prototype	No Shades	Double Cell	Triple Cell	% Savings of Double-Cell Shades	% Savings of Triple-Cell Shades
Prototype # 1 (U=0.32)	15,957	14,648	14,486	8%	9%
Prototype #2 (U=0.68)	19,371	16,514	16,461	15%	15%
Prototype #3 (U=0.68)	8,999	7,184	7,119	20%	21%

- Cellular Shade operation assumptions:
 - Summer: Shades are down (April to September)
 - Winter: Shades are up during the day and down at night (October to March)
- Prototypes (WWR 15%)**
 - #1 – 2400 sq ft and 0.32 U-Factor
 - #2 – 2400 sq ft and 0.68 U-Factor
 - #3 – 15000 sq ft and 0.68 U-Factor

Metzger et al. Modeling Cellular Shades in EnergyPlus. December 2017. Pacific Northwest National Laboratory. PNNL-27187.

Lab Homes Characteristics

- Specified to represent existing manufactured and stick-built housing
- 3 BR/2BA, ~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
- 13% window area
 - All double-pane and aluminum framed clear glass windows



PNNL Lab Homes Cellular Shades Impact on Energy Savings (2015-2016)

Technology (experiment)	Baseline and Experiment Description	Energy Savings (%)
High Efficiency Cellular Shades: Static Operation – always down	Control: Vinyl blinds Use: Closed for duration	Cooling: 13.3 \pm2.8% Heating: 10.5 \pm3.0%
High Efficiency Cellular Shades: Optimum Operation Comparison	Control: Vinyl blinds Use: Hunter Douglas energy-saving schedule	Cooling: 10.4 \pm6.5% Heating: 16.6 \pm5.3%
High Efficiency Cellular Shades: Optimum Operation	Control: No blinds (double pane window) Use: Hunter Douglas energy-saving schedule	Cooling: 14.8 \pm2.1% Heating: 14.4 \pm2.0%

All cellular shade products provided by Hunter Douglas.



*Petersen et al. Evaluation of Cellular Shades in the PNNL Lab Homes. November 2016. PNNL. PNNL-24857, Rev2.

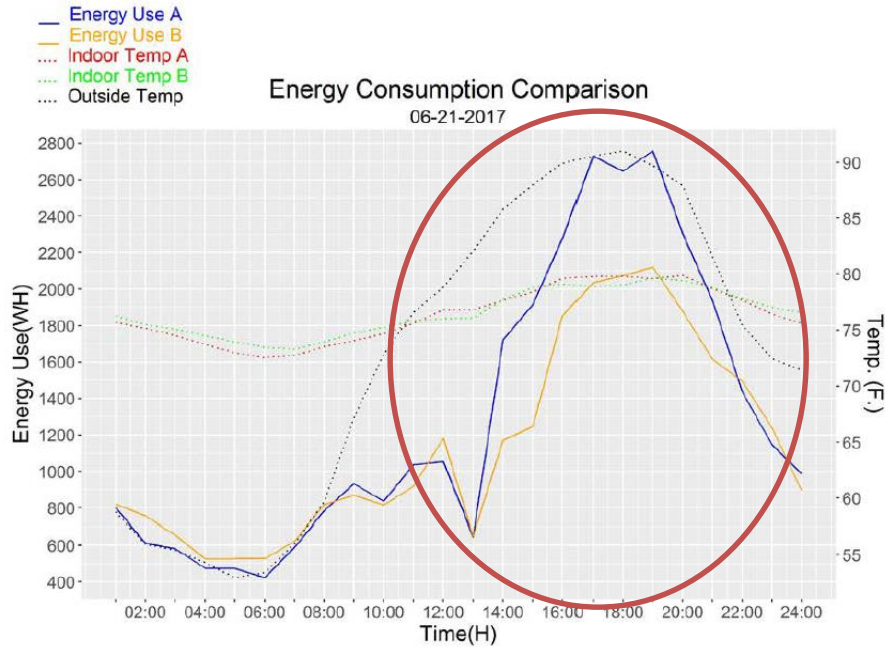


Figure 4.3. Whole-House Cooling Use (solid lines) on a Summer Day with Cellular Shades Closed in the Experimental Home (Lab Home B) and No Shades on the Baseline Home (Lab Home A) Shows Peak Flattening Effect

Shades closed in summer

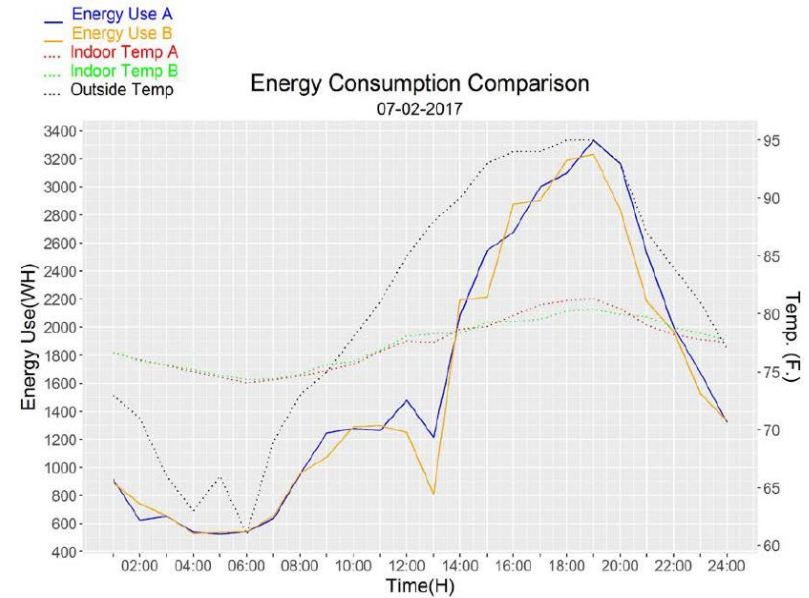


Figure 4.5. Whole-House Cooling Use (solid lines) on a Summer Day with Cellular Shades with Typical Use Settings in the Experimental Home (Lab Home B – yellow line) and Vinyl Blinds with a Typical Use Setting in the Baseline Home (Lab Home A – blue line)

Shades open in summer

Cort et al. Testing the Performance and Dynamic Control of Energy-Efficient Cellular Shades in the PNNL Lab Homes. August 2018. Pacific Northwest National Laboratory. PNNL-27663.

Cellular Shades – PNNL Lab Homes

Cooling Season Results

Cooling Test Protocol – Dynamic Control of Cellular Shades Lab Homes Testing	Duration	HVAC Savings % (+/- 95% confidence)	Average W-hr/day Savings
<i>Static Use</i> compared to blinds with typical use	6 days	13.3%	2,650
<i>Typical Use</i> compared to blinds with typical use	8 days	5.8%	1,487
Optimal and Integrated Control Strategies (in common area rooms) Compared to Blinds operated in Typical Use			
<i>Optimal Control – HD “Green Mode”</i> Schedule compared to blinds with typical use	6 days	15.1%	3,287
<i>Typical Use with Occupancy Override 9AM-5PM</i> compared to blinds with typical use	11 days	15.2%	3,814

Cort et al. Testing the Performance and Dynamic Control of Energy-Efficient Cellular Shades in the PNNL Lab Homes. August 2018. Pacific Northwest National Laboratory. PNNL-27663.

Cellular Shades – PNNL Lab Homes Cooling Season DR Results

Integrated Control and Demand Response	Duration	HVAC Savings % (+/- 95% confidence)	Average W-hr/day Savings
<i>Cellular shades</i> pulled down during 4-hr peak and 4°F thermostat increase versus <i>vinyl blinds</i> , typical use, no thermostat set-back	15 days	15.7%	4,060
<i>Cellular shades</i> pulled down during 4-hr peak and 4°F thermostat increase versus <i>vinyl blinds</i> , typical use, 4°F thermostat increase	8 days	16.6%	2,998

Cort et al. Testing the Performance and Dynamic Control of Energy-Efficient Cellular Shades in the PNNL Lab Homes. August 2018. Pacific Northwest National Laboratory. PNNL-27663.

Cellular Shades – PNNL Lab Homes

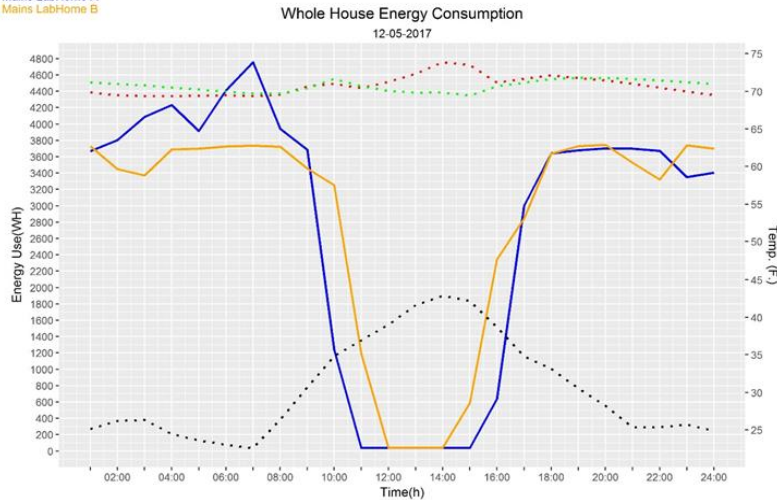
Heating Season Results

Static Thermal Performance	Duration	HVAC Savings % (+/- 95% confidence)	Average W-hr/day Savings
Static use: Double-cell <i>cellular shades</i> always pulled down on all windows versus <i>no shades</i>	9 days	2.3%	1,970
Static use: Double-cell <i>cellular shades</i> always pulled down on all windows versus <i>vinyl blinds</i> , always down	6 days	9.3%	7,011
Typical use: Double-cell <i>cellular shades</i> bedrooms closed, living/dining open versus <i>vinyl blinds</i> , typical use	4 days	2%	1,505

Cort et al. Testing the Performance and Dynamic Control of Energy-Efficient Cellular Shades in the PNNL Lab Homes. August 2018. Pacific Northwest National Laboratory. PNNL-27663.

Cellular Shades - Lab Homes 2017-2018 Heating Season Results

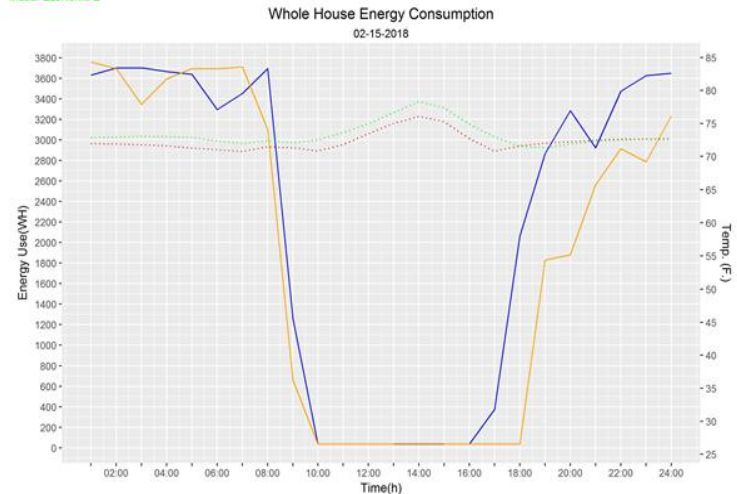
... Indoor LabHome A
... Indoor LabHome B
... Outside Temperature
— Mains LabHome A
— Mains LabHome B



- **Scenario:** Cellular shades up during day and closed at night
- **Results:** HVAC savings were 8% compared to the home with blinds operated typically.

- **Scenario:** Cellular shades covering all windows in Lab Home B and no shades covering Lab Home A
- **Results:** Negligible average savings when shades down all the time (although ~4% savings recorded on very cloudy days)

— Mains LabHome A
— Mains LabHome B
... Indoor LabHome A
... Indoor LabHome B



Cort et al. Testing the Performance and Dynamic Control of Energy-Efficient Cellular Shades in the PNNL Lab Homes. August 2018. Pacific Northwest National Laboratory. PNNL-27663.

Low-E Storm Window Study Results

PNNL Lab Homes – Low-E Storm Windows Energy Savings

Low-E Storm Windows	Baseline and Experiment Description	Energy Savings (%)
Exterior 2014 (Larson Manufacturing)	Metal-frame, double-pane clear glass windows (no window coverings)	Average Annual Savings: 10.1 ±1.4% Simple Payback = 5-7 yrs
Interior 2015 (Quanta Technologies)	Covering ~75% of window area over double-pane metal-frame clear glass windows	Average Annual Savings: 7.8 ±1.5%

Knox JR and SH Widder. Evaluation of Low-E Storm Windows in the PNNL Lab Homes. PNNL. May 2014.
Petersen et al. Evaluation of Interior Low-E Storm Windows in the PNNL Lab Homes. PNNL. Oct 2015.
Triple-cell Hunter Douglas cellular shade used for study.



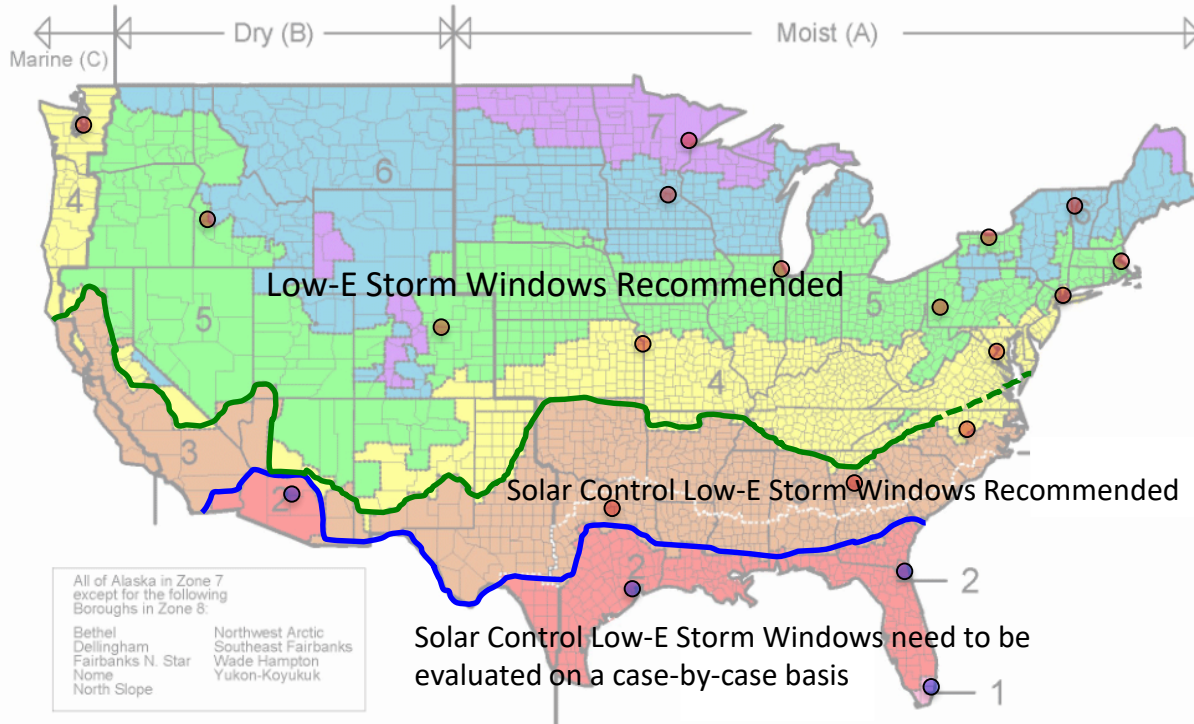
- Modern Clear Glass Storm Window vs. Low-E comparison

Wood Double Hung, Double Glazed	U-Factor	SHGC
Baseline	0.51	0.57
Clear, Exterior	0.34	0.49
Clear, Interior	0.32	0.51
Low-E, Exterior	0.28	0.42
Low-E, Interior	0.26	0.47

- Older clear glass storm windows will not provide the same performance and air leakage benefit as modern storm windows

Culp et al. Thermal and Optical Properties of Low-E Storm Windows and Panels. Pacific Northwest National Laboratory. July 2015.

Over single-pane windows or double-pane metal-framed windows:



- Cost effective in climate zones 3-8
- Savings to Investment Ratio = 1.2 – 3.2

Culp et al. 2014 and 2015. PNNL-22864 rev2 and PNNL-24826

Modeled Energy Savings

Smaller, Older Home (1-story, 1700 sq ft)

Baseline Window: Wood frame, single pane	% Source Energy Savings	Energy Cost Savings	Simple Payback
With exterior low-e storm	25.1%	\$418.21	6
With interior low-e storm	27.2%	\$450.14	5.6

Culp et al. 2014. PNNL-22864 rev2.

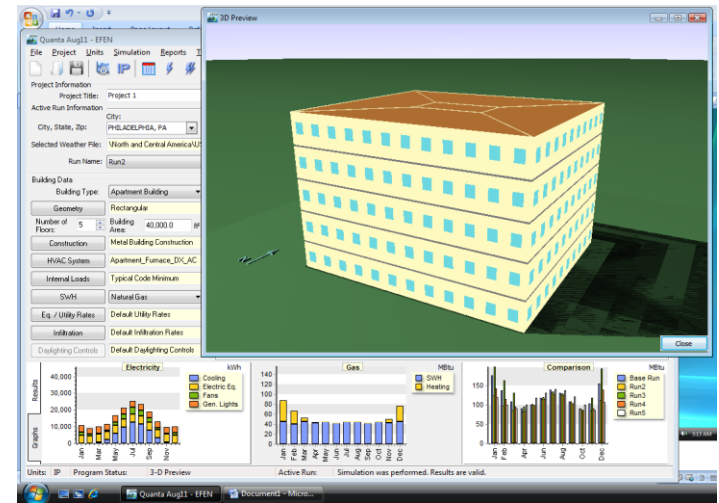
Storm Window Multi-Family Case Studies

Storm Window Multi-Family Modeling

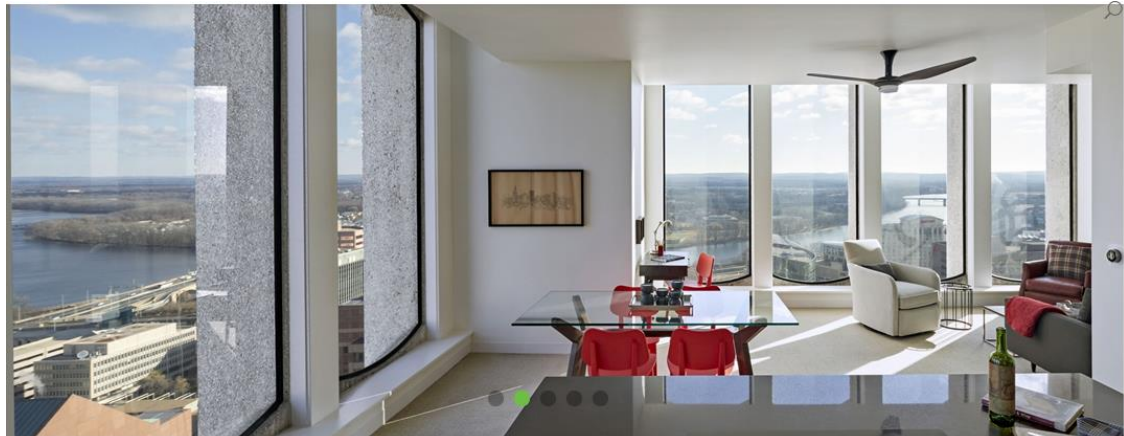
Source: *Birch Point Consulting, 2012..*

	25% Window-to-Wall Ratio				50% Window-to-Wall Ratio			
City	Mbtu Savings	kWh Savings	\$ Savings	% Savings	Mbtu Savings	kWh Savings	\$ Savings	% Savings
New York	212	8,530	\$3,967.80	22.1%	387	14,967	\$7,137.39	25.6%
Chicago	275	9,717	\$3,406.20	26.5%	529	18,291	\$6,512.15	32.5%
Atlanta	97	9,077	\$2,497.39	19.4%	183	16,100	\$4,607.54	23.0%

- Model details:
 - 5 story apartment, default construction (e.g. R13 walls, R19 roof)
 - 40,000 ft² building area; 1.17 aspect ratio (96.6 x 82.8 ft), long side on north/south
 - Single glazing, aluminum window: U 1.14, SHGC 0.76, Air leakage 0.55 (assumes 50%-50% split between operable at 1.0 and fixed at 0.1)
 - With QuantaPanel - interior: U 0.36, SHGC 0.51, Air leakage 0.03



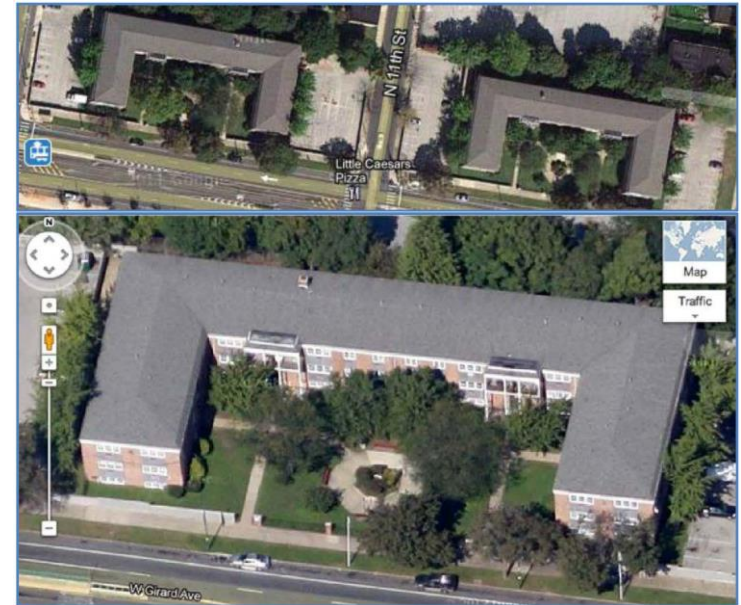
Multi-Family Case Study



Storm Windows

Multi-Family Field Study

- Replaced existing clear glass storm windows with Low-E storm windows in a 101 multi-family unit building in Philadelphia
- Goal to improve air leakage and reduce energy consumption (including supplemental heaters)



Source: *Performance Comparison of a Low-E Storm Window in a Philadelphia Multifamily Apartment Building*. Home Innovation Research Labs, November 2013.

Storm Windows Multi-Family Field Study

- Retrofit assessment techniques:
 - Blower door tests in 15 units
 - Infiltration leakage before and after installation
 - Utility bill comparison before and after installation for winter months



Multi-Family Savings Results

Table 1. Energy Use Comparison Based on Monthly Utility Billing

Heating	October 2011 to April 2012 ^A	October 2012 to April 2013 ^B
Heating Degree-Days, HDD	3,938	4,693
Heating Gas Use ^C , therms	22,167	21,692
Normalized Gas Use, therms/HDD	5.63	4.62
Heating Savings Over Base		18%
Heating	November 2011 to March 2012 ^A	November 2012 to March 2013 ^B
Heating Degree-Days, HDD	3,309	4,058
Heating Gas Use ^C , therms	18,808	18,023
Normalized Gas Use, therms/HDD	5.68	4.44
Heating Savings Over Base		22%
^A Pre-window retrofit		
^B Post-window retrofit.		
^C Heating Gas Use estimated by subtracting estimated hot water gas use in non-heating swing months.		

Source: *Performance Comparison of a Low-E Storm Window in a Philadelphia Multifamily Apartment Building*. Home Innovation Research Labs, November 2013.

Multi-Family Savings Results

Table 2. Cooling Electricity Use Estimates

Cooling Month	Apartment Average Electric Use ^A , kWh		Estimated Cooling Electric Use, kWh		CDD ^B Normalized, kWh/CDD		Post- to Pre-Retrofit Savings ^C
	2012	2013	2012	2013	2012	2013	
May	322	245	151	124	1.33	1.09	18.0%
June	474	424	278	289	2.45	2.54	-3.8%
July	752	673	557	519	4.90	4.57	6.7%
August	721	482	526	335	4.63	2.95	36.3%
Month Average Total	2,269	1,824	1,512	1,267	1.34	1.21	9.3%
^A Only non-zero meter values (occupied apartments) included. ^B CDD = Cooling Degree Days, 65°F base. ^C Savings based on normalized energy use.							

Source: *Performance Comparison of a Low-E Storm Window in a Philadelphia Multifamily Apartment Building*. Home Innovation Research Labs, November 2013.

Commercial Secondary Glazing System Case Study

- 12-story office building in Philadelphia
 - Building constructed in 1971
 - Existing technology: Single pane windows with window film
 - Upgrade: commercial SGS panels (RENOVATE system)
 - Converted windows to triple pane Low-E window system
 - Solar control low-e glass and argon fill



- Results:
 - East-facing offices: savings between 36% and 39%
 - North-facing offices: savings between 9% and 60%
 - Savings show effects for perimeter offices

Test Office/Orientation	Heating Energy ^A , kWh	Cooling Energy ^B , kWh
	December - February	July 27 - September ^C
East, Original Glazing, Film	372	341
East, Low-e Retrofit Panels	226	217
East Office Energy Savings	39%	36%
North, Original Glazing, Film	863	222
North, Low-e Retrofit Panels	343	202
North Office Energy Savings	60%	9%

Source: *Performance Comparison of a Low-e Retrofit Window in a Philadelphia Office Building*. Home Innovation Research Labs, October 2013.

- Results:
 - Smaller temperature swings on glazing surface after retrofit
 - Minimum temperatures 15-20°F greater after retrofit

Table 3. Diurnal Glazing Surface Temperature Range for Selected Periods

Inside Glass Surface Temperature Profile	East Facing		North Facing	
	Low-e Retrofit Panel	Original Single Pane/Film	Low-e Retrofit Panel	Original Single Pane/Film
Winter day, Maximum during day	70 - 76°F	75 - 85°F	65°F	52 - 53°F
Winter day, Minimum during day	57 - 58°F	33 - 40°F	61 - 62°F	34 - 37°F
Summer day, Maximum during day	84°F	104 - 109°F	73 - 74°F	83 - 84°F
Summer day, Minimum during day	72 - 73°F	74 - 75°F	71°F	72°F

Source: *Performance Comparison of a Low-e Retrofit Window in a Philadelphia Office Building*. Home Innovation Research Labs, October 2013.

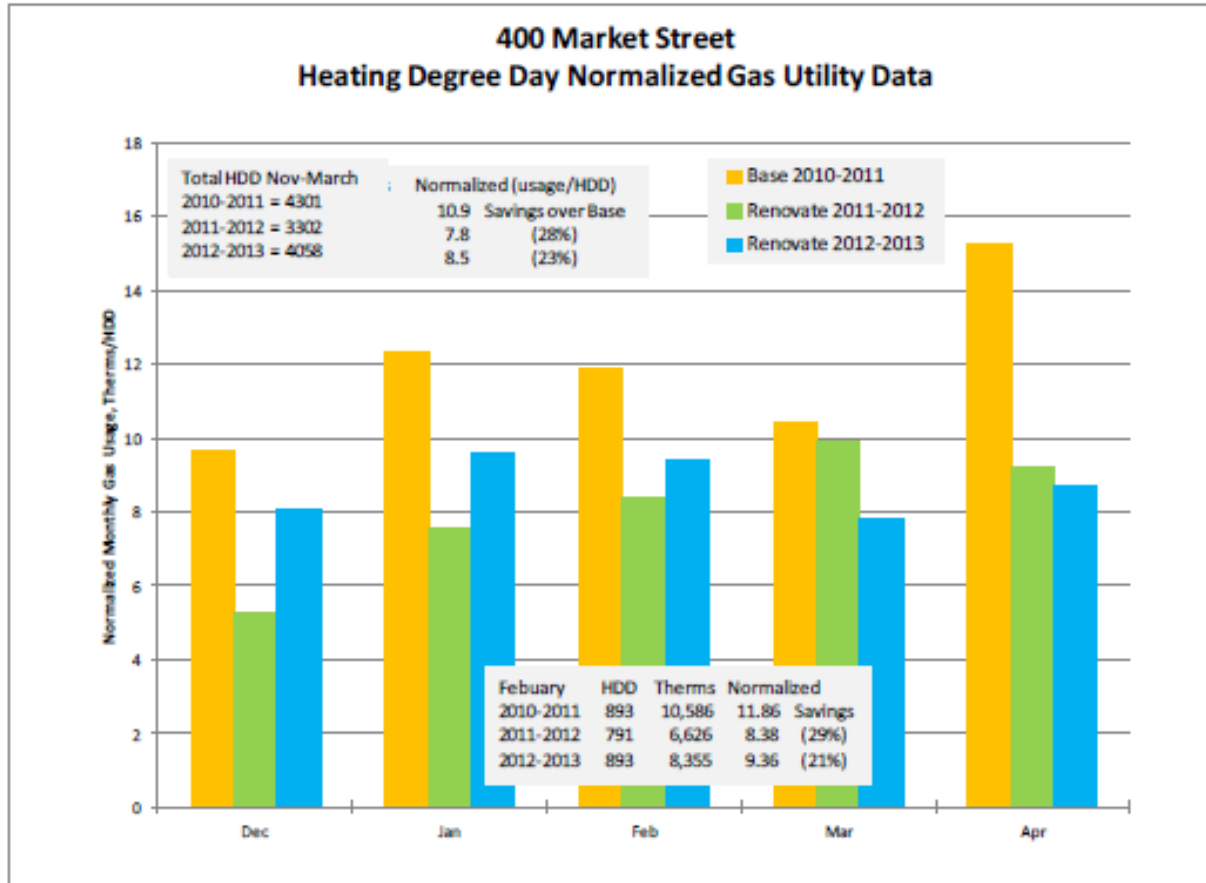


Figure 14. Normalized Heating Fuel Use

Source: *Performance Comparison of a Low-e Retrofit Window in a Philadelphia Office Building*. Home Innovation Research Labs, October 2013.

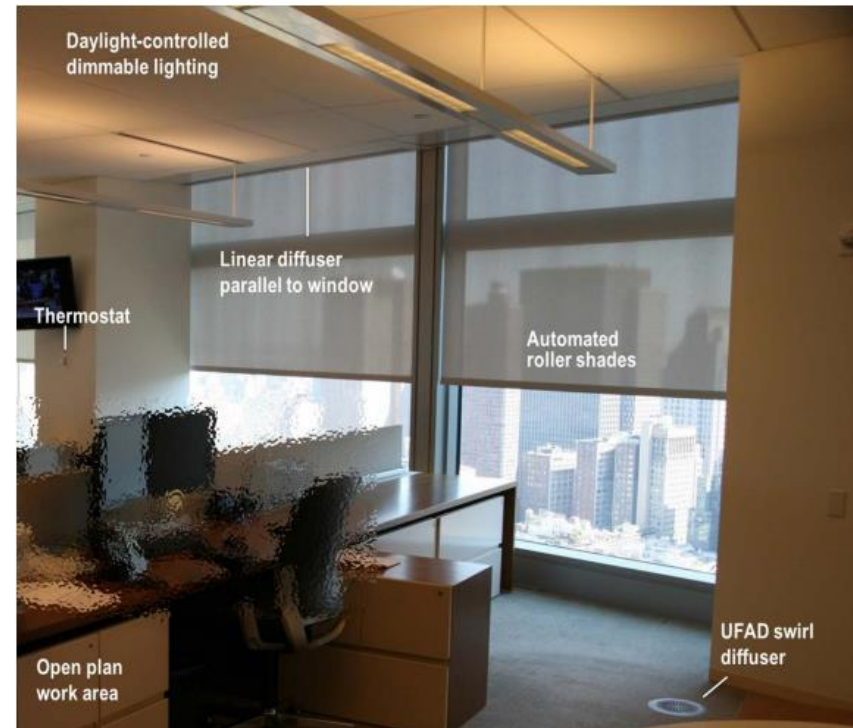
Commercial Shading Case Studies

New York City – Goldman Sachs Building

- 40,000 ft²/floor of 43-story high-rise office building
- 1-floor retrofitted with automated shades and LED lighting and controls
- Estimated whole building energy savings from 3.6-4.5 million kWh/year and dollar savings of \$730,000-\$900,00/year

Source: Demonstration of Energy Efficient Retrofits for Lighting and Daylighting in New York City Office Buildings

https://aercnet.org/wp-content/uploads/2018/10/LBNL_Demonstration-of-Energy-Efficiency-Retrofits-in-NYC-Offices_April-2017.pdf



- 12-story, 8,343 square foot high rise building
- Modeled building retrofitted with automated external venetian blinds
 - Façade replaced with argon-filled double glazed units with low-e coating
- Found energy savings of 27% in comparison to base case building with static shading

Source: Responsive Shading and Energy Efficiency in Office Buildings: an Australian Case Study

https://aercnet.org/wp-content/uploads/2018/10/Melbourne_Responsive-shading-in-office-buildings_2012.pdf

Attachments Energy Rating Council

What is the AERC?

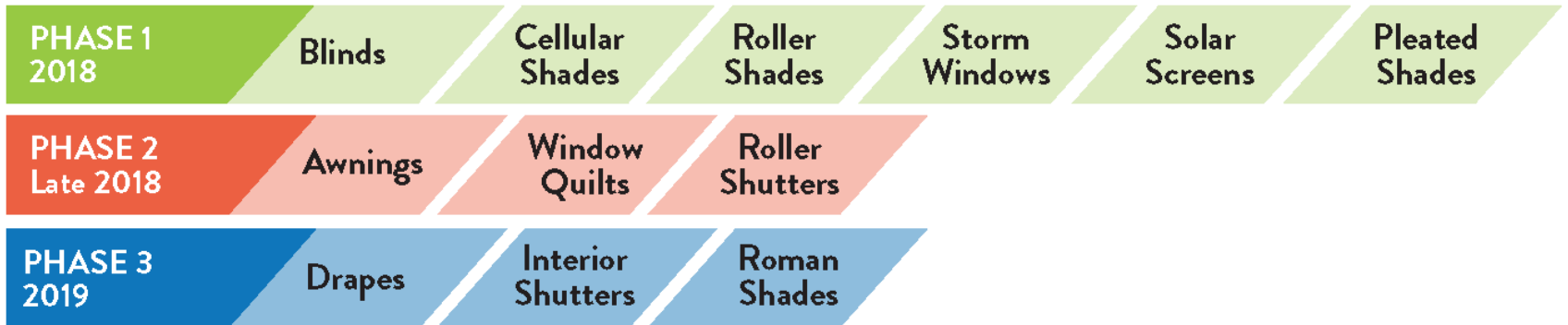
AERC is an independent, **public interest** organization whose mission is to provide consumers with **credible, relevant, and comparable** information about **window attachments** and their **performance**.



- AERC members include
 - Public Interest Groups
 - National Labs
 - Commercial Labs
 - Product Manufacturers
 - Component Manufacturers
 - Utilities

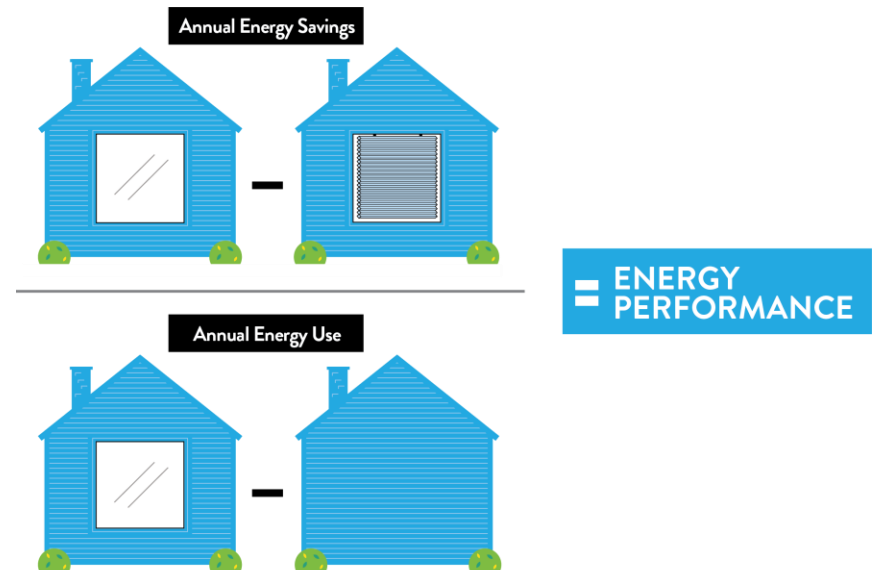


Phased Ratings Development



- U-Factor
- Solar Heat Gain Coefficient
- Visual Transmittance
- Air Leakage (as applicable)

- Annual Energy Performance
 - Comparative metric
 - Cold climate
 - Warm climate



Save energy and make your home more comfortable.

Window attachments products with this label-such as **blinds, shades, shutters and storm windows**-can help you do both.

1. Look for the AERC Energy Improvement Label

Seeing the AERC Energy Improvement label on a window attachment product means it will help you save energy and make your home more comfortable. This label also allows you compare energy improvement across different product types in order to select the best one for your home.



2. Choose Your Climate

Since window attachments can help keep your home warmer in cool climates and cooler in warm climates, this label helps you select the best product for where you live.

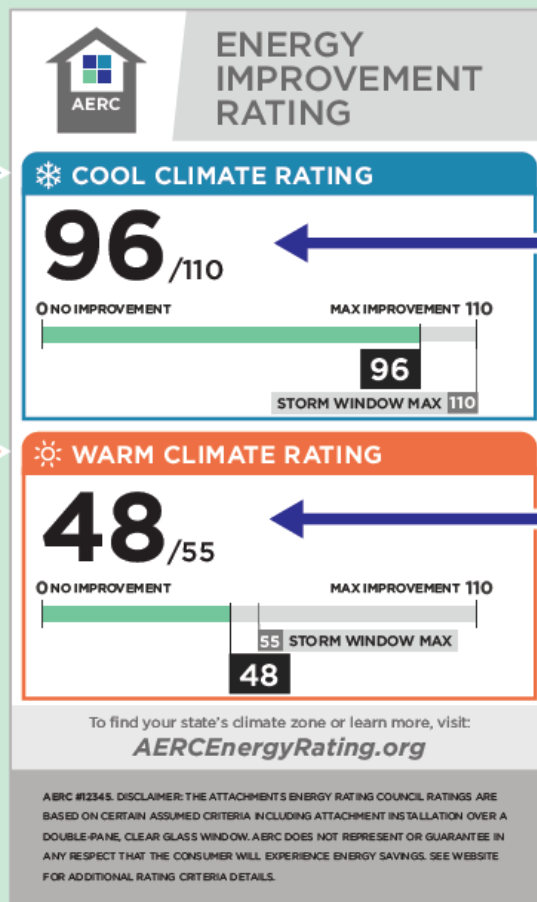
Cool Climate

If you tend to turn on the heat more throughout the year, be sure to look at the **COOL CLIMATE RATING**.



Warm Climate

If you tend to use your air conditioning more throughout the year, then take a look at the **WARM CLIMATE RATING**.



3. Discover Your Energy Savings



The amount of energy you can save will vary based on the type of product you buy.

96_{/110}

The large number indicates the product's **energy rating**.

The smaller number indicates the **maximum energy rating** possible for that product category (storm windows, in this case).

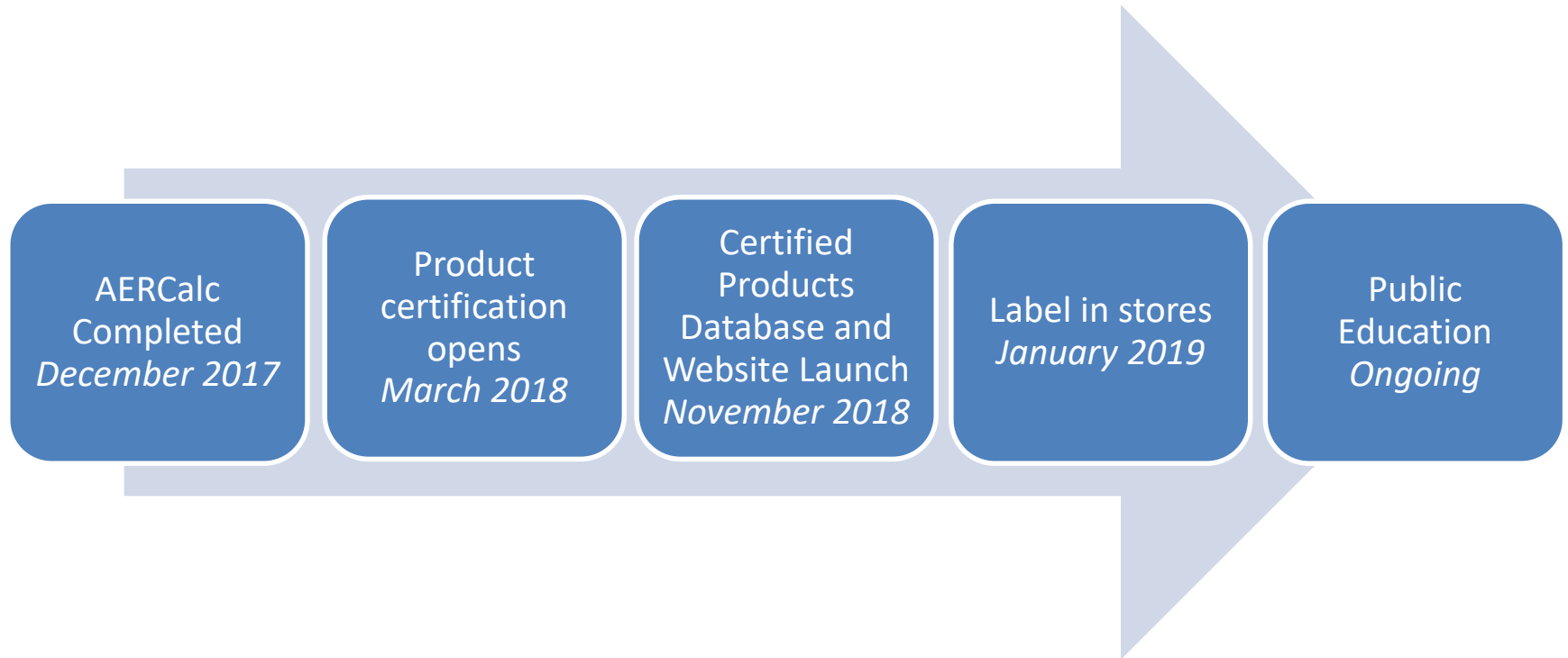
So, the closer the product's energy rating is to the maximum energy rating in your climate, the greater your energy savings!

In some cases, you may see "Not applicable for energy savings" listed instead of a rating number. This means that the product is not recommended for energy improvement in that particular climate.


ENERGY RATED. ADDED COMFORT.

Want to learn more? Visit www.AERCEnergyRating.org

EP value	Signifies: The window attachment installed over baseline window
<0	Use more energy on an annual basis than if it had no attachment at all
0	No net impact on the energy performance of the home on an annual basis
>0 and 100	Improves the net annual energy performance of the home
100	Performance is equivalent to a net zero energy window
>100	Net annual energy producer compared to a net zero energy window




AERC Product Certification is now open!


[PRODUCT SEARCH](#)
[ENERGY RATING LABEL](#)
[WINDOW ATTACHMENTS GUIDE](#)
[RESOURCES](#)
[ABOUT US](#)

Look for the Label


Your resource for energy efficient window products

[LOOK FOR THE ENERGY IMPROVEMENT LABEL](#)



Energy Rated. Added Comfort.


Did you know that window attachments – such as blinds, shades and shutters – can help you save energy? Not only that, energy efficient window attachments make it easier for you to control the temperature of your home for added comfort.



Certified Product Search

The AERC Product Search allows you to find energy-efficient window attachments tailored to your specific needs. Select the type of product you're looking for from icons at the top of the search. Then, narrow your search using various filters.

[EXPLORE](#)



Window Attachments

You may not know the term, but chances are you use window attachments every day in your home or at the office. Click here to learn more about the different kinds of window attachments and how they can benefit you.

[EXPLORE](#)

What Can WINDOW ATTACHMENTS DO FOR ME?



A window attachment of your choice—such as blinds, shades or storm windows—can help your home **save energy**.










WINDOWS + CELLULAR SHADES + SHADES + STORM WINDOWS + BLINDS = ENERGY SAVINGS

DID YOU KNOW?

Window attachments also allow you to control the amount of heat and sunlight that enter your home, which can help regulate temperature and make your living space more comfortable.



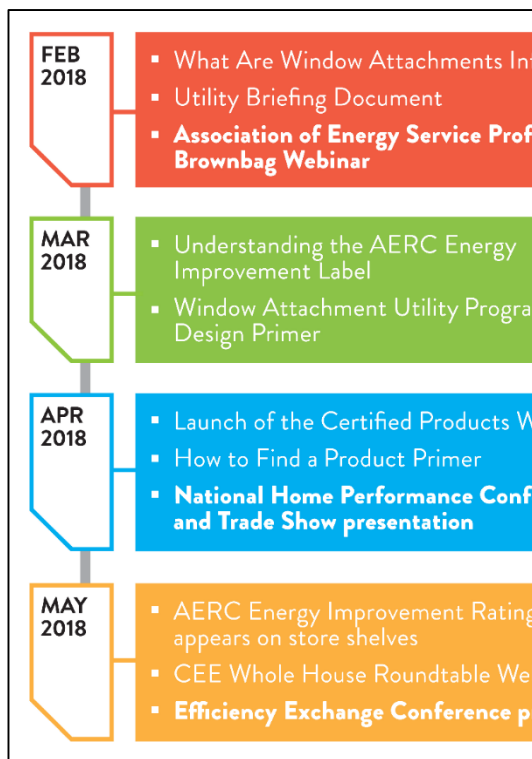

When choosing window attachments, look for the AERC Energy Improvement logo and label for increased energy savings and added comfort.

ENERGY RATED. ADDED COMFORT.

This label indicates that the product has been rated according to strict standards set forth by the Attachments Energy Rating Council (AERC). For more information, visit www.AERCnet.org.



Utility Monthly E-Blast



Utility Program Design Primer

Utility Briefing Document

Window Attachments: Call to Action

64% of U.S. homes have non-low-e single or double pane windows

30% Windows make up of a typical home's heating and cooling energy

Attributing Savings

Attributing savings for window attachment products involves a number of factors. For storm windows, there are three major groups:

- Customers who were already interested in purchasing standard window attachments and, because of the utility incentive, purchased more efficient products
- Customers who were not planning to purchase window attachments but chose to take advantage of the lower prices and purchase efficient products
- Customers who were considering full window replacement but were able to resolve window issues with a window attachment.

For other product categories, window attachments are not a substitute for full window replacement, but can substitute across product categories:

- Customers who were already interested in purchasing standard window attachments and because of the utility incentive, purchased more efficient products.
- Customers who were not planning to purchase window attachments but chose to take advantage of the lower prices and purchase efficient products.

For its pilot, Focus on Energy estimated that about 49% of the customers were category 1 and 51% were category 2. The customers considering full replacement windows are a subset of category 2 and made up about 42% of that category, or about 21% of the total demand, as shown below.

Share of Low-E Storm Window Sales by Customer Type

Customer Type	Percentage	Details
Customers who had no storm windows	51%	Customers who had no storm windows
Customers who planned to replace their windows in 10+ years	42%	Customers who planned to replace their windows in 10+ years
Customers who planned to replace their windows in 1-10 years	58%	Customers who planned to replace their windows in 1-10 years
Customers who had storm windows and upgraded to low-e	49%	Customers who had storm windows and upgraded to low-e

1.1% Replacing windows in 10+ years
20.3% Replacing windows in 1-10 years
29.6% No plans to replace their windows
49% Had storm windows and upgraded to low-e

Types of Attachments

Attachment Type	Price Range	Savings
Window Shades	\$20 - \$360	AVINGS
Cellular Shades	\$280 - \$770	SAVINGS
Storm Windows	\$370 - \$910	SAVINGS

Window attachments can upgrade the performance of existing windows and save up to 13% of a household's annual energy use.

- FIELD DEMONSTRATED ENERGY SAVINGS:** 3X-30%
- LOWER COST MEASURE:** \$100 median price per window
- YEAR ROUND BENEFITS:**
 - Heating: 20 - 500 therms/year
 - Cooling: 700 - 5,200 kWh/year
- HIGH MARKET POTENTIAL:**
 - 150 million+ attachments shipped annually
 - 4-16 year lifetimes

How to Get Involved with AERC

- Run a pilot program
- Educate your customers about window attachments

What Is the Attachments Energy Rating Council (AERC)?




- An independent, public interest, non-profit organization funded by the U.S. Department of Energy (DOE) and managed as part of the Window Coverings Manufacturers Association (WCMA).
- An organization dedicated to the running of a comprehensive rating, labeling, and certification program for window attachments.
- The AERC has developed ratings for residential cellular shades, roller shades, blinds, storm windows, solar screens, and pleated shades. Over the next three years, ratings will be developed to include all product categories and provide ratings for commercial building products.
- Technical ratings development is supported by Lawrence Berkeley National Laboratory (LBNL).

- Engage with AERC
 - Sign-up for our newsletters
 - Consider becoming a member
 - Participate on utility working group
- AERC can:
 - Provide additional technical details and analysis
 - Check out our [Resources](#) page
 - Provide introduction to manufacturers
 - Help facilitate pilot projects or field studies

Visit our website:
www.aercnet.org

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 and Quanta Panel (multi-family)
Retail Partners	 	 
Markdown	Full product markdown of Low-E storm window incremental cost to clear glass (20-35%)	25% customer discount

Branding and
messaging of
product benefits

In-store displays

Utility
communications

Digital
marketing and
social media ads

BENEFITS OF LOW-E STORM WINDOWS



MODERN DESIGN

A visually appealing addition to your home with an easy, ready to use design.



NO BRAINER ECONOMICS

The elimination of wasted energy pays for itself many times over.



SUPERIOR COMFORT

Regain comfort everywhere in your home, all year long.

Low-E Storm Windows

25% OFF

FOR A LIMITED TIME ONLY
Sept. 15 to Nov. 15



focus on energy



focus on energy
Partnering with Wisconsin utilities

FOR YOUR HOME FOR YOUR BUSINESS FOR TRADE ALLY CONTRACTORS ABOUT US

Low-E Storm Windows

Every window needs another layer. Layer it on for energy savings and comfort.

A modern low-E storm window uses high performance weather stripping to create a tight seal and adds a super insulating polymer known as PVB and triple weatherstripping. This combination of materials creates a permanent low-emissivity (low-E) coating that acts as a thermal barrier which keeps the heat inside in the winter months and outside in the summer months.

No brainer economics

Studies have shown that with low-E storm windows, you can achieve similar energy saving performance to R-19 cavity insulation without the need for additional space. This means you can save money on your energy bills without help from contractors. Limited time discounts provided by Focus on Energy reduce the price of low-E storm windows even further.

Superior comfort

Did you know that air leakage accounts for 35-40% of the energy used for home heating and cooling? Low-E storm windows not only reduce air leakage, but they also reduce heat loss and gain, making your home more comfortable. Low-E storm windows also help reduce noise by 30% or more. In addition, low-E storm windows improve interior comfort by reducing exterior noise, so you can enjoy your quiet home.

Modern design

Low-E storm windows are a smart investment. The durable, high-quality finish and low profile design gives them the look of a permanent window. Even though the same look, they are as easy to install as a new window.

Interested in purchasing low-E storm windows at a limited-time discount from Focus on Energy? Check the eligibility details for home owners and multifamily property owners, frequently asked questions, and qualifying low-E storm window products below!

HOW CAN I GET DISCOUNTED LOW-E STORM WINDOWS?

- Homeowners** in the Milwaukee area can purchase a maximum of 10 Low-E storm windows at a 25% discount at participating Menards and Home Depot locations from September 15 through November 15, 2017, or get a quote online today.
- Multifamily Property Owners** or managers can request an estimate and determine their eligibility or contacting the Focus on Energy Multifamily Energy Savings Program. www.focusonenergy.com for more information.

Contact Us
Do you have questions about Focus on Energy and its programs or our eligibility? We're happy to help. Get in touch with us.

What's New?
Residential Programs
Browse all the latest Residential Program updates.

Focus on Energy
Sponsored

Like Page

For high performance weather stripping that keeps a tight seal and keeps your home warm in the winter, Focus on Energy has a great deal for you!

Every Window Needs Another Layer!

Milwaukee Residents
NOW 25% OFF
Low-E Storm Windows

Get 25% Off Now On Low-E Storm Windows!
Click to learn more.

FOCUSONENERGY.COM

Learn More





Milwaukee Residents!

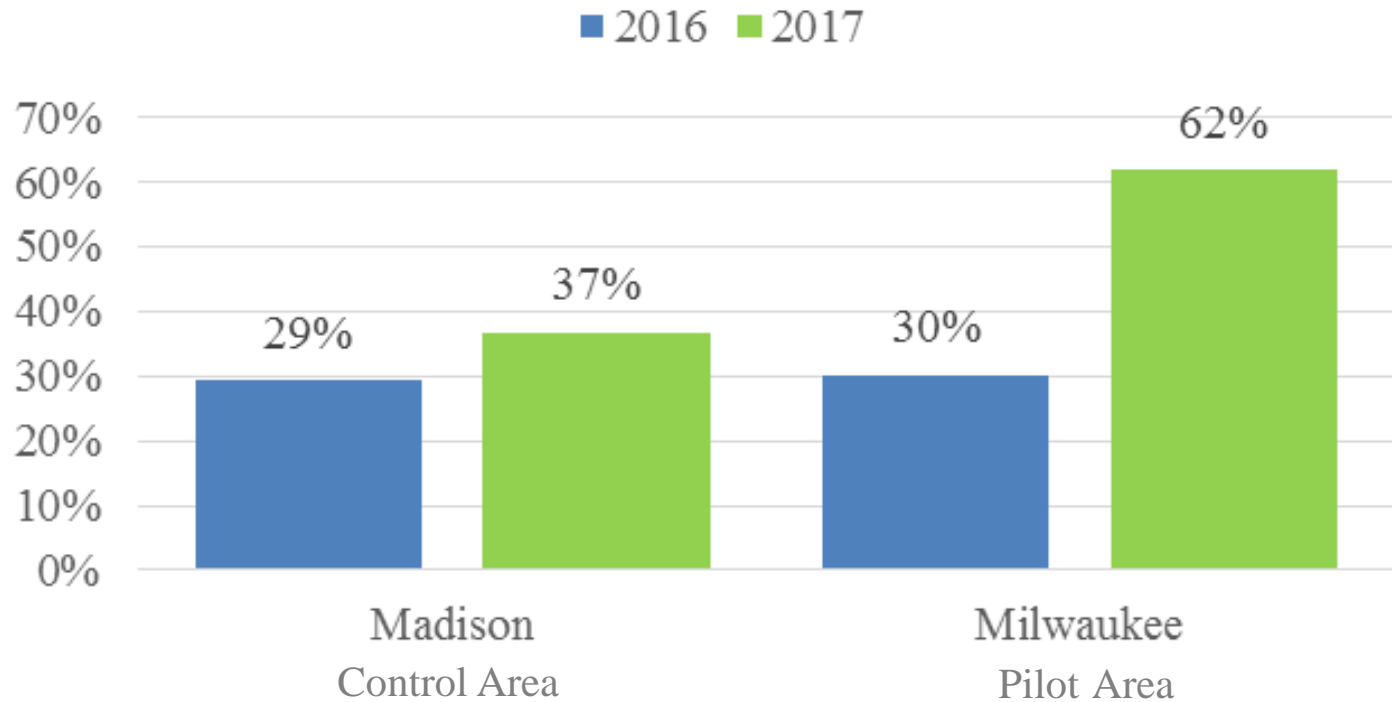
NOW 25% OFF

LOW-E Storm Windows

Low-E Storm Window Utility Pilot Results

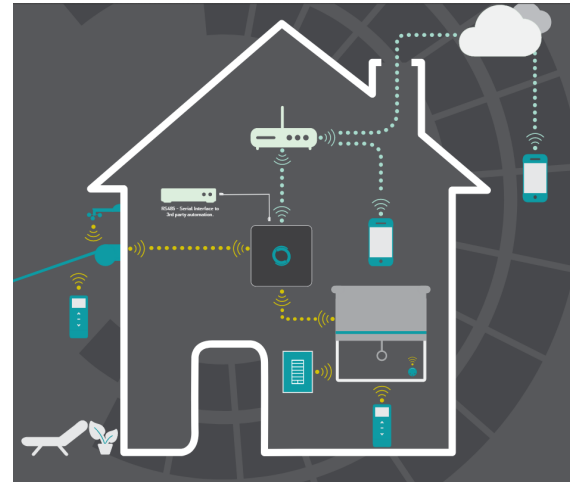
Pilot (year)	Overall storm window sales increase	Low-E sales increase	Low-E market share
 (2015)	37%	337%	2014 – 22% 2015 – 70%
 (2017) <small>Partnering with Wisconsin utilities</small>	9.6%	125%	2016 – 30% 2017 – 62%

Focus on Energy Comparison City Results



- ENERGY STAR Storm Window program just launched earlier in September
- Will be included in Wisconsin TRM published in January
- On list for development for Minnesota TRM process currently underway
- Approved by NW RTF as single-family weatherization measure

Pilot/Program Concepts



Commercial

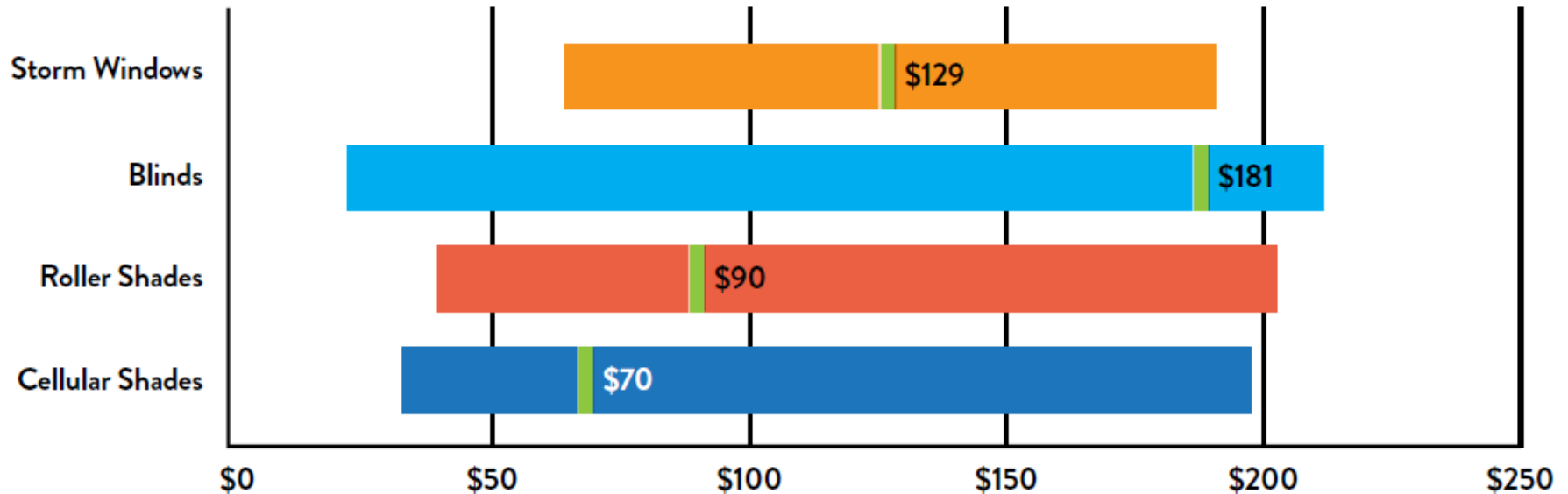
- C&I New Construction or Public Sector
 - Encourage inclusion of automated shades with lighting and HVAC downsizing
- Facility assessments
 - Automated shades
 - Secondary glazing systems
- Target management companies with mid-century buildings for SGS installation and maintenance staff training program
- Test DR capabilities

Residential/Multi-Family

- Nest Seasonal Savings or Total Connected Savings with automated shades
- Low-e storm windows for income eligible programs (single and multi-family)
- Cellular shades for affordable housing new construction
- Public housing retrofits

Thank You!

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



Note: Blinds data includes pricing for vinyl, metal, wood, faux wood, and vertical blinds; Pricing ranges include 25th-75th percentile data points for stock and custom products

 Median Price Point

Residential Motorization and Automation Pricing

Product Category	Average Price Manual	Average Price Motorized
Cellular Shades	\$140	\$280
Roller Shades	\$145	\$290
Blinds	\$125	\$280

- Average price of hub: \$153
- Average price of remote: \$45

*Pricing information based on information provided by manufacturers and through internet research conducted by D+R International in October 2018.