

Window Attachments:

Call to Action



What Is the Attachments Energy Rating Council (AERC)?

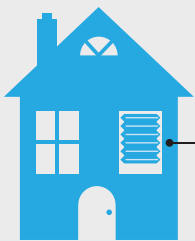
- An independent, public interest, non-profit organization funded by the U.S. Department of Energy (DOE) and managed as part of the Window Coverings Manufacturers Association (WCMA).
- An organization dedicated to the development of a comprehensive rating, labeling, and certification program for window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

80%

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



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

TYPES OF ATTACHMENTS



BLINDS:
SAVINGS
\$220 - \$360



CELLULAR SHADES:
SAVINGS
\$280 - \$770



ROLLER SHADES:
SAVINGS
\$9 - \$180



STORM WINDOWS:
SAVINGS
\$370 - \$910

✓ **FIELD DEMONSTRATED ENERGY SAVINGS:**
3%-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

Call to Action

- Get involved with AERC
- Run a pilot program
- Learn more at aercnet.org

What are Window Attachments?

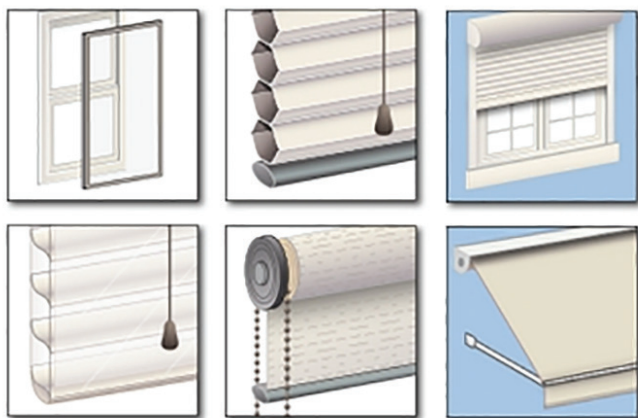


Comfort and Energy Benefits:

- Enhanced daylighting
- Reduced draftiness
- Minimized glare
- Increased thermal comfort
- Energy savings
- Aesthetics
- Privacy
- Sound abatement

Window attachments are interior and exterior products that are installed over windows or doors in both residential and commercial buildings. Interior products are often referred to as window treatments or window fashions and include blinds, shades, drapes, shutters, window quilts, and films. Exterior products include roller shades, roller shutters, and awnings. Attachments also include both interior and exterior storm windows. Window attachment products, particularly interior ones, have traditionally been thought of as a decorative feature; however, these products offer a variety of benefits to homeowners, including energy savings. The flexibility offered by attachments allows end-users to choose products that fit their lifestyle and that can be adapted to meet hourly or seasonal needs. Automatically and manually controlled products provide additional options for customers and can offer increased savings depending on climate zone.

Figure 1: Types of Window Attachments



Starting from top left: storm window, cellular shade, exterior roller shutter, sheer shade, roller shade, and retractable awning.

Why Are Window Attachments Important?

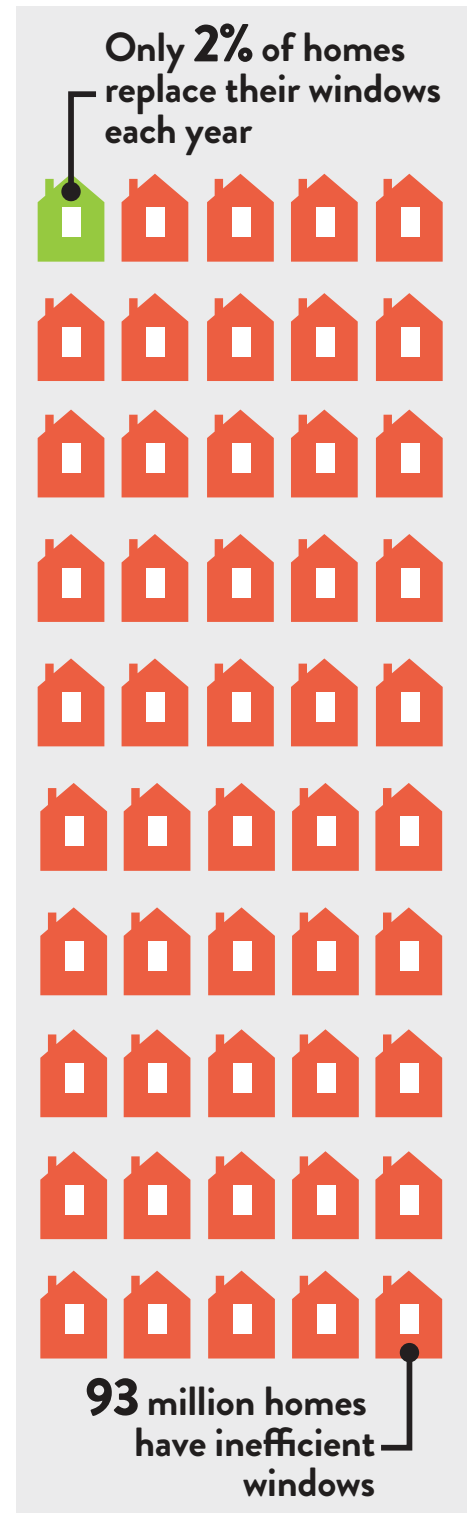
There is a significant opportunity to improve the thermal envelope of today's homes by upgrading the performance of existing windows. In fact, DOE estimates that 42% (47.2 million) of U.S. homes have single-pane windows¹ and based on DOE and industry shipment data, it has been estimated that an additional 46 million homes have double-pane windows with clear glass (i.e., not low-e).^{2,3}

Figure 2: Thermal Image of Home



Complete window replacement can be expensive and occurs in only an estimated 2% of homes each year.⁴ Given that approximately 80% of windows in U.S. homes have some sort of window attachment, there is an opportunity to increase the performance of the existing window system by making these attachments energy efficient.⁵ AERC rated window attachment products will provide an additional solution for the building envelope, by providing consumers with information that will help them identify which products can save them more energy, and offer a new space for utility program managers to capture energy savings and help their customers save money and increase comfort.

Figure 3: Average frequency of window replacement in U.S. homes.

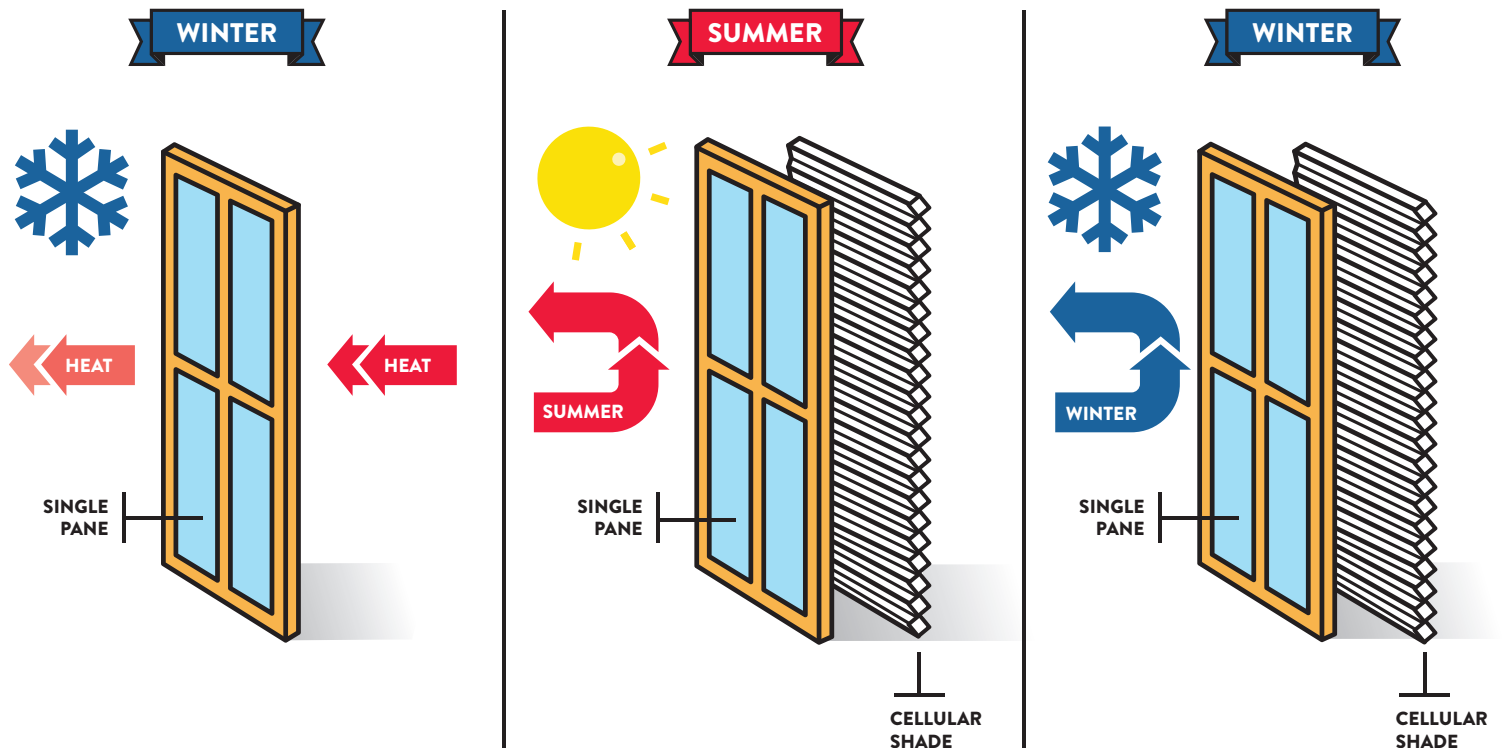


How Do Window Attachments Save Energy?

Window attachments can save energy by preventing or blocking the transfer of heat. Using these products can keep homes cooler in the summer and warmer in the winter, providing benefits to consumers in the heating and cooling seasons. Each energy efficient attachment type has properties which allow it to reduce heat transfer in different ways. The performance of different window coverings and attachment types will vary based on climate zone and season.



Figure 4: Window attachments prevent heat transfer



How Much Energy Can Window Attachments Save?

Window attachments can save significant amounts of energy across product types, window types, and climate zones. Table 1 shows the range of energy savings from field demonstrations, payback periods, and estimated product lifetime for cellular shades and storm windows. Table 2 shows modeled estimates of energy and dollar savings for various attachment types over single- and double-pane clear windows based on estimates from 12 U.S. cities.

Table 1: Window Attachment Energy Savings – Whole Home Experimental Results

Product Category	Whole Home Energy Savings Range – Experimental Homes: Matched set of homes, 1,500 ft ² , Pacific Northwest			Product Installed Lifetime Estimates
	Baseline Window	Percent Savings		Years
		Heating	Cooling	
Cellular Shades (covering all window area)	Double pane clear glass	10.5% ±3.0%- 16.6%±5.3% ⁶	10.4% ±6.5%- 15.9±0.7% ⁷	4 – 10 ⁸
Exterior Storm Windows (covering all window area)	Double pane clear glass, aluminum frame	10.5%±1.2% ⁹	8.0% ±0.5% ¹⁰	10-20 ¹¹
Interior Storm Windows (covering 74% of window area)	Double pane clear glass, aluminum frame	8.2% ±1.9% ¹²	4.2% ±0.7% ¹³	

Note: See citation page for savings references.

In addition to the whole home experiments (Table 1) and energy modeling of window attachments (Table 2), a number of DOE-sponsored field studies have been conducted that demonstrate significant heating, cooling, and infiltration reductions from the installation of low-e storm windows over single-pane windows in both single-family homes and high-rise multi-family buildings in a variety of climate zones including Illinois, Pennsylvania, New York, and Georgia.¹⁴ Climate-based modeling has also demonstrated that low-e storm windows are cost effective (i.e., savings-to-investment ratio is larger than one) in most climate zones, using the criteria for cost-effectiveness and the modeling software utilized by most weatherization and utility programs.¹⁵ In the Pacific Northwest, low-e storm windows met the criteria to be considered a “proven” and cost-effective energy saving measure in the Bonneville Power Administration region (includes Oregon, Washington, Idaho, and part of Montana).

Climate-based modeling has also demonstrated that low-e storm windows are cost effective.

Table 2: Window Attachment Energy Savings* – LBNL Modeled Estimates¹⁶

Product Category	Average Annual Household Energy Savings (kWh) On Single Pane Window				Average Annual Household Energy Savings (kWh) On Double Pane (Non-low-e) Window			
	25th Percentile	Median	75th Percentile	\$ Savings	25th Percentile	Median	75th Percentile	\$ Savings
Blinds**	1,900	2,400	3,300	\$220 - \$360	30	800	1,200	\$0 - \$140
Cellular Shades	2,560	3,150	4,230	\$280 - \$470	810	1,210	2,050	\$90 - \$230
Roller Shades	80	750	1,600	\$10 - \$180	440	720	1,100	\$50 - \$120
Solar Screens	-80	970	2,400	\$0 - \$270	380	970	1,400	\$40 - \$160
Storm Windows (Interior and Exterior)	3,300	5,200	8,200	\$370 - \$910	2,500	4,200	6,900	\$280 - \$770

* These savings numbers represent attachments that are operated manually and do not reflect the savings potential of attachments if automated to achieve optimal savings

** Blinds data includes pricing for vinyl, metal, wood, faux wood, and vertical blinds.

How Do People Use Window Attachments?

A compelling argument for window attachments as an energy savings measure is that by upgrading to a more efficient window attachment option, **consumers can save energy without adjusting their daily routine.** Lawrence Berkeley National Laboratory (LBNL) modeled the energy savings of a range of attachment products based on “typical” user behavior patterns as determined by a study funded by the DOE.¹⁷ The DOE study found that homes in southern climates tended to have their interior attachments closed more frequently during the summer compared to homes in northern climates, suggesting that, to some degree, homeowners may already operate their attachments in a manner that optimizes energy efficiency.¹⁸



LBNL concluded that consumers could save energy by installing energy-efficient window attachments while continuing to operate window attachments as they usually would (i.e., no behavioral changes required to achieve savings). In a separate follow-up study to a 2005 field demonstration of storm windows, the issue of persistence in savings was explored to determine whether or not households kept their storm windows installed and in good condition over time. In this study, researchers found

that 10 years after the initial installation, 96 out of the original 100 storm windows installed on low-income weatherization homes were present and in very good condition, suggesting a 96% persistence rate over this timeframe.¹⁹

Consumers can achieve further energy savings and comfort benefits with additional education and resources on how to optimally operate their window attachments. Many window attachment manufacturers currently offer motorized attachments or attachments that can be operated through a control system, making it easier for consumers to optimally operate their window attachments and generate higher energy savings. While behavior change on the part of the user is not necessary in order to achieve savings, automated window attachments can allow the users to incur higher savings numbers with little effort.²⁰ The growing demand for home automation and controls products provide consumers and utilities with a large opportunity to capture substantial energy savings using window attachments.

How Large is the Window Attachment Market?

Approximately 150-225 million interior residential window coverings are shipped annually in the United States (see Figure 6).²¹ Horizontal blinds make up the majority of product shipments, with vertical blinds and shades making up the next largest shares. **There is a large market opportunity to shift consumers from less efficient products toward high efficiency products, particularly with the higher volume product categories.**

Distribution Network

The majority of interior window coverings are distributed through retail channels including big box, window treatment, and mass merchant stores, while approximately 44% of the market is sold through wholesale or distributors. Retail channels differ greatly across the industry with some manufacturers selling solely through certified dealers, while others focus primarily on sales through big box and mass merchant stores.

Figure 5: Estimated 2015 Market Share Interior Window Coverings

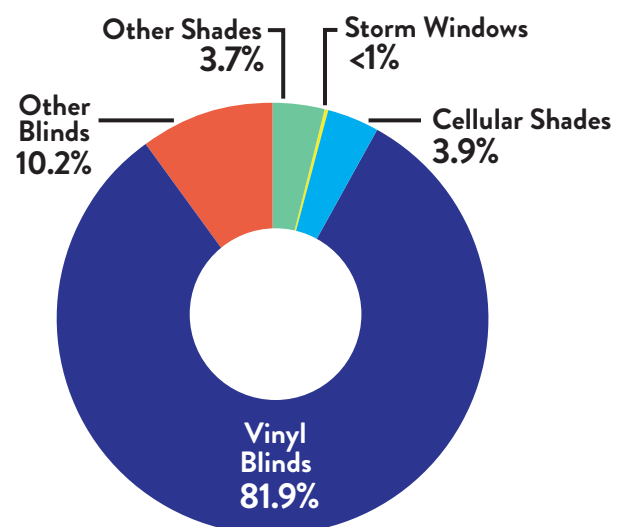
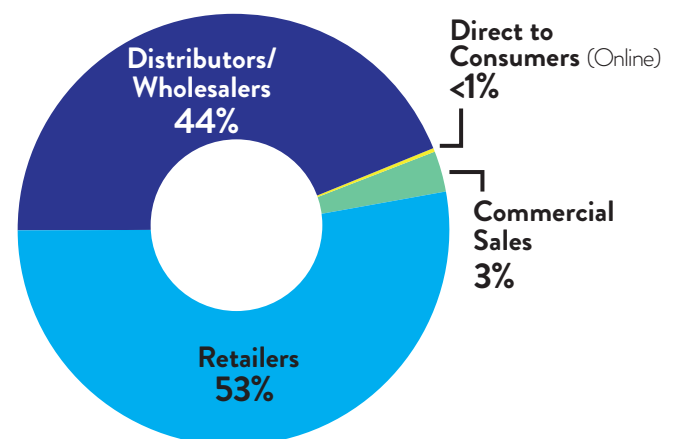


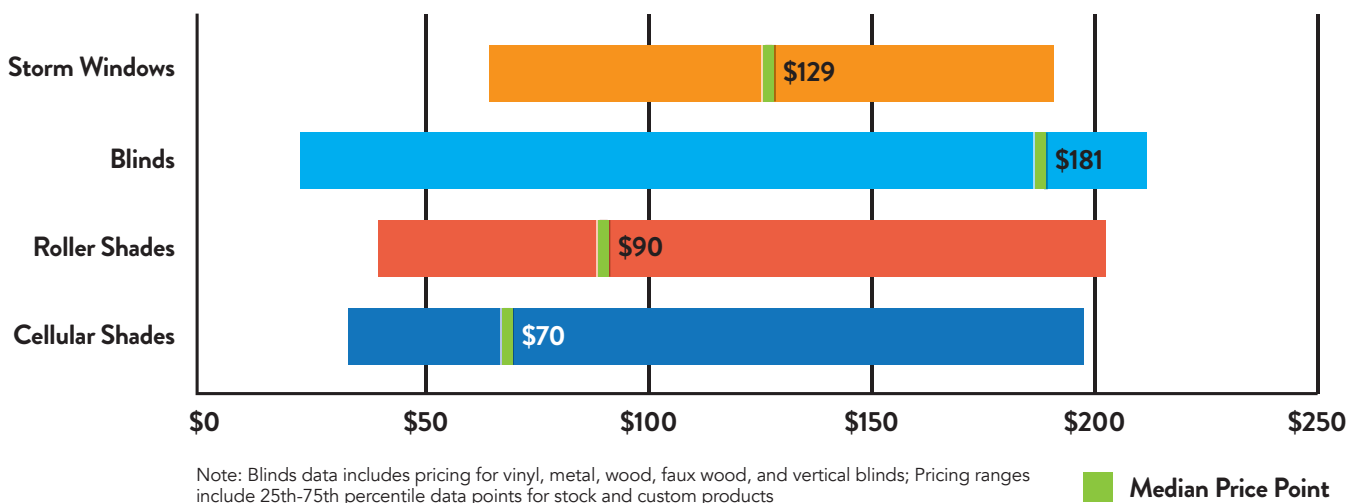
Figure 6: Distribution Channels



How Much Do Window Attachments Cost?

Window attachments have a wide range of prices, with the **median price points for most interior product types around \$100**, making them an affordable option for upgrading a home's energy performance. Exterior attachments are generally more expensive because they need to be more durable and tend to have longer lifetimes.²² Storm windows - a popular attachment category - range in price from \$50 to \$150 for a standard window, or from approximately \$6 - \$10 per square foot.²³

Figure 7: Phase 1 Product Pricing: Low (Stock) – High (Custom) Price Points²⁴



How Can I Help My Customers Identify Which Products Are Efficient?

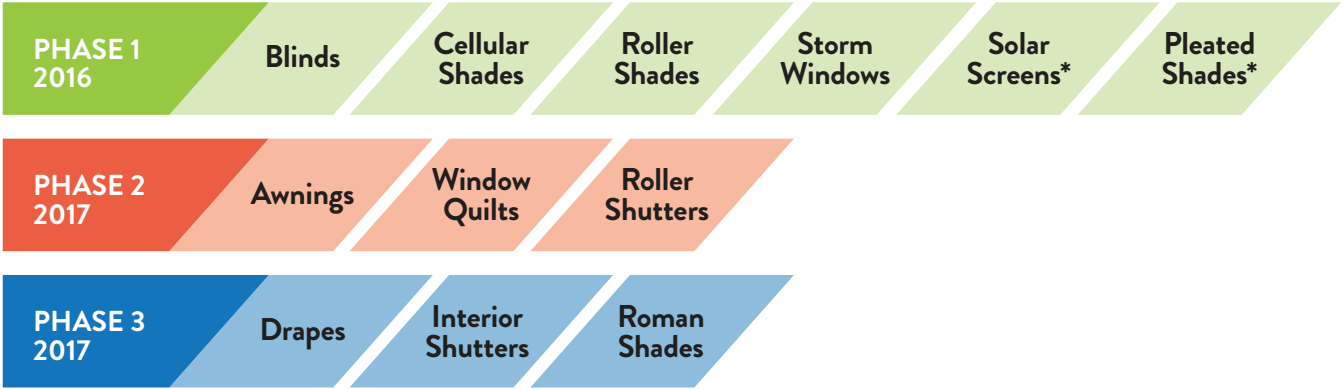
One of the biggest challenges when it comes to identifying efficient window attachments is that there is not a consistent way to calculate and report product performance. This has made it difficult for consumers to make comparisons of the energy performance between products and product types in terms of energy performance.

In 2017, AERC will be launching its program to rate, certify, and label attachment products. The first products that will receive AERC ratings include interior and exterior storm windows, cellular shades, blinds, pleated shades, solar screens, and interior and exterior roller shades. Ratings will be available for additional product categories in late 2017 and early 2018. AERC will also be launching a website where utilities and consumers can access product performance information and general information about window attachments. AERC is anticipating certified products with the AERC label to appear in big box and other stores by June 2017.

Figure 8: AERC program roll-out timeline



Figure 9: Product Development Schedule



*May be added to Phase 1 development as resources allow

What Are Other Programs Doing?

ENERGY STAR®

The Environmental Protection Agency (EPA) is in the process of developing a specification for low-e storm windows as part of the ENERGY STAR Program. In January 2016, the EPA released a framework document outlining its preliminary research and discussion questions for comment. EPA expects to release a first draft of the specification sometime in early 2017.

Bonneville Power Administration (BPA)

In the Pacific Northwest, the Regional Technical Forum approved low-e storm windows as a deemed unit energy savings measure. BPA is offering an incentive for low-e storm windows for single-family, multi-family, and manufactured housing.

Efficiency Vermont

Efficiency Vermont ran a pilot program in fall 2015 to test a markdown of low-e storm windows to the price of non-low-e storm windows across different marketing platforms. The pilot showed more than a 300% increase in low-e sales and an overall increase in storm panel sales of 37%. Efficiency Vermont is currently going through the review process to add low-e storm windows as an energy-efficiency measure.

To keep up-to-date with all of AERC's activities visit our website:

www.aercnet.org

For more information about window attachments visit:

<http://www.efficientwindowcoverings.org>

or email us at info@aerc.org

AERC's Mission

Provide accurate and credible information about the energy performance of window attachments to residential and commercial consumers.

References

- ¹ U.S. Energy Information Administration. 2009. Residential Energy Consumption Survey.
- ² Cort, K.A. 2013. "Low-E Storm Windows: Market Assessment and Pathways to Market Transformation." Pacific Northwest National Laboratory on behalf of the U.S. Department of Energy. PNNL-22565.
- ³ U.S. Energy Information Administration. 2009. Residential Energy Consumption Survey.
- ⁴ Calculations by D+R International based on Consumer Checkbook.
- ⁵ Bickel, S., Phan-Gruber, E., Christie, S. 2013. Residential Windows and Window Coverings: A Detailed View of the Installed Base and User Behavior. Building Technologies Office, Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy.
- ⁶ Cort, K.A., Merzouk, M.B., Peterson, J.M., Sullivan, G.P., and Weber, J.M. 2015. Evaluation of Cellular Shades in the PNNL Lab Homes. Pacific Northwest National Laboratory on behalf of the U.S. Department of Energy.
- ⁷ Cort, K.A., Merzouk, M.B., Peterson, J.M., Sullivan, G.P., and Weber, J.M. 2015. Evaluation of Cellular Shades in the PNNL Lab Homes. Pacific Northwest National Laboratory on behalf of the U.S. Department of Energy (Rev 2 forthcoming, October 2016).
- ⁸ Lifetime for average installation.
- ⁹ Knox, J.R., Widder, S.H. 2014. Evaluation of Low-E Storm Windows in the PNNL Lab Homes. Pacific Northwest Laboratory on behalf of the U.S. Department of Energy.
- ¹⁰ Knox, J.R., Widder, S.H. 2014. Evaluation of Low-E Storm Windows in the PNNL Lab Homes. Pacific Northwest Laboratory on behalf of the U.S. Department of Energy.
- ¹¹ Widder, S., et al. 2015. Cost and Lifetime of Low-e Storm Windows. Pacific Northwest Laboratory.
- ¹² Petersen J.M., Sullivan, G.P., Cort, K.A., Merzouk, M.B., Weber, J.M. 2015. Evaluation of Interior Low-E Storm Windows in the PNNL Lab Homes. Pacific Northwest National Laboratory on behalf of the U.S. Department of Energy.
- ¹³ Petersen J.M., Sullivan, G.P., Cort, K.A., Merzouk, M.B., Weber, J.M. 2015. Evaluation of Interior Low-E Storm Windows in the PNNL Lab Homes. Pacific Northwest National Laboratory on behalf of the U.S. Department of Energy.
- ¹⁴ Petersen J.M., Sullivan, G.P., Cort, K.A., Merzouk, M.B., Weber, J.M. 2015. Evaluation of Interior Low-E Storm Windows in the PNNL Lab Homes. Pacific Northwest National Laboratory on behalf of the U.S. Department of Energy.
- ¹⁵ Culp, T., Cort, K.A. 2014. Database of Low-E Storm Window Energy Performance across U.S. Climate Zones. Pacific Northwest National Laboratory on behalf of the U.S. Department of Energy.
- ¹⁶ These data points are derived from data provided by Lawrence Berkeley National Laboratory.
- ¹⁷ Based on warranties in industry (actual lifetime would likely be longer). Cort, KA. 2015. Cost and Lifetime of Low-e Storm Windows. Pacific Northwest National Laboratory, Memorandum to Adam Hadley of the Pacific Northwest Regional Technical Forum, July 6, 2015
- ¹⁸ Bickel, S., Phan-Gruber, E., Christie, S. 2013. Residential Windows and Window Coverings: A Detailed View of the Installed Base and User Behavior. Building Technologies Office, Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy.
- ¹⁹ Bickel, S., Phan-Gruber, E., Christie, S. 2013. Residential Windows and Window Coverings: A Detailed View of the Installed Base and User Behavior. Building Technologies Office, Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy.
- ²⁰ Culp, T. 2015. Low-E Storm Window Persistence in Chicago Case Study Homes. Birch Point Consulting.
- ²¹ These data points are derived from data provided by Lawrence Berkeley National Laboratory. The savings estimates were calculated by multiplying the kWh savings with the average cost of energy (\$0.11).
- ²² Petersen J.M., Sullivan, G.P., Cort, K.A., Merzouk, M.B., Weber, J.M. 2015. Evaluation of Interior Low-E Storm Windows in the PNNL Lab Homes. Pacific Northwest National Laboratory on behalf of the U.S. Department of Energy.
- ²³ Petersen J.M., Sullivan, G.P., Cort, K.A., Merzouk, M.B., Weber, J.M. 2015. Evaluation of Interior Low-E Storm Windows in the PNNL Lab Homes. Pacific Northwest National Laboratory on behalf of the U.S. Department of Energy.
- ²⁴ Manufacturer-provided pricing data under NDA

AERC

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