

Energy-Efficient Window Attachments: PNNL LAB HOMES EXPERIMENTS

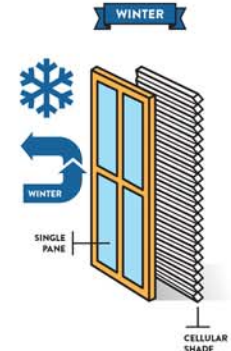
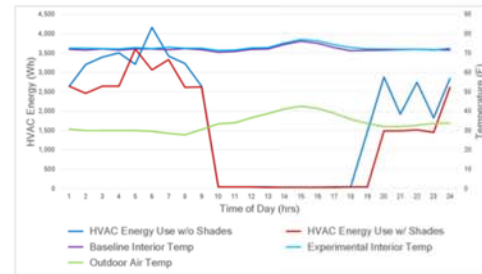


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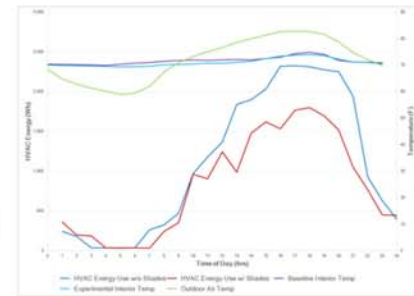
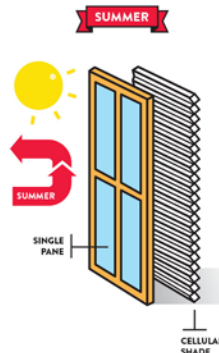
Energy Savings on a Winter Day (cellular shades testing, December 2015)



PNNL Side-by-Side Laboratory Home Testing:

- » Two 1,500 square-foot homes serve as a laboratory where new building technologies can be tested in a closely monitored environment that replicates how normal homes operate.
- » Occupancy and heating load simulation
- » 42 individually controllable and monitored circuit breakers
- » Temperature and relative humidity sensors throughout the home

Energy Savings on a Summer Day (cellular shades testing, July 2016)



Cellular Shades Testing

PNNL partnered with Hunter Douglas to test the triple cell opaque honeycomb "cellular" shades in the Lab Homes under various operating scenarios. PNNL is currently testing double cell honeycomb shades and evaluating the savings from dynamic control strategies (results forthcoming).



Low-E Storm Window Testing

PNNL partnered with Quanta Technologies and Larson Manufacturing to test both interior and exterior low-e storm window attachments in the Lab Homes. These panels are operable (i.e., can be opened and closed) and are typically installed as year-round permanent attachments.



Lab Homes Show Annual Energy Savings when Honeycomb Shades are Added to Double-Pane Clear Glass Windows

Experiment Description	Baseline	Season	HVAC Savings %
"Optimal Operation" » Honeycomb shades operated in "optimal" manner (e.g., opened during day and closed in evenings)	Double-pane, aluminum frame clear glass windows with no window shades	Cooling	14.8% (±2.1)
		Heating	14.4% (±2.0)
"Static Operation" » Honeycomb shades remain closed for the duration of the experiment in both experimental and baseline homes.	Double-pane, aluminum frame clear glass windows with vinyl slatted venetian-style shades closed	Cooling	16.6% (±2.9)
		Heating	10.5% (±3.0)

Lab Homes Show Annual Energy Savings when Low-e Storm Window Attachments are Installed over Double-Pane Clear Glass Windows

Experiment Description	Baseline	Season	HVAC Savings %
Exterior Low-e Storm Windows » Exterior storm panels installed over every window	Double-pane aluminum frame clear glass windows	Cooling	8.0% (±0.5)
		Heating	10.5% (±1.2)
Interior Low-e Storm Windows » Interior panels installed over 74% of the window area in experimental home	Double-pane aluminum frame clear glass windows	Cooling	4.2% (±0.7)
		Heating	8.2% (±1.9)

For more information on this project, please contact:

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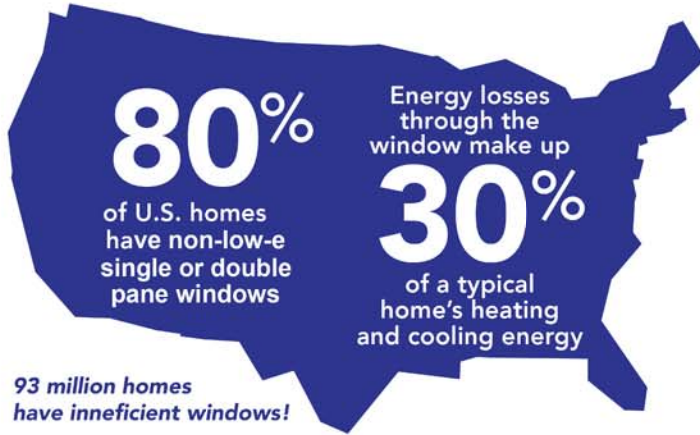
Energy-Efficient Window Attachments: MIND THE GAP



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PROBLEM



93 million homes have inefficient windows!



Most household heat is lost through the windows and roof.

OPPORTUNITY



Window attachments

Can upgrade the performance of existing windows and cut a household's annual energy use by an average of **13%**

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
- ✓ LOWER COST MEASURE
- ✓ YEAR ROUND BENEFITS
- ✓ HIGH MARKET POTENTIAL

AERC Attachment Energy Rating Council

- An independent, public interest, non-profit organization
- Funded by the U.S. DOE and managed as part of the Window Coverings Manufacturers Association
- Purpose: to develop a comprehensive rating, labeling, and certification program for window attachments
- Goal is to develop ratings for the following residential products over the next 3 years:
 - Cellular shades
 - Roller shades
 - Blinds
 - Storm windows
- Long term goal is to do the same for commercial building products

CALL TO ACTION

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

Programs Working with Energy-Efficient Window Attachments



For more information, please contact:

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