



Product Council Series

Commercial Secondary Windows – A Solution for Existing Buildings

August 11, 2026





Speakers

- Introduction to CSW – Tom Culp
- QuantaPanel – Jay Reyher, CEO
- Indow Windows – Sam Pardue, CEO



Commercial Secondary Windows and Panels



- Thomas D. Culp, Ph.D.
Birch Point Consulting LLC
culp@birchpointconsulting.com
- NEEA Product Council Series, August 2026



Window Retrofit Opportunities

We work very hard on new building technology, yet often overlook the vast amount of energy used in existing buildings.

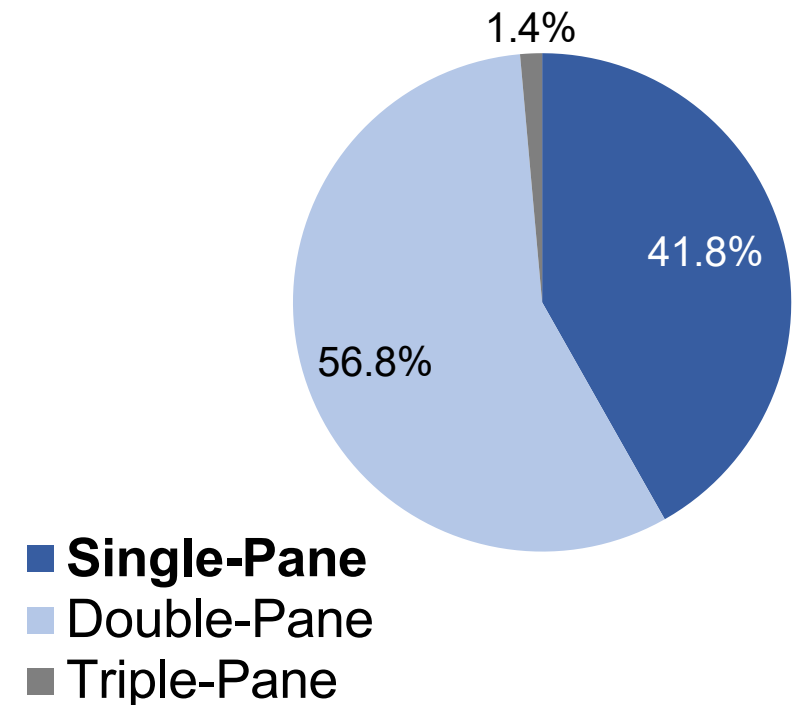
Residential:

- ~ 19 billion ft² of existing windows,
- ~ 40% with single glazing
- ~ 47 million homes with single glazing
- another ~ 46 million with double pane clear¹

Commercial:

- ~ 2 billion ft² single glazing in commercial buildings
- Over a 23 year period, only 6.7% addressed their windows ... just 0.3% of total per year.

Percent of Homes in the US with Each Window Type





Addressing Windows in Existing Buildings



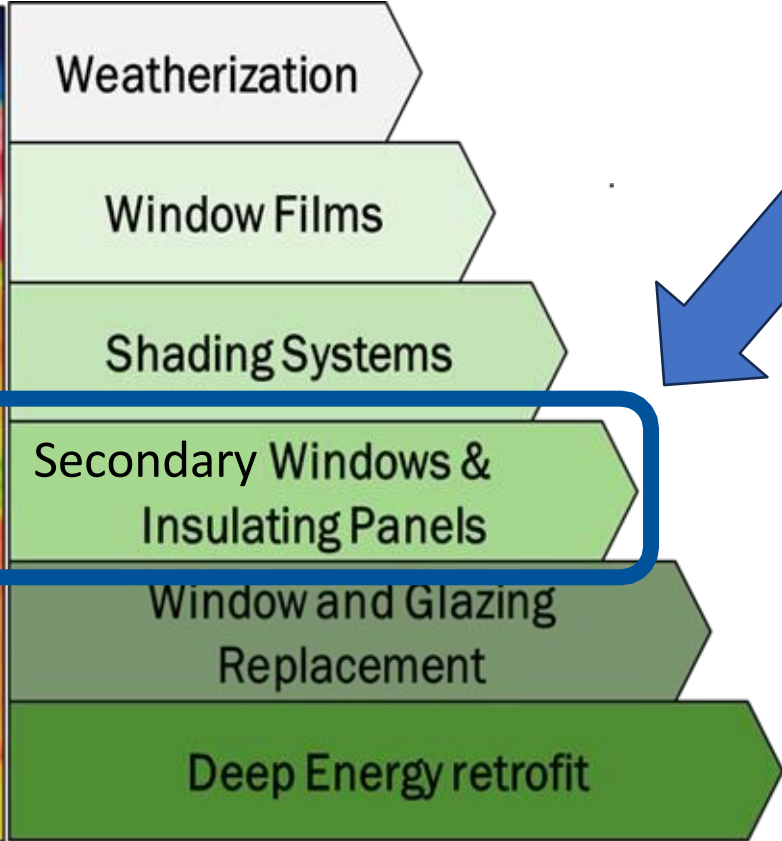
There is great new window and glazing technology, but what do you do when:

- Rip-out and replacement of existing windows is impractical or ***cost prohibitive?***
- Not allowed or don't want to replace existing windows in ***historic buildings?***





Affordable Window Retrofit Options and Initiatives





One Solution: Secondary Windows, Low-E Storm Windows, and Insulating Panels

What is a Commercial Secondary Window (CSW)?

- Rather than replacing the existing window or glazing, **add an additional frame and glazing layer** that creates an insulating air space between the existing and new window.
- Other terms you may hear:
 - Secondary glazing system (SGS)
 - Insulating panel
 - Window insert
 - Storm windows (residential)



One Solution: Secondary Windows, Low-E Storm Windows, Insulating Panels



- Cost ~ 1/3 of the cost of full window replacement
- Insulation **AND** air sealing measure.
- Similar energy savings to full window replacement
- Options with low-e glass, acrylic panels, thin glass, vacuum insulating glazing (VIG)



- Aesthetically pleasing
- Fixed or Operable
- Interior or Exterior
- Improved comfort
- Soundproofing / improved acoustics
- Permanent year-round installation





Real World Examples

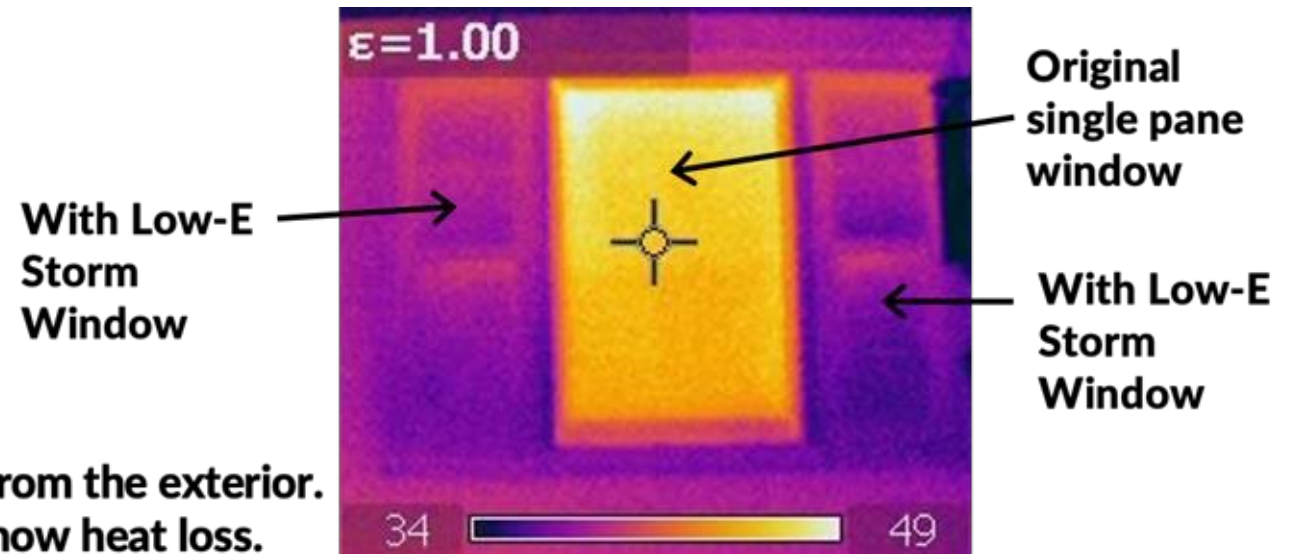


Photos courtesy of Indow, Alpen, QUANTAPANEL



How Secondary Windows Can Be A Solution

- Air Seals Primary Window
- Creates “Dead Air Space” to improve thermal insulating performance
- Low-e Glass can Reflect Radiant Heat
- Solar Control Coatings can Reduce Solar Heat Gain

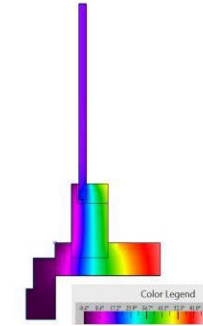




Improved Window Performance

Improvement depends on existing window type:

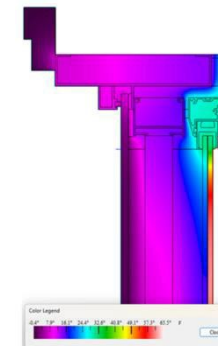
- Over *single pane* windows, U-factor decreased 59-64% with low-E panel
- Over *double pane* windows, U-factor decreased 43-57% with low-E panel
- SHGC reduced by 17-28% (more with solar control low-E glass option)
- Even further improvement possible with dual pane secondary windows using thin glass or vacuum insulating glazing (VIG)



Fixed wood window, single glazed



With exterior low-e storm window





Benefits of Secondary Windows

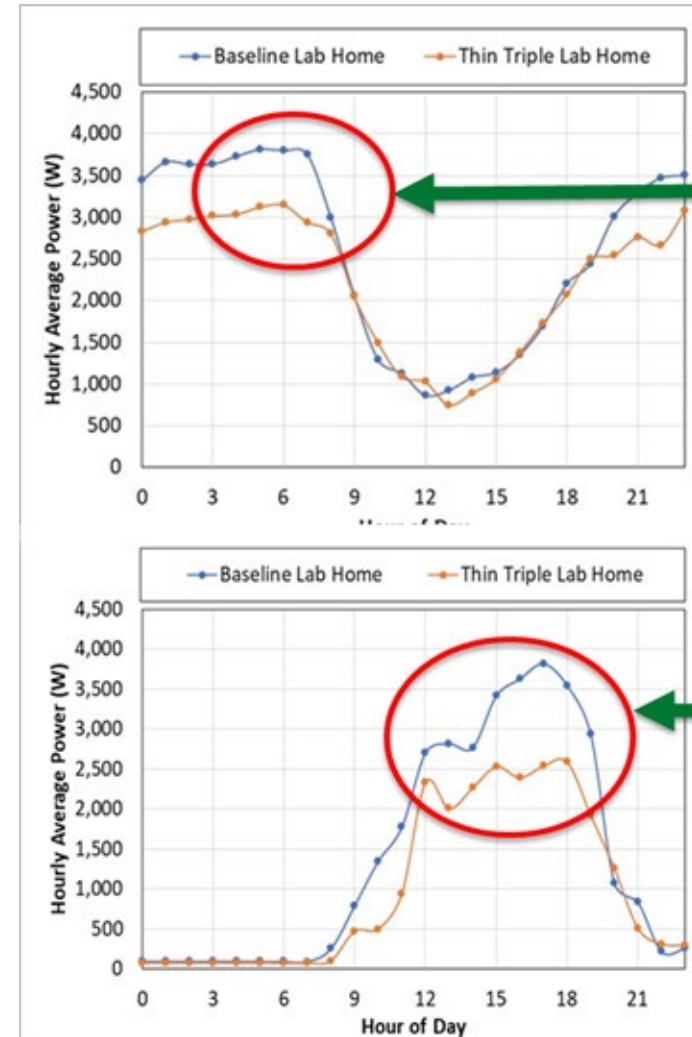
- Improved Energy Efficiency of Window
 - Lower U-factor
 - Lower SHGC
- Air Sealing
- Reduced Outdoor Noise
- Improved Occupant Comfort
- Improved Temperature and Humidity Control
- Improved Indoor Air Quality (allergens, smoke)
- Help building owners comply with Building Performance Standards
- Helps with grid infrastructure issues ...





Grid Benefits from High Performance Windows

- Peak Load Reductions
- Addressing efficiency of existing windows is the fastest way to "buy back" grid capacity.
- Building new power plants is 2x to 4x more expensive and takes years longer than recovering grid capacity through building envelope efficiency.



Winter Avg Peak Electrical Load Reduction: **17%** (650 Watts)

Reduced early morning heating needs
(when heat pumps require auxiliary heat)

Summer Avg Peak Elect. Load Reduction: **33%** (1200 Watts)

Reduced afternoon and early evening cooling load
(coincident with transmission system peak demand)

Thin Triples versus Double-Pane Clear:
PNNL Lab Home Study (Hunt et al. 2021)



DOE Field Studies - Residential



2012-2013 Philadelphia Multi-Family field study (DOE, NAHB, QuantaPanel)

- 2 large 3-story buildings (101 apartments)
- Replaced old clear storm windows over single pane with new low-e storms
- 20% heating and 9% cooling energy use reduction
- Apartment air leakage reduced by 10%



2003-2006 Chicago field study (DOE, HUD, LBNL)

- 6 **weatherization homes** with single-pane windows
- Reduced heating load by 21%
- Payback of 4.5 years
- Home air leakage reduced by 6-8% (15 cfm₅₀ reduction per window)



2011-2013 Atlanta field study (DOE, Larson, QuantaPanel)

- 10 **older single-family homes** with single-pane windows
- ~15% heating savings, 2-30% cooling savings
- Home air leakage reduced by 17% (3.7 cfm₅₀)



2014-2015 Lab Home field test of interior and exterior panels on PNNL Richland, WA campus (DOE, PNNL, NEEA, BPA, Larson, QuantaPanel)

- **Manufactured homes** with metal-framed double-pane clear glass windows
- 11% heating and 8% cooling energy use reduction with application of low-e panels



Minnesota Air Sealing Case Study

- MN Center for Energy and Environment project with Xcel Energy in 2024
- Single family and multifamily residential



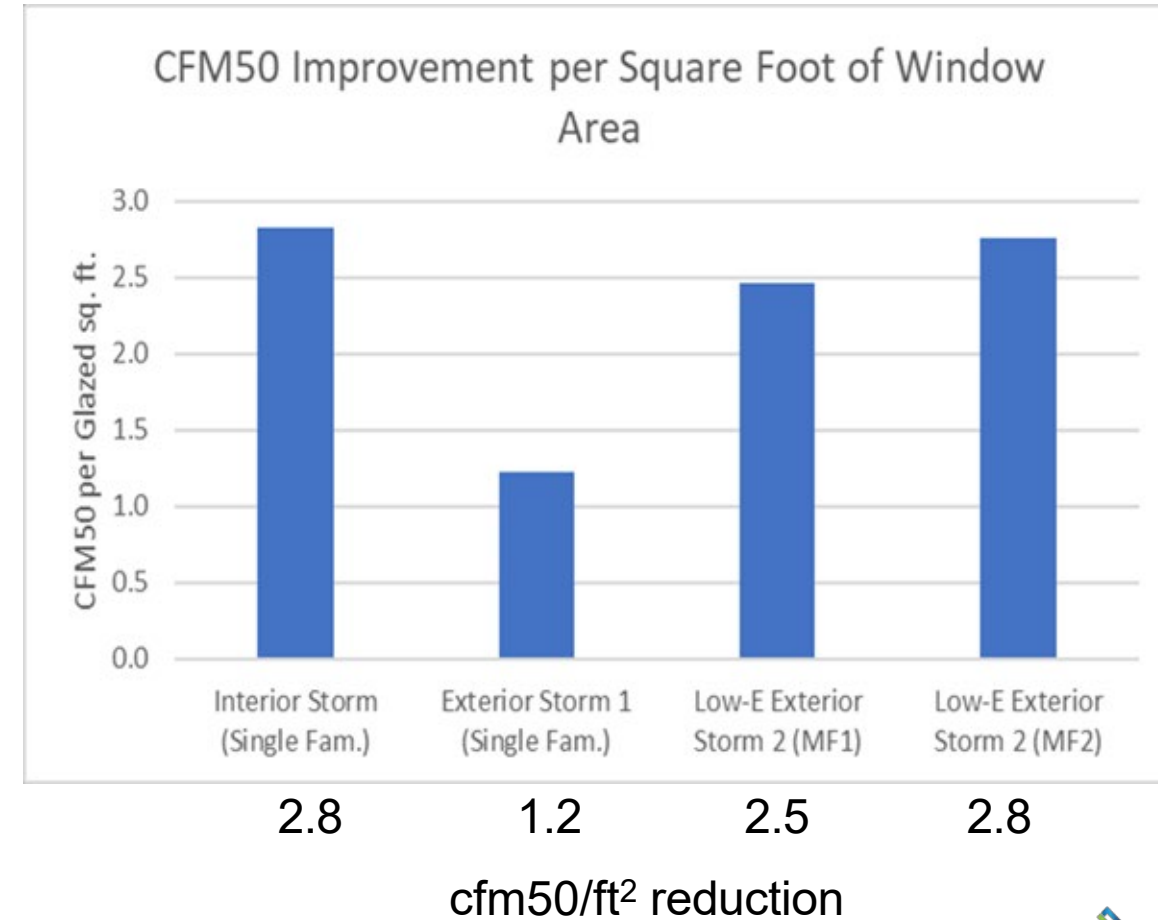
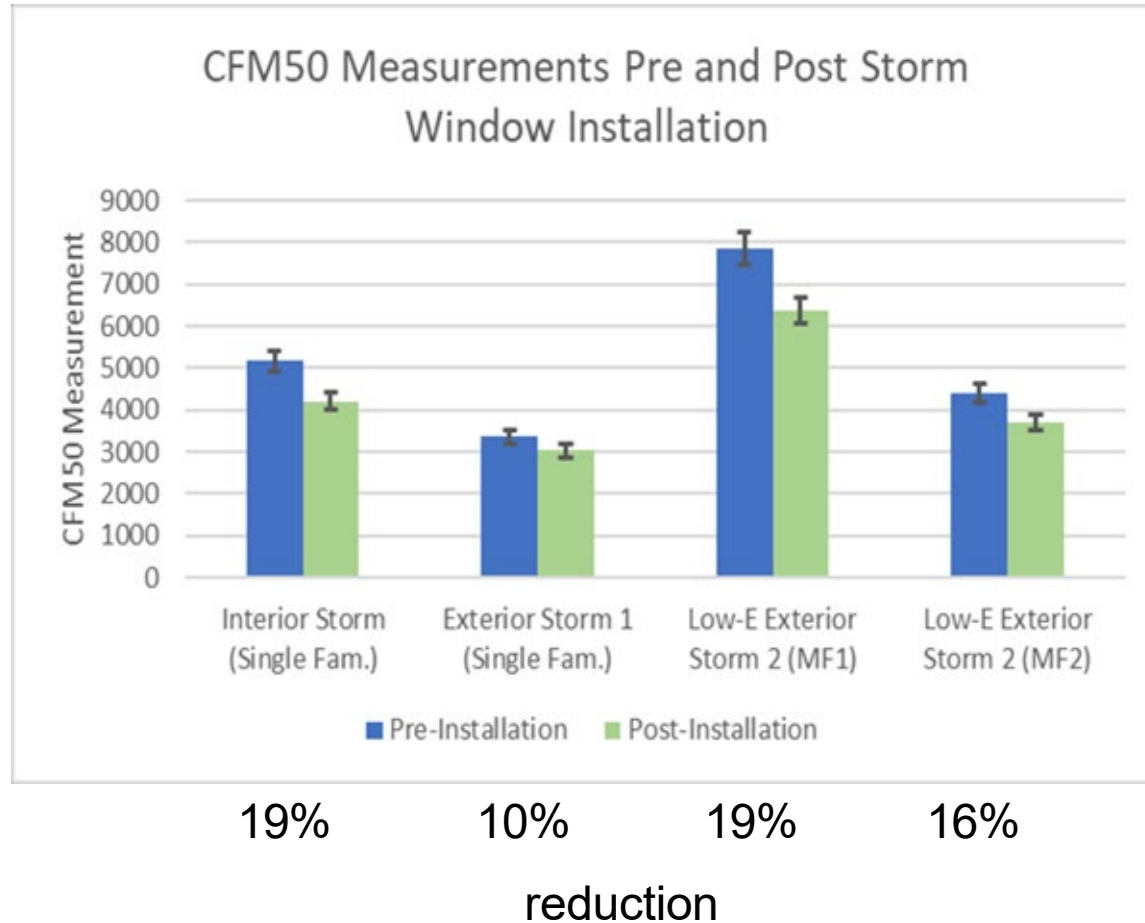
- Measured whole building air leakage after adding secondary windows / panels.
- With *no other air sealing*, see significant air leakage reduction just from addressing the windows.



Minneapolis Air Sealing Results

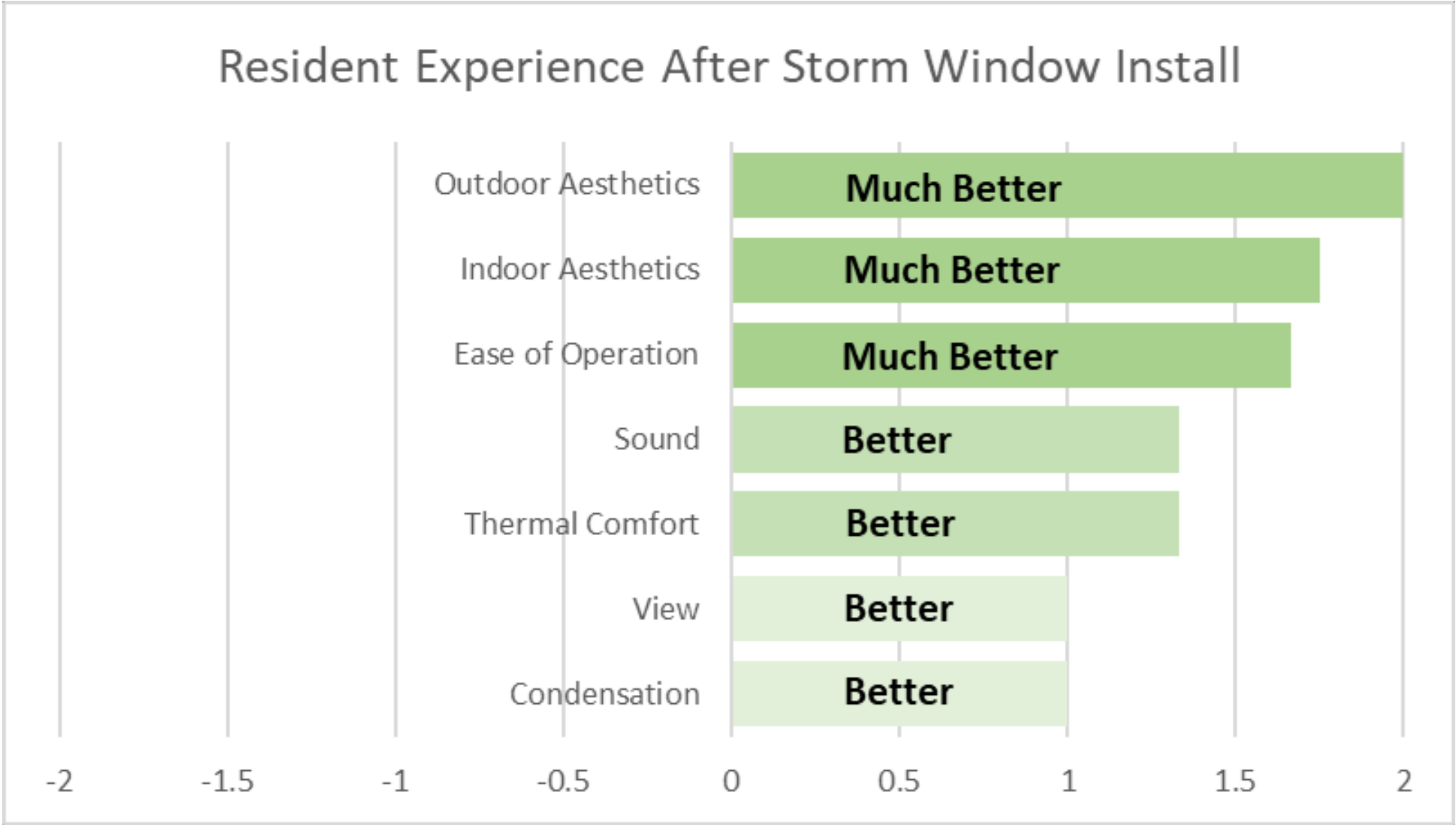
**10-20% whole building
air leakage reduction**

**Approx 2 cfm50
reduction per square foot
of window area**





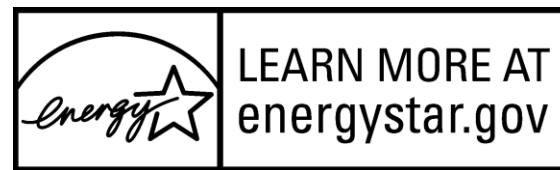
Tenant Feedback



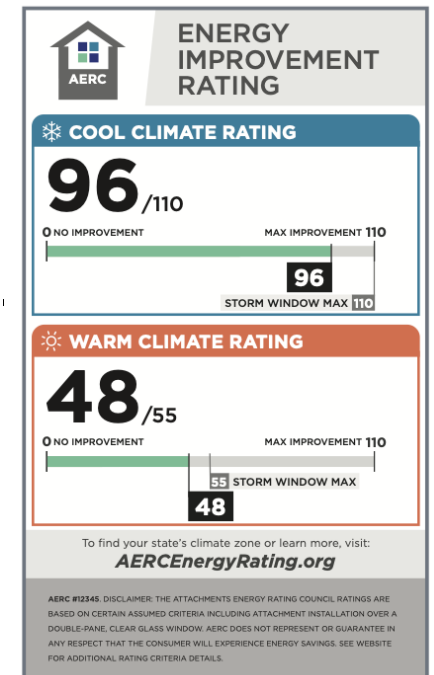


Product Information

- **EPA Energy Star®** program for exterior and interior storm windows
- https://www.energystar.gov/products/storm_windows_0



- **Attachments Energy Rating Council (AERC)** certification program for storm windows and commercial secondary windows.
- <https://aercenergyrating.org/product-search/residential-product-search/>
- <https://aercenergyrating.org/product-search/commercial-product-search/>





Energy-Rated Products



20 Records Found

Filter Your Results

filter by keyword

ENERGY STAR Partner®
☐ Chosen Wood Window Maintenance, Inc (1)
☐ QUANTA Technologies, Inc. (19)

Brand Name®
☐ Chosen (1)
☐ QUANTAPANEL (19)

Product Type®
☐ Exterior Storm Window (10)
☐ Interior Storm Window (10)

ENERGY STAR Storm Window Zone®
☐ Northern (17)
☐ Southern (3)

Operator type®
☐ Fixed/Stationary/Picture (6)
☐ Horizontal Slider (2)
☐ Vertical Slider/Single-Double Hung (12)

Sort by Emissivity

No results for Storm Windows found in (99338) - click here to search other areas >>

QUANTA Technologies, Inc. : QUANTAPANEL - 506-SL Architectural Low-e Storm Window N

Product Type: Exterior Storm Window
Operator type: Vertical Slider/Single-Double Hung
Emissivity: 0.16
Solar Transmittance: 0.74

CLICK FOR PRODUCT DETAILS

QUANTA Technologies, Inc. : QUANTAPANEL - 605-DH Architectural Low-e Storm Window

Product Type: Interior Storm Window
Operator type: Vertical Slider/Single-Double Hung
Emissivity: 0.16
Solar Transmittance: 0.74

CLICK FOR PRODUCT DETAILS

QUANTA Technologies, Inc. : QUANTAPANEL - 502-PW Architectural Low-e Storm Window N

Product Type: Exterior Storm Window
Operator type: Fixed/Stationary/Picture
Emissivity: 0.16
Solar Transmittance: 0.74

CLICK FOR PRODUCT DETAILS

Share Your Results



SAMPLE

AERC ENERGY PERFORMANCE CERTIFICATE COMMERCIAL SECONDARY WINDOW

MANUFACTURER ABC

PRODUCT INFORMATION		GLAZING INFORMATION
SERIES	1000	GLAZING TYPE XYZ GLASS COMPANY XXMM CLEAR (IGDB: 9999)
PRODUCT	XYZ-1	
INSTALLATION POSITION	Interior	
AERC NUMBER	WP-L-ABCDE	
DESCRIPTION	This product is an interior secondary window with clear glass.	
MANUFACTURER URL	https://ManufacturerName.com	

PRODUCT RATINGS INSTALLED OVER BASE WINDOW

RATING	PRIMARY BASELINE WINDOW	WITH SECONDARY WINDOW ADDITION*
U-FACTOR [Btu/hr·ft²·°F]	1.12	0.63
SOLAR HEAT GAIN COEFFICIENT (SHGC)	0.72	0.56
VISIBLE TRANSMITTANCE (VT)	0.77	0.61
AIR LEAKAGE (AL) [cfm/ft²]**	2.0	1.15

For more information, visit AERCEnergyRating.org/Commercial

This certificate indicates that the product has been rated according to strict standards set forth by the Attachments Energy Rating Council (AERC).

DISCLAIMER: THE ATTACHMENTS ENERGY RATING COUNCIL RATINGS ARE BASED ON CERTAIN ASSUMED CRITERIA INCLUDING ATTACHMENT INSTALLATION OVER A SINGLE PANE CLEAR GLASS ALUMINUM FRAME EXISTING WINDOW. AERC DOES NOT REPRESENT OR GUARANTEE IN ANY RESPECT THAT THE CONSUMER WILL EXPERIENCE ENERGY SAVINGS. SEE WEBSITE FOR ADDITIONAL RATING CRITERIA DETAILS.

*Simulated over a single pane clear glass aluminum frame existing window (AERC 1 Baseline Window D).
**Based on AERC 1.2 physical test method.

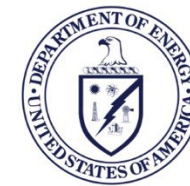




Partnership...

public, private collaborative with DOE,
national labs, utilities, industry, energy
efficiency and market transformation
groups to promote cost-effective, high
performance window solutions

<https://paws.energy>



U.S. DEPARTMENT
of **ENERGY**



CALIFORNIA
ENERGY COMMISSION



For More Information

- Tom Culp, culp@birchpointconsulting.com
- **QuantaPanel:** Jay Reyher, jreyher@quantapanel.com
<https://www.quantapanel.com>
- **Indow Windows:** Sam Pardue, sam@indowwindows.com
<https://indowwindows.com>
- **NEEA:** Blake Ringeisen, BRingeisen@neea.org
- **PAWS:** Walt Zalis, WZalis@Energetics.com
Katie Cort, Katherine.Cort@pnnl.gov
<https://paws.energy>
- **MN-CEE:** Steve Sylvestre, ssylvestre@mncee.org



**Because you don't need brand new windows.
Your windows need brand-new technology.**

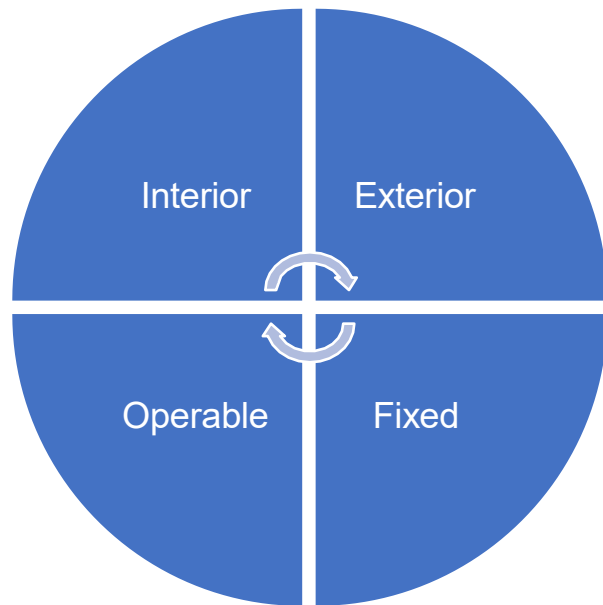
Jay Reyher, CEO
jreyher@quantapanel.com

QUANTAPANEL® is a registered trademark of QUANTA Technologies, Inc.

As an alternative to window replacement, **Secondary Glazing Systems (SGS)** provide the opportunity to engineer a building envelope solution that can be:

- Installed without disrupting the exterior building envelope.
- Optimized for a climate zone, building and HVAC system.
- Either fixed or operable.
- Achieve significant reduction in air infiltration.
- Designed with advanced glazing systems to achieve superior thermal performance.
- Designed to enhance acoustical performance and reduce exterior noise transmission.
- Integrated with shade systems to optimize comfort and lighting.
- Integrated with shade systems to provide variable solar control to harvest or deflect solar energy.
- AI-automated to dynamically control and optimize energy, comfort, and lighting.
- Designed to turn your existing windows into smart windows.
- In most cases at or below the cost of replacement.

Why replace your windows when you can do so much more?



QUANTAPANEL 500 Series (exterior)

QUANTAPANEL 600 Series (interior)

QUANTAPANEL 700 Series (interior/exterior)

- Fixed v. Operable (horizontal/vertical sliding).
- Method of attachment (application dependent).
- Attachment specific criteria (e.g., depth, substrate).
- Prime window size (govern product selection).
- Color/finish (AAMA 2604, over 200 colors).

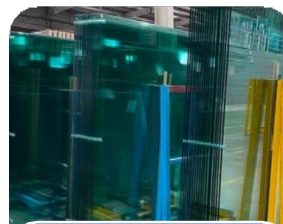
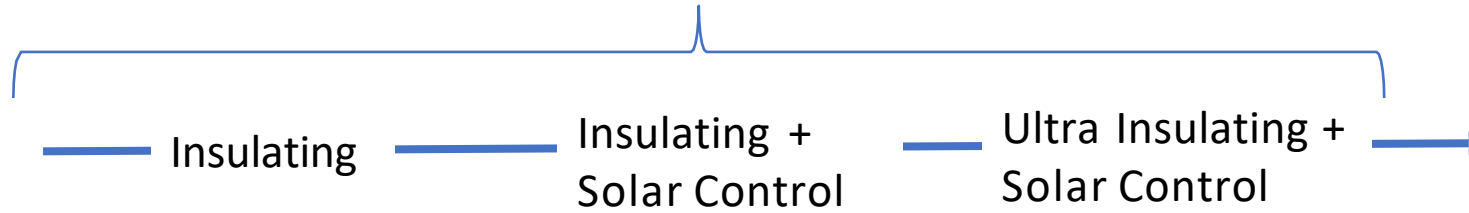
SGS

Glazing

Shading

Automation





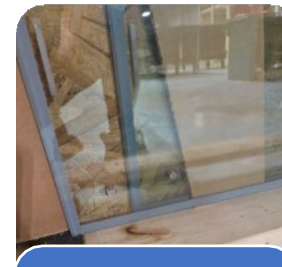
Low-e

- Energy Advantage
- IS20
- I89



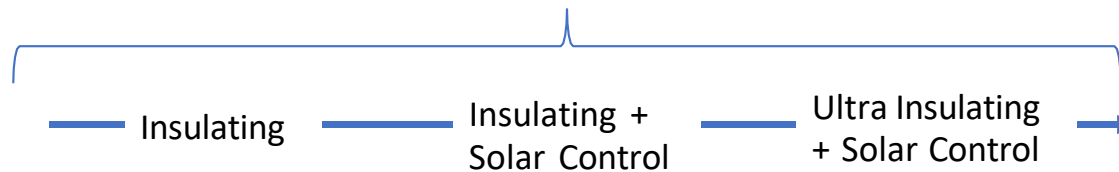
NXLite low-e

- L 80
- S 75
- S 60



Luxwall VIG

- 8 mm,
- 10 mm



COG	PILKEA	NxLite L80	NxLite S75	NxLite S60	Enthermal
U-Value	0.358	0.335	0.317	0.313	0.050
SHGC	0.68	0.58	0.52	0.37	0.25
VT	0.75	0.74	0.69	0.57	0.56

Center of Glass Performance
(over 6 mm clear single glazing)



← Low-E Options → VIG

QUANTAPANEL® 602-PW
(interior, fixed, removable sash)

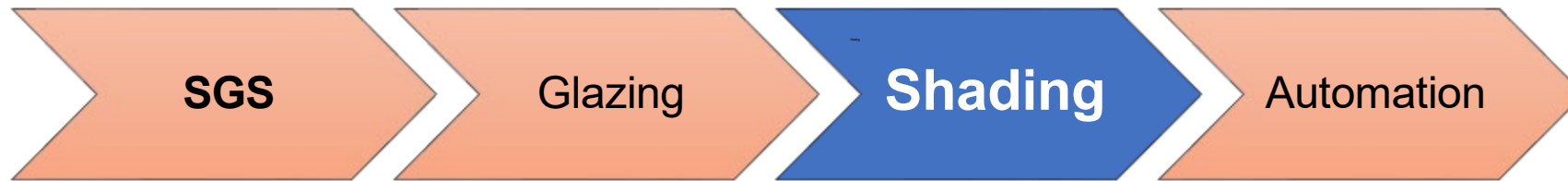
	EXISTING	PILKEA(*)	NxLite L80	NxLite S75	NxLite S60	Enthermal
U-Value	1.010	0.480	0.465	0.453	0.450	0.240
SHGC	0.71	0.55	0.47	0.42	0.30	0.19
VT	0.77	0.60	0.59	0.55	0.46	0.44
Air Leakage	2.00	0.04	0.04	0.04	0.04	0.04

QUANTAPANEL® 605-DH
(interior, double hung, no screen)

	EXISTING	PILKEA(*)	NxLite L80	NxLite S75	NxLite S60	Enthermal
U-Value	1.010	0.500	0.485	0.473	0.470	
SHGC	0.71	0.54	0.46	0.42	0.30	
VT	0.77	0.59	0.58	0.54	0.45	
Air Leakage	2.00	0.39	0.39	0.39	0.39	

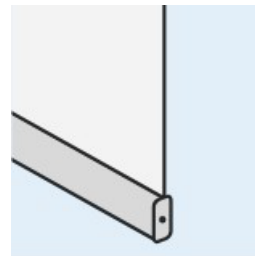
Combined Whole Assembly Performance over AERC Baseline Window D
(single pane clear glass, nonthermal commercial metal frame)

(*) AERC Certified.

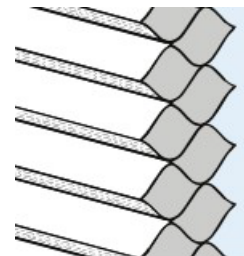


Motorized

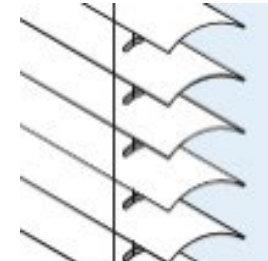
- **Power**
 - AC
 - DC/POE
 - Battery + PV
- **Control**
 - Wireless
 - Hardwired
 - Serial
 - POE



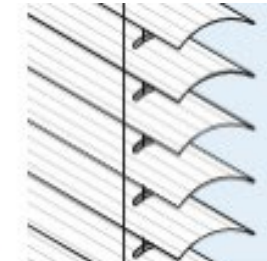
Solar Roller Shades



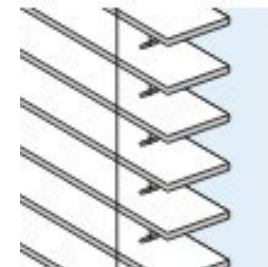
Cellular Shades



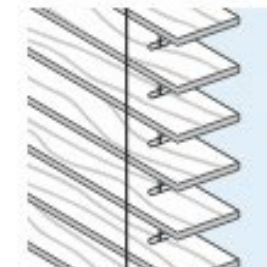
Aluminum Blinds



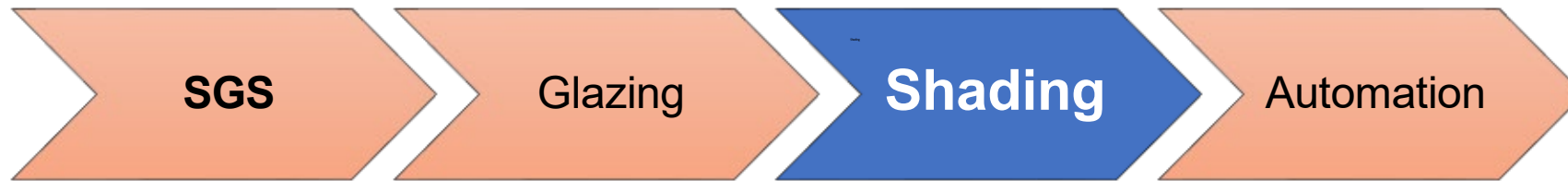
Vinyl Blinds



Faux Wood Blinds

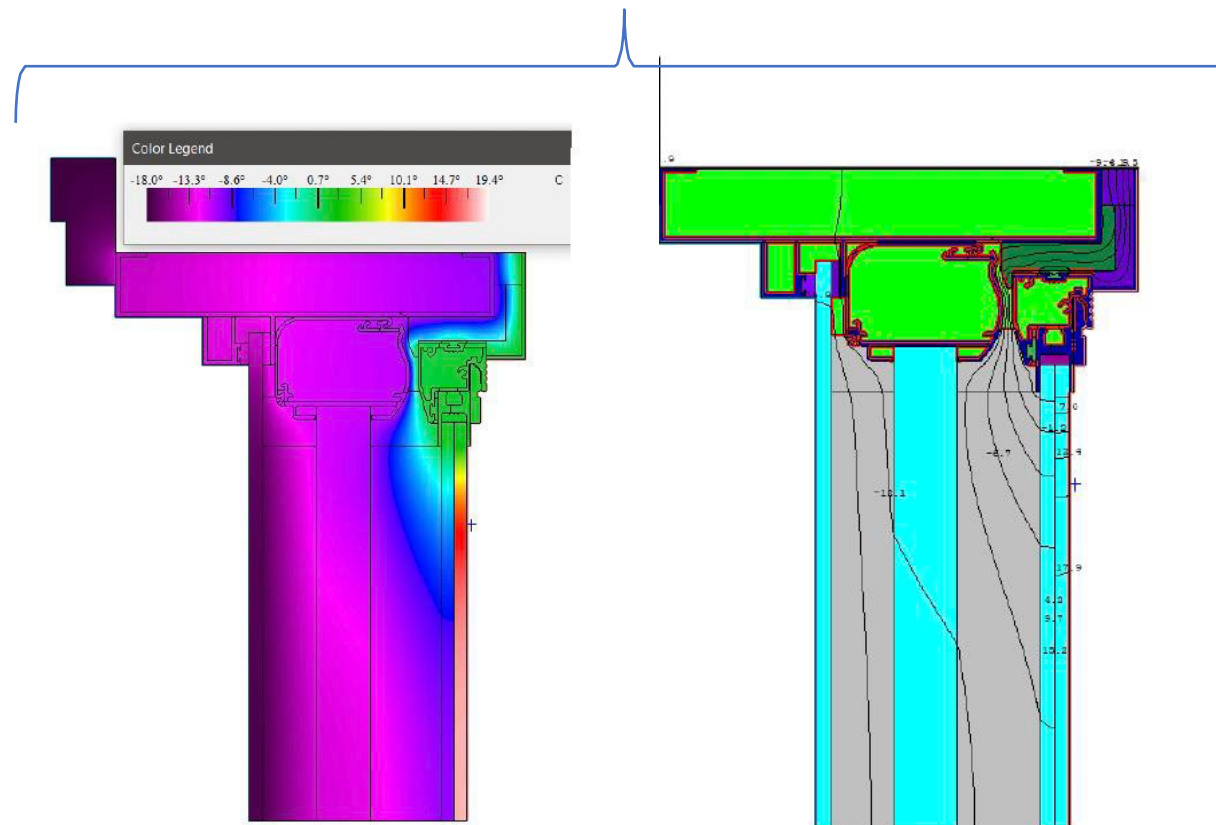


Wood Blinds



Motorized

- Power
 - AC
 - DC/POE
 - Battery
- Control
 - Wireless
 - Hardwired
 - Serial
 - POE





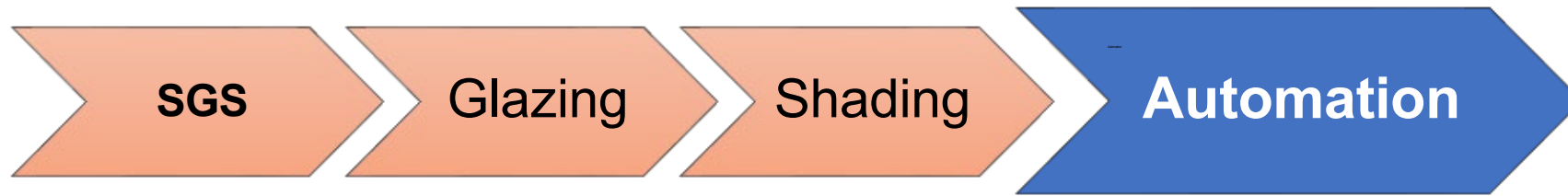
QUANTAPANEL® 602-PW
(interior, fixed, removable sash)

	EXISTING	PILK EA(*)	Tilt Blind (1" aluminum)		Cellular Shade	
			Open ➡	Closed	Open ➡	Closed
U-Value	1.010	0.480	0.480	0.400	0.480	0.410
SHGC	0.71	0.55	0.55	0.09	0.55	0.18
VT	0.77	0.61	0.61	0.00	0.61	0.01
Air Leakage	2.00	0.04	0.04	0.04	0.04	0.04

	EXISTING	Enthermal	Tilt Blind (1" aluminum)		Cellular Shade	
			Open ➡	Closed	Open ➡	Closed
U-Value	1.010	0.240	0.240	0.220	0.240	0.220
SHGC	0.71	0.19	0.18	0.02	0.18	0.03
VT	0.77	0.44	0.42	0.00	0.42	0.01
Air Leakage	2.00	0.04	0.04	0.04	0.04	0.04

Combined Whole Assembly Performance over AERC Baseline Window D
(single pane clear glass, nonthermal commercial metal frame)

What is the objective for the building (building envelope)?



- Energy Demand Management
- Wellness
- Comfort
- View

**Astronomical
Scheduler**



**Sensor
Control**



**Full
Automation
Control**





Forest Park Apartments (IL)

Utility Program

- **AMEREN Illinois utility program.**
- Income Qualified utility program.
- Product: **QUANTAPANEL 605-DH IGS,**
QUANTAPANEL 607-SL IGS.
- Qualify under two IL TRMs:
low-e storm windows (#5.6.7) based on Energy Star program,
and air sealing (#5.6.1).
- Feedback: all positive utility & residents
(comfort, energy savings, operable, safer).

Opportunity for other
utilities to replicate





◀ **Wetherill School**
 historic adaptive reuse
 apartments (20u, 2015).
 QUANTAPANEL 604-DH IGS.

Zion Garden Apartments ▶
 existing apartments (101u)
 replace triple-tracks (2013),
 existing metal frame window
 QUANTAPANEL 504-DH IGS.

Commercial Multifamily (PA)

Energy Performance



Zion Garden Performance Improvement¹

- 20% energy reduction in heating (gas),
- 9 -15% energy reduction in cooling,
- 10% reduction in overall unit air infiltration.



◀ 777 Main Street (Hartford, CT)



▲ 55 Elm Street (Hartford, CT)



French Apartments (New York) ▲



- ▲ **777 Main Street** (Hartford, CT)
26 story, mixed use, 285 u (2014).
- U-Factor: 1.12 → 0.35
 - SHGC: 0.55 → 0.39
 - LEED Platinum certified.
 - Energy Star Score: 80-83



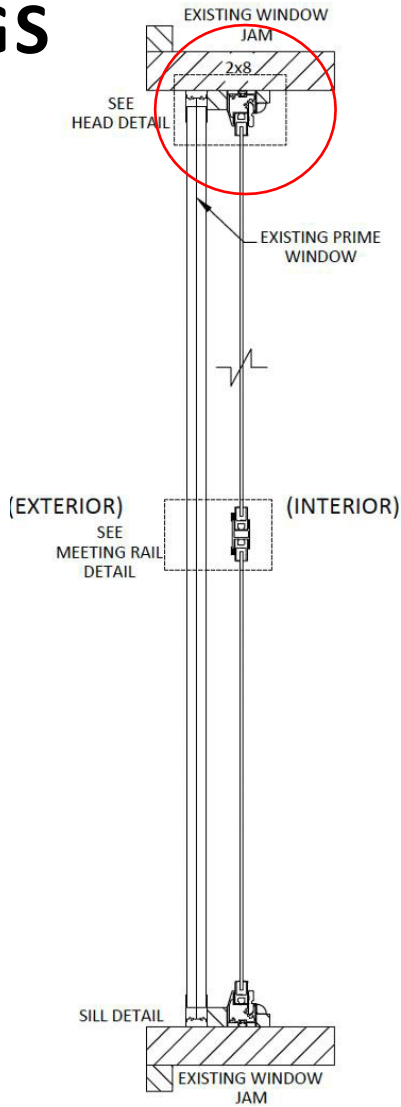
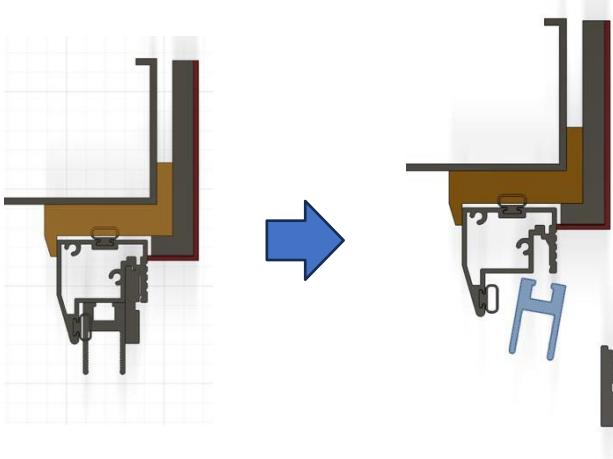
High Rise Multifamily (CT, NY)

Adaptive Reuse & Energy Performance



▲ **55 Elm Street** (Hartford, CT), 2025

QUANTAPANEL 602-PW IGS



High Rise Multifamily (CT, NY)

Adaptive Reuse & Energy Performance



▲ 55 Elm Street (Hartford, CT), 2025



High Rise Multifamily

Performance Potential, Adaptive Reuse

QUANTAPANEL 602-PW IGS
With Luxwall Entermal (10 mm).



Field Test Data

	AREA	U-Value
Prime Window	40.743	0.796
QUANTAPANEL VIG	37.745	0.085



**Because you don't need brand new windows.
Your windows need brand-new technology.**

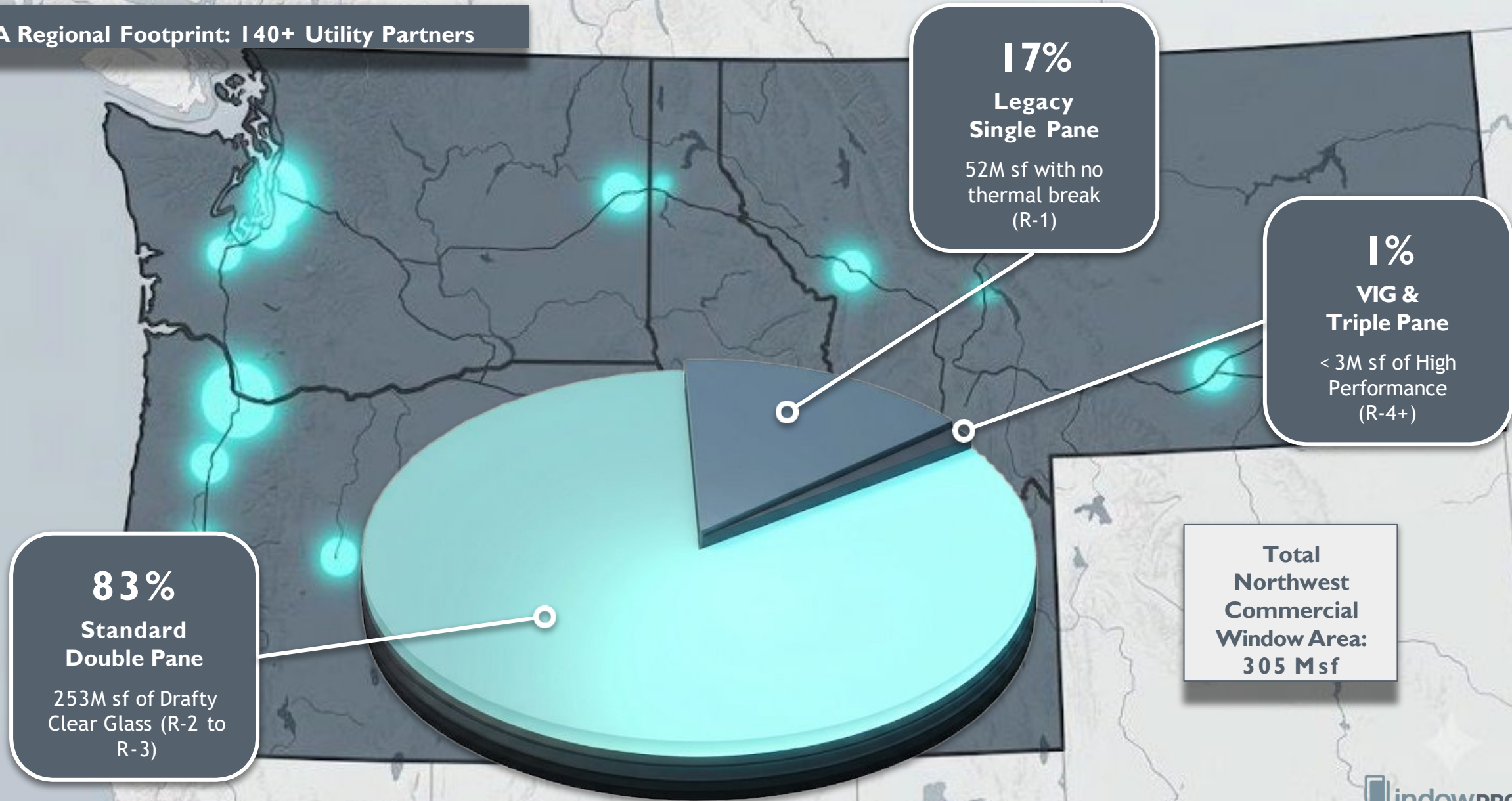


Scaling the Envelope: Cracking the Physics and Market Systems of Commercial Secondary Glazing

R Value, Inc. DBA Indow Confidential Information

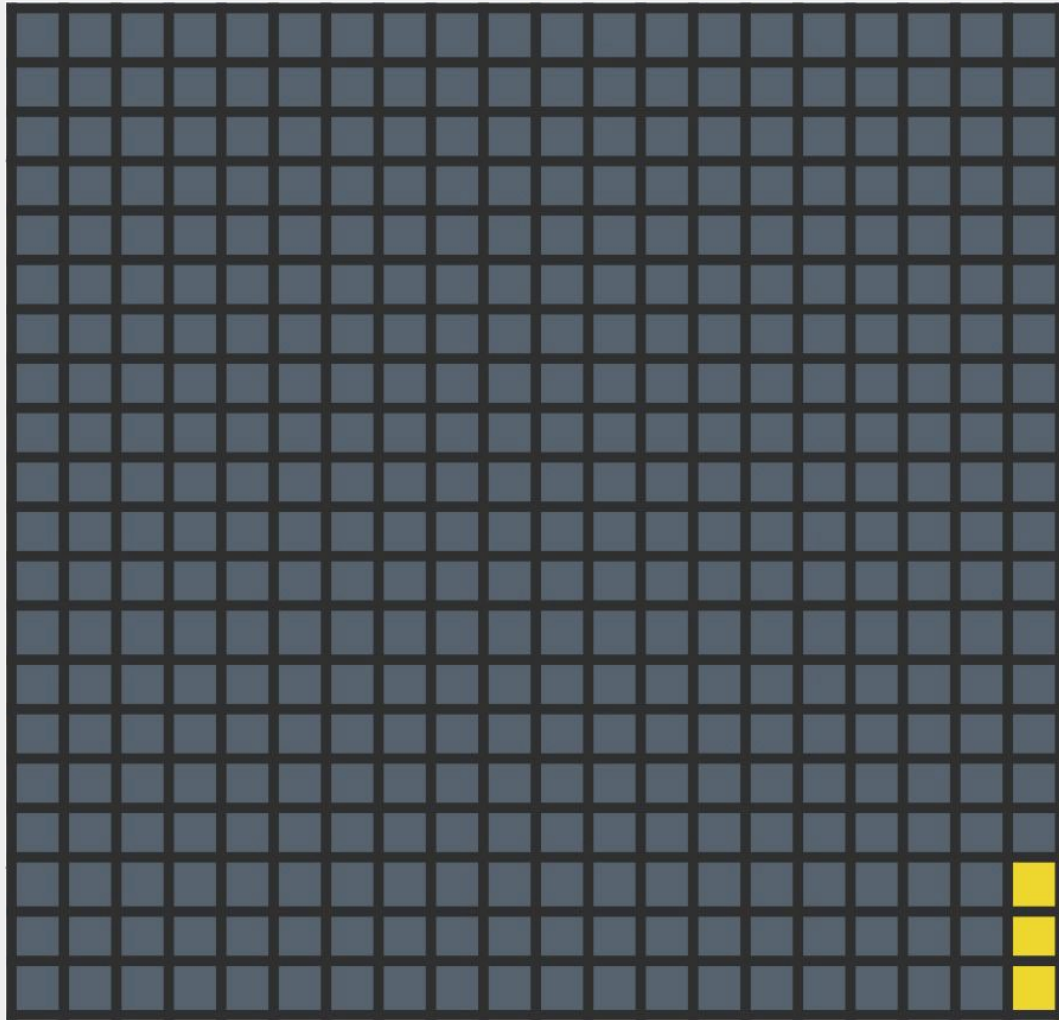
Total NW Commercial Window Area: 305 M sf

NEEA Regional Footprint: 140+ Utility Partners



Window Replacement Doesn't Scale

2 Billion SQ FT of Commercial Single-Pane Glass



Only 0.3% Replaced Annually

What does **Secondary Glazing** need to scale?

- ❑ Deliver a compelling ROI which motivates financial investors
- ❑ Provide excellent aesthetics
- ❑ Manage risk

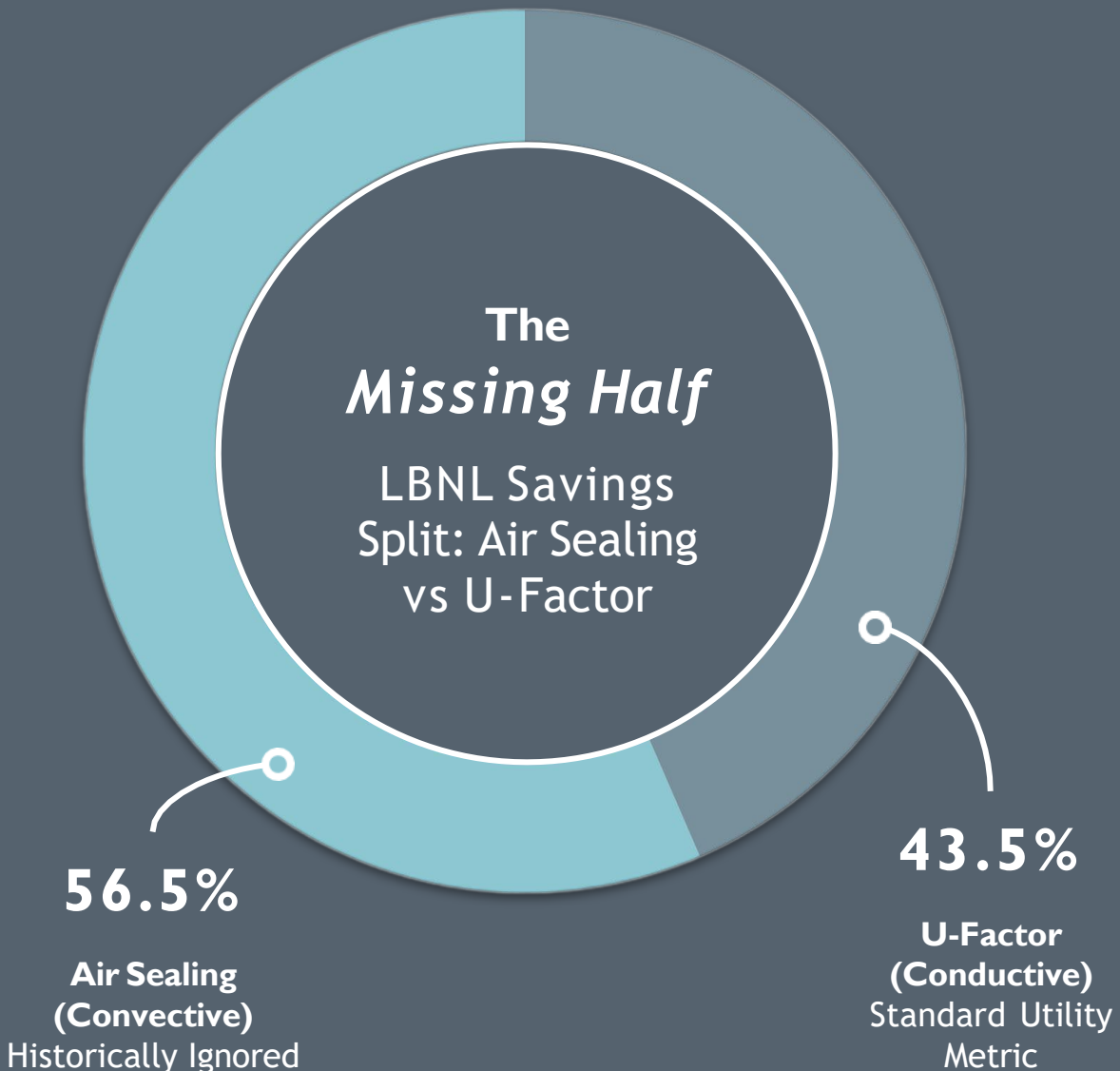
“

We realized if we fixed our window problem, we could lease the space for market rate. The return on the investment has been outstanding.

”

— Mike Larkin
Elliot Associates

The "Missing Half" of Envelope Savings



Lawrence Berkeley National Laboratory modeling

Air Sealing is Vital

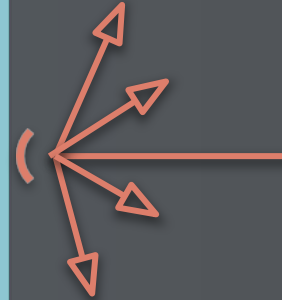
Lawrence Berkeley National Laboratory (LBNL) energy modeling showed air leakage sealing can account for more than half (55% to 58%) of overall window energy savings. Failing to count air sealing dramatically under values secondary glazing technology.

CEE Minneapolis Blower Door Test Results:

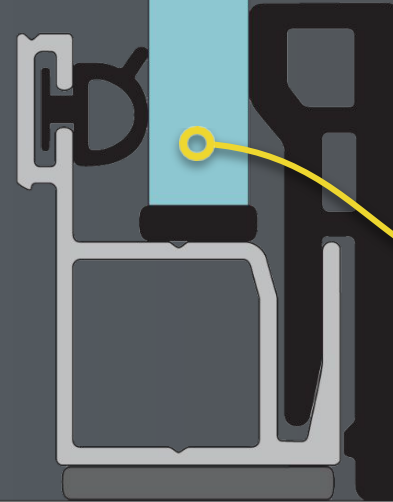
10% - 20%
reduction in
whole-building air leakage

Unparalleled Performance

**Air Infiltration
Reduced By 99%+**



**Radiant Energy Loss
Reduced 94%**



SECONDARY GLAZING
IndowPRO Insert with
High-Performance Glass or Acrylic

Efficient Fulfillment Delivers ROI

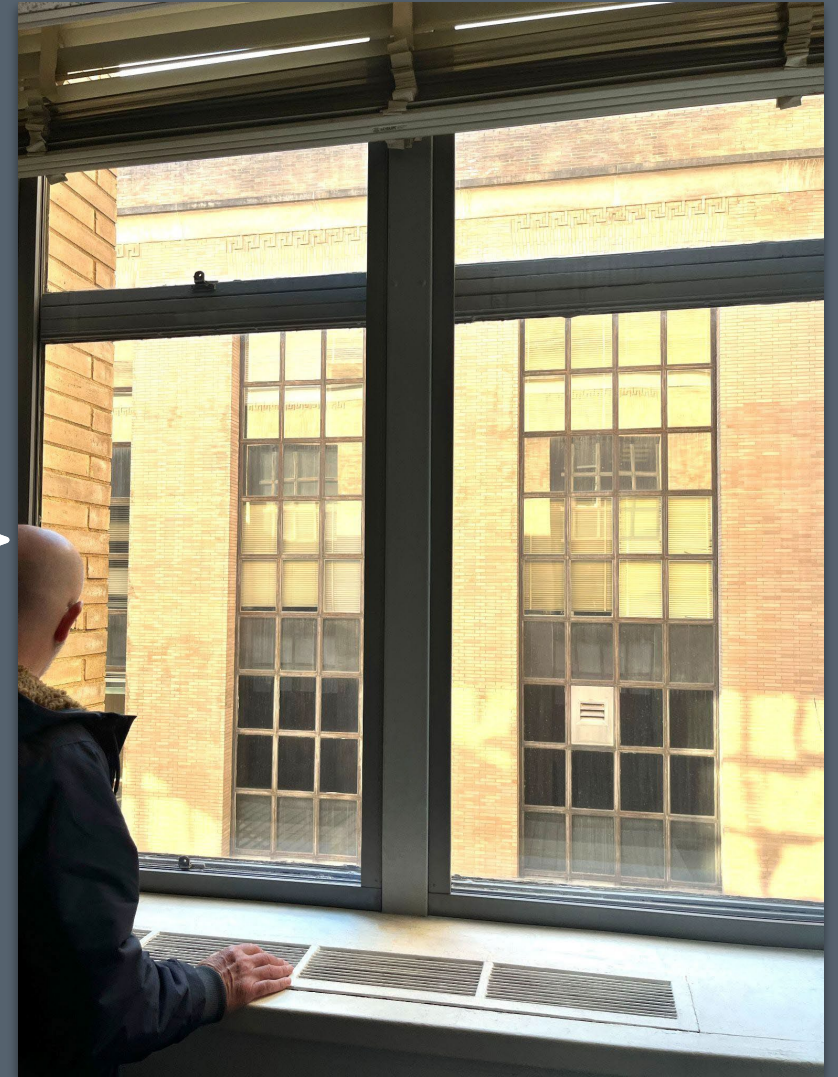


Indow Factory

IndowPRO's knock-down design
slashes shipping, margin, &
labor costs



Glass Factory



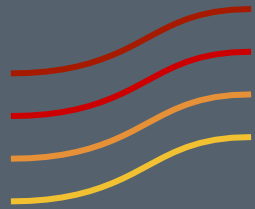
Customer Building

The Best Solution: Integrated Systems

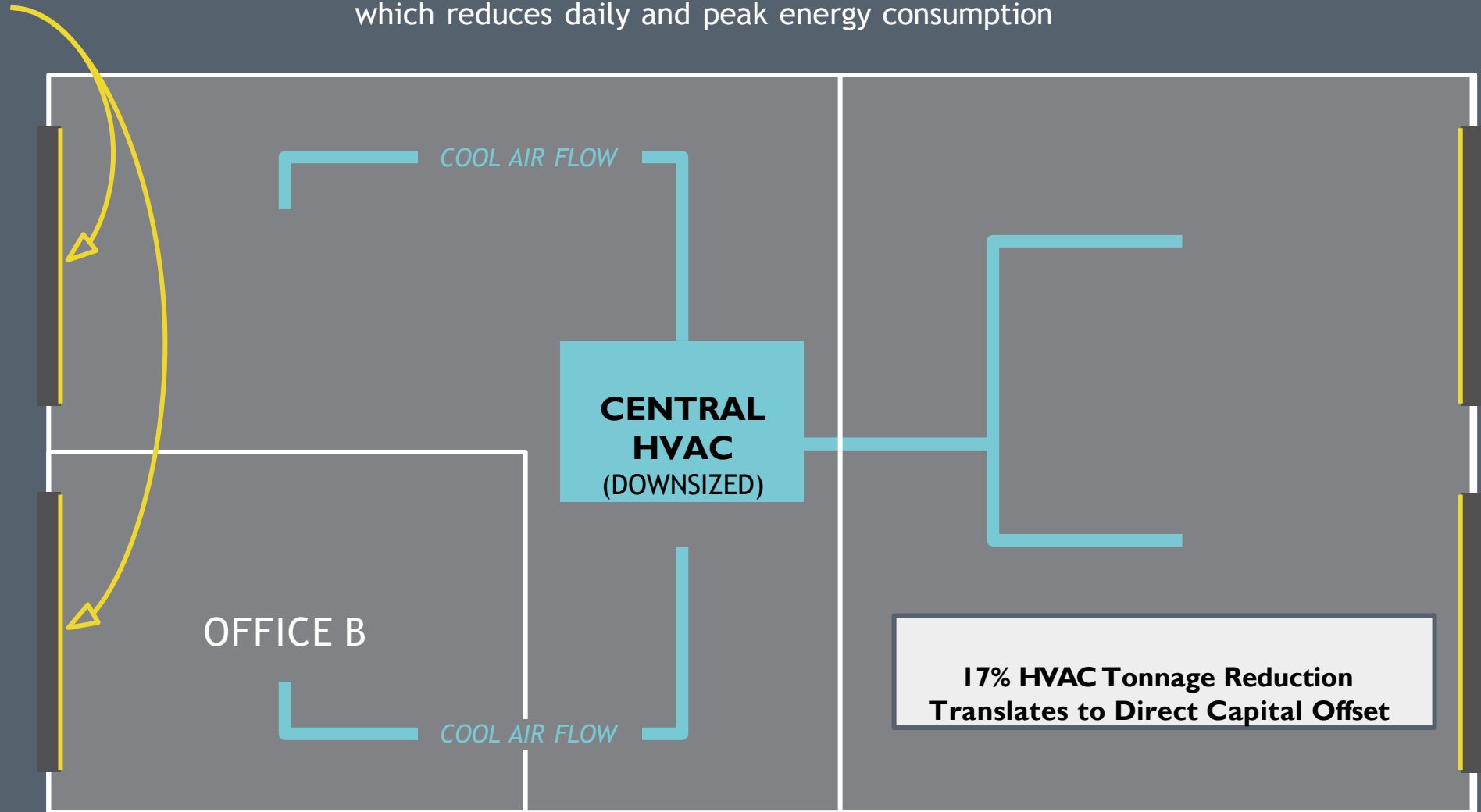
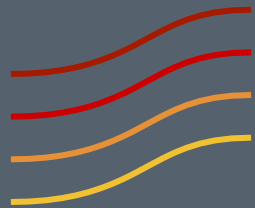
Downsized HVAC Capital Offset

HVAC tonnage reductions pay for secondary glazing which reduces daily and peak energy consumption

INDOWPRO
THERMAL
BOUNDARY



SUMMER
HEAT LOAD
BLOCKED

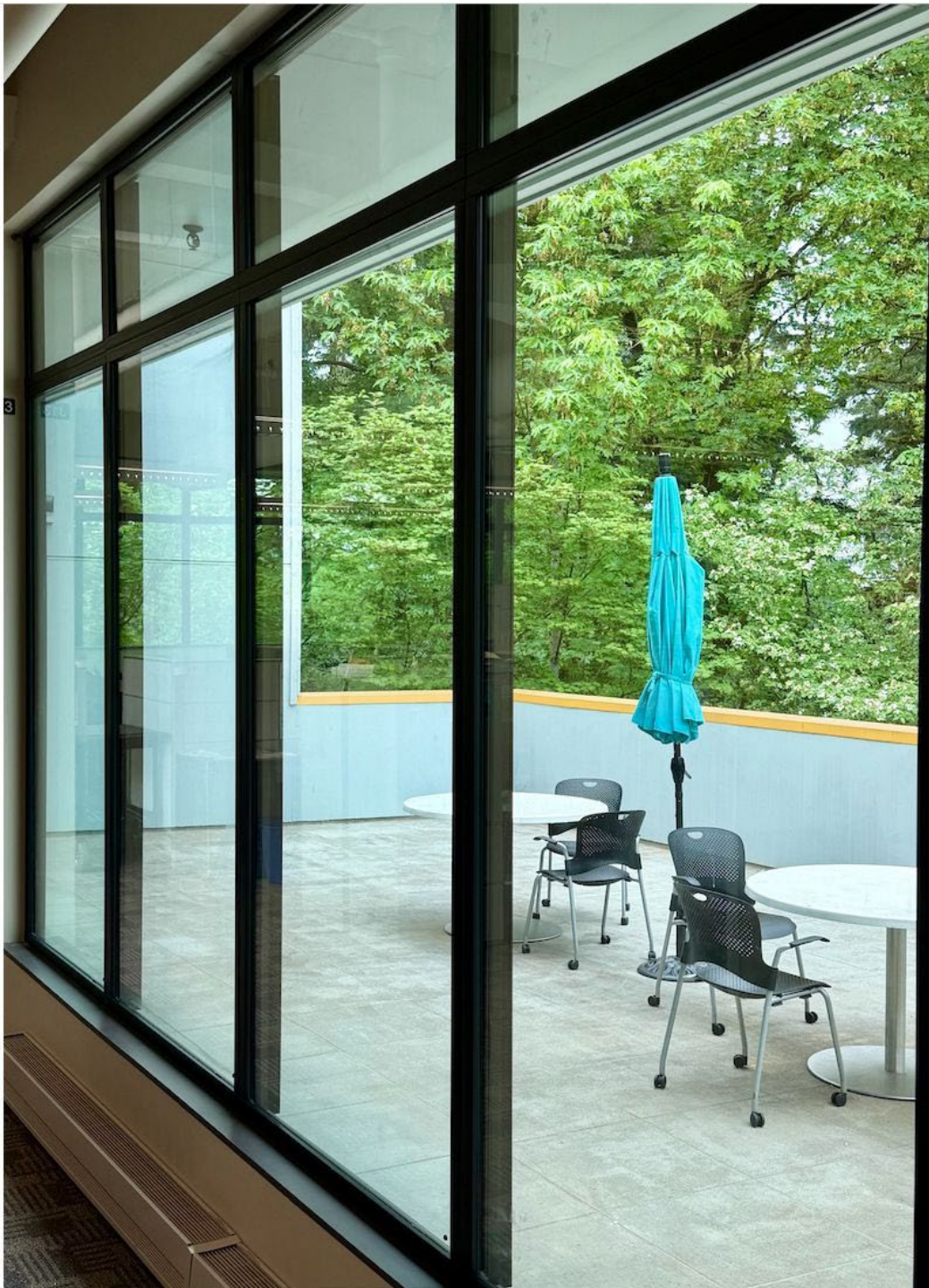


Job Site & Aesthetic Wins

Pilot installations de-risk projects for both the glazing contractors and Fortune 500 clients.

- ❑ Knock down systems offer material flow and customization options.
- ❑ Specialized, lower cost teams for material movement and frame installation.





Integrating High-Performance Vacuum Insulated Glass (VIG)

Overall R-13 / U-.077 in grid mullion based on field measurements by Building Innovations Technology.

VIG secondary glazing decouples primary glazing from conditioned interior, dramatically raising condensation and thermal risks.

Technical Reference Manual (TRM) Update

Proposed Deemed Air-Sealing Savings for Secondary Glazing

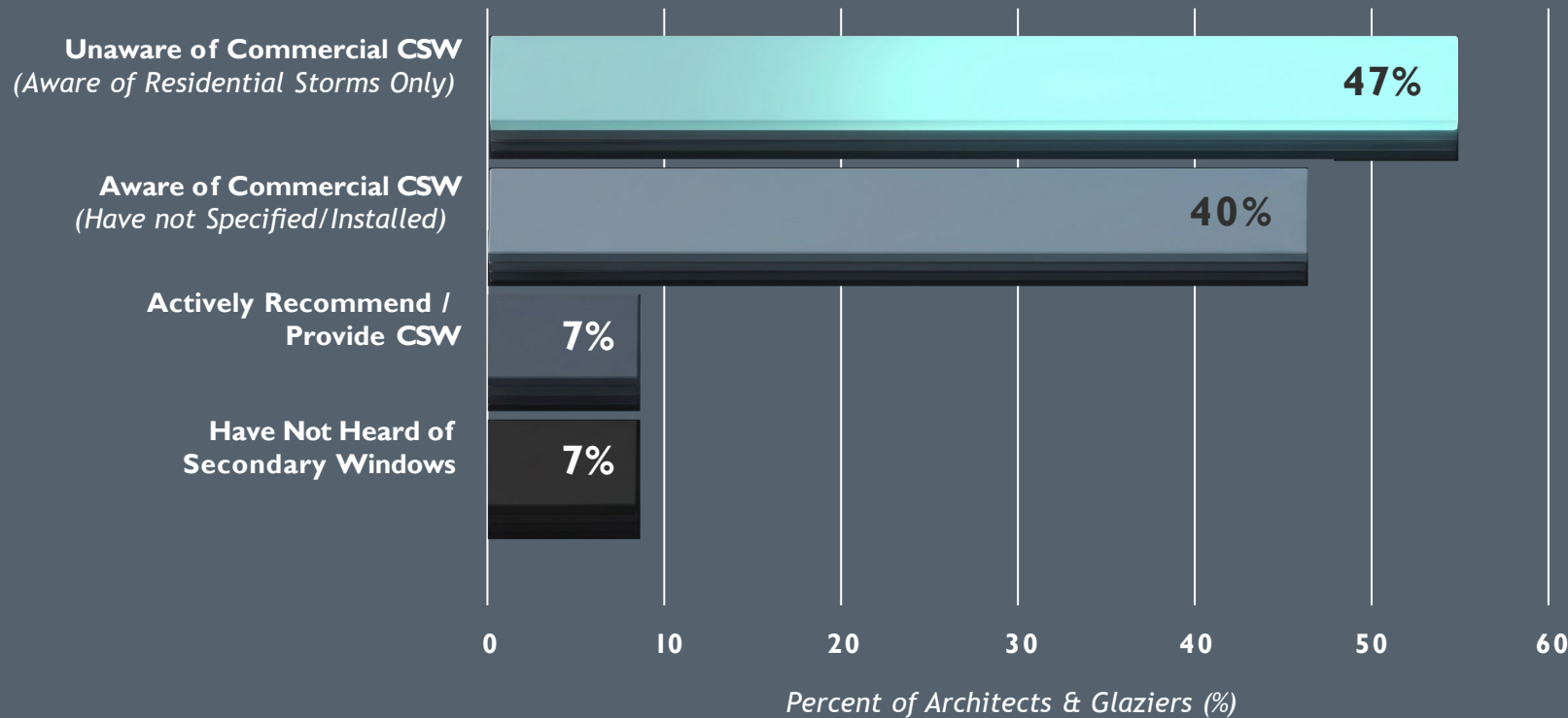
Deemed improvement per glazed area	2.5+ CFM 50 / sq. ft	LBNL Simulation Modeling & CEE Minneapolis Field tests
Deemed improvement per lineal perimeter	1.9+ CFM50 / lineal ft.	PNNL Field Valuations & AERC Certifications

UTILITY PROGRAM DESIGN

Standardizing these inputs will increase modeled secondary glazing cost-effectiveness & drive program participation.

Creating Market Momentum

The Awareness Bottleneck



CRITICAL BARRIER

93% of regional market specifiers do not actively recommend CSWs due to awareness gaps & perceived liability

Pacific Northwest National Laboratory

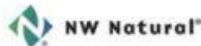
12-MONTH GOAL

100 Deployments across WA, OR, ID, & MT to establish local proof-points and glazier momentum



Commit to Scaling

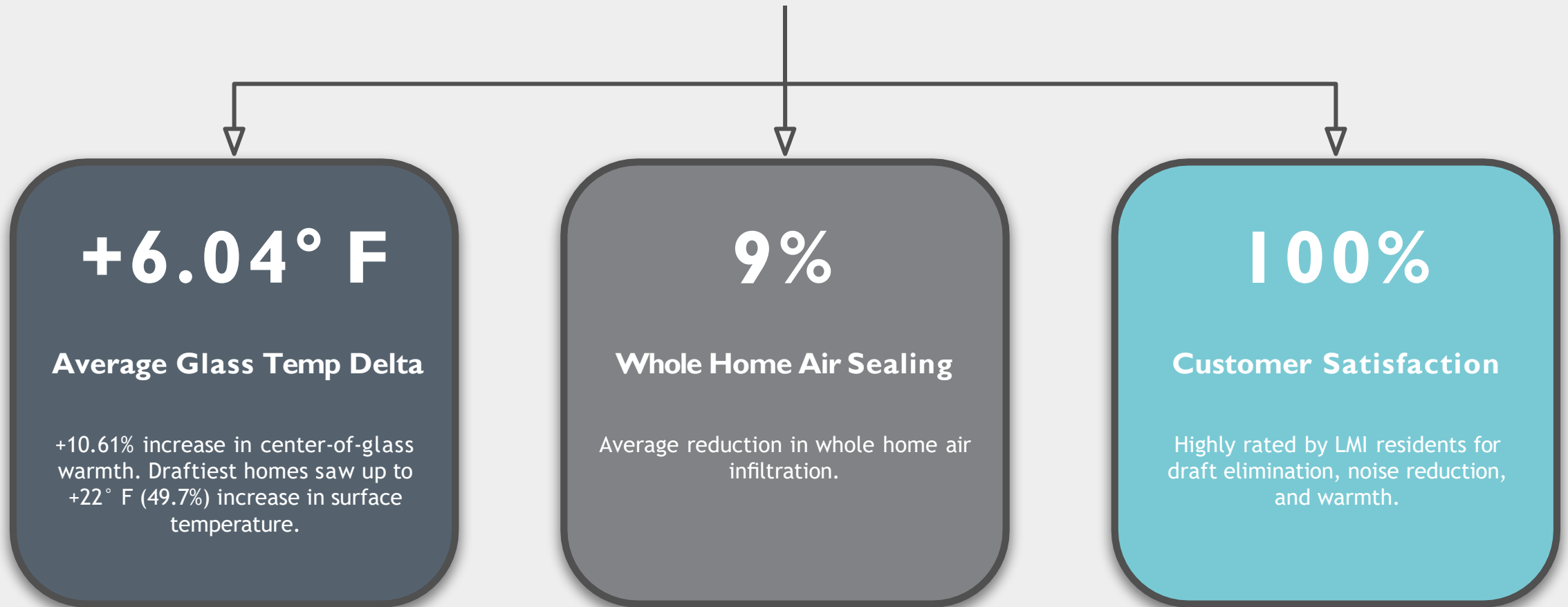
- **Standardize the air-sealing benefit** in your regional TRM measures
- **Incorporate secondary glazing** into multi-measure building retrofit packages.
- **Leverage secondary windows** as an equitable weatherization tool to slash energy vulnerable communities.



Backup

IndowONE Field Validation: CLEAResult Michigan Pilot

59 Manufactured Homes | 618 Indow Window Inserts Installed



CLEAResult / Michigan Community Action Income Qualified Pilot Report (Climate Zone 5)



For More Information

- Tom Culp, culp@birchpointconsulting.com
- **QuantaPanel:** Jay Reyher, jreyher@quantapanel.com
<https://www.quantapanel.com>
- **Indow Windows:** Sam Pardue, sam@indowwindows.com
<https://indowwindows.com>
- **NEEA:** Blake Ringeisen, BRingeisen@neea.org
- **PAWS:** Walt Zalis, WZalis@Energetics.com
Katie Cort, Katherine.Cort@pnnl.gov
<https://paws.energy>
- **MN-CEE:** Steve Sylvestre, ssylvestre@mncee.org

Thank You!

