



ENERGY STAR® for Windows, Doors, and Skylights

Draft 1 Criteria and Analysis Report
Stakeholder Meeting

WILL BEGIN SHORTLY

For audio, call **1-877-423-6338** and enter participant code **277680#**

- Please mute your lines
- Do NOT put the conference call on hold
- All lines will be muted for the duration of the webinar
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ENERGY STAR® for Windows, Doors, and Skylights

Draft 1 Criteria and Analysis Report
Stakeholder Meeting

August 27, 2012



Doug Anderson

U.S. Environmental Protection Agency

Project Manager

ENERGY STAR Window, Door, and Skylights

Welcome



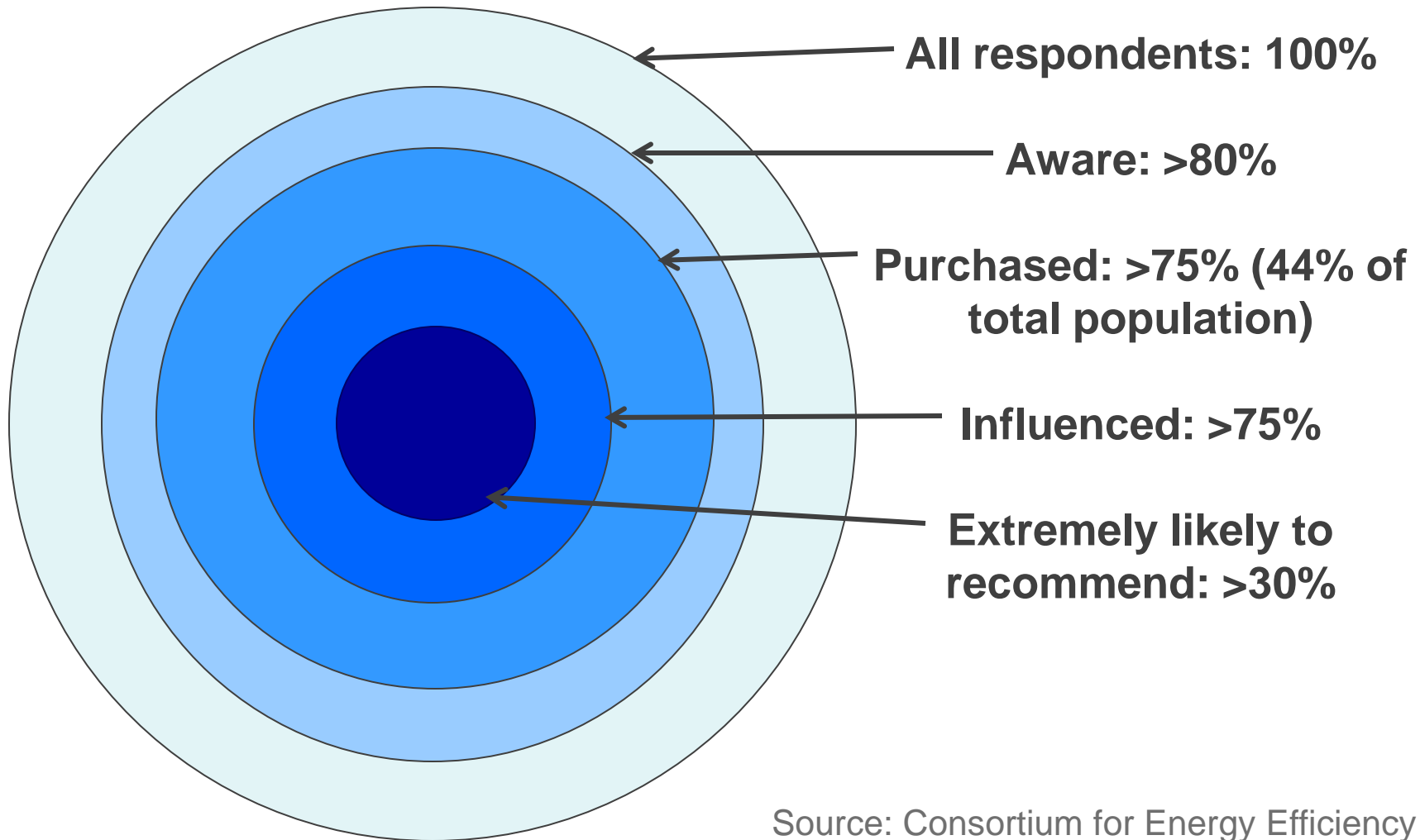
- **Thank you for participating**
- **Please mute phones and laptops**
- **Please hold questions until the end of the day**
- **Clarifying questions about slides may be asked during the presentations**
- **Meeting is not being recorded**
- **Presentations will be put on the www.energystar.gov/windows web site**

Agenda



- **Brand Recognition**
- **Code versus ENERGY STAR**
- **Guiding Principles**
- **Market Share**
- **Windows Criteria Over Time**
- **Program Elements Considered for Adoption**
- **Program Elements Remaining Unchanged**
- **New Additions to Program Requirements**

ENERGY STAR: A Powerful Brand

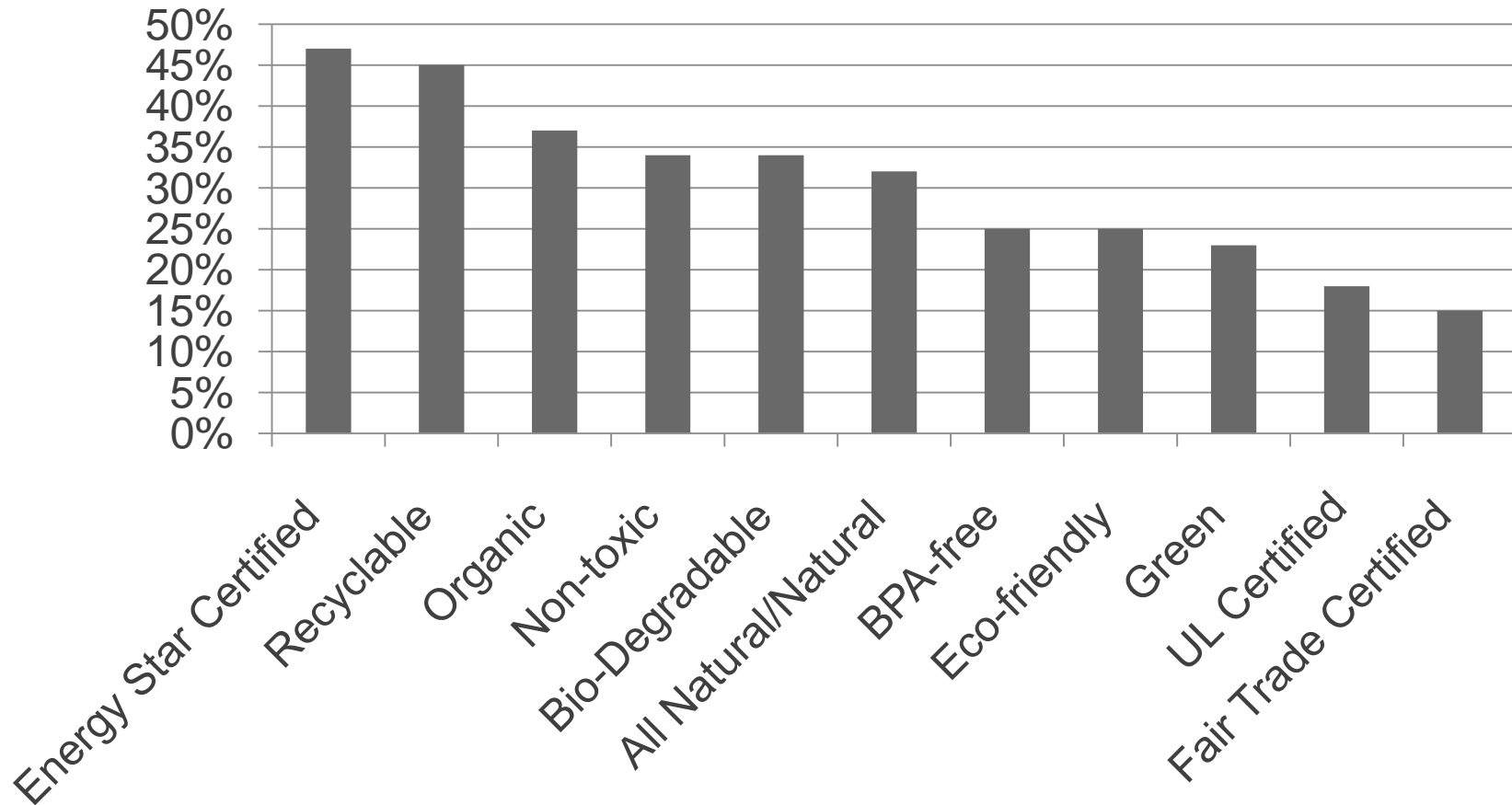


Source: Consortium for Energy Efficiency
(CEE) Household Survey 2011

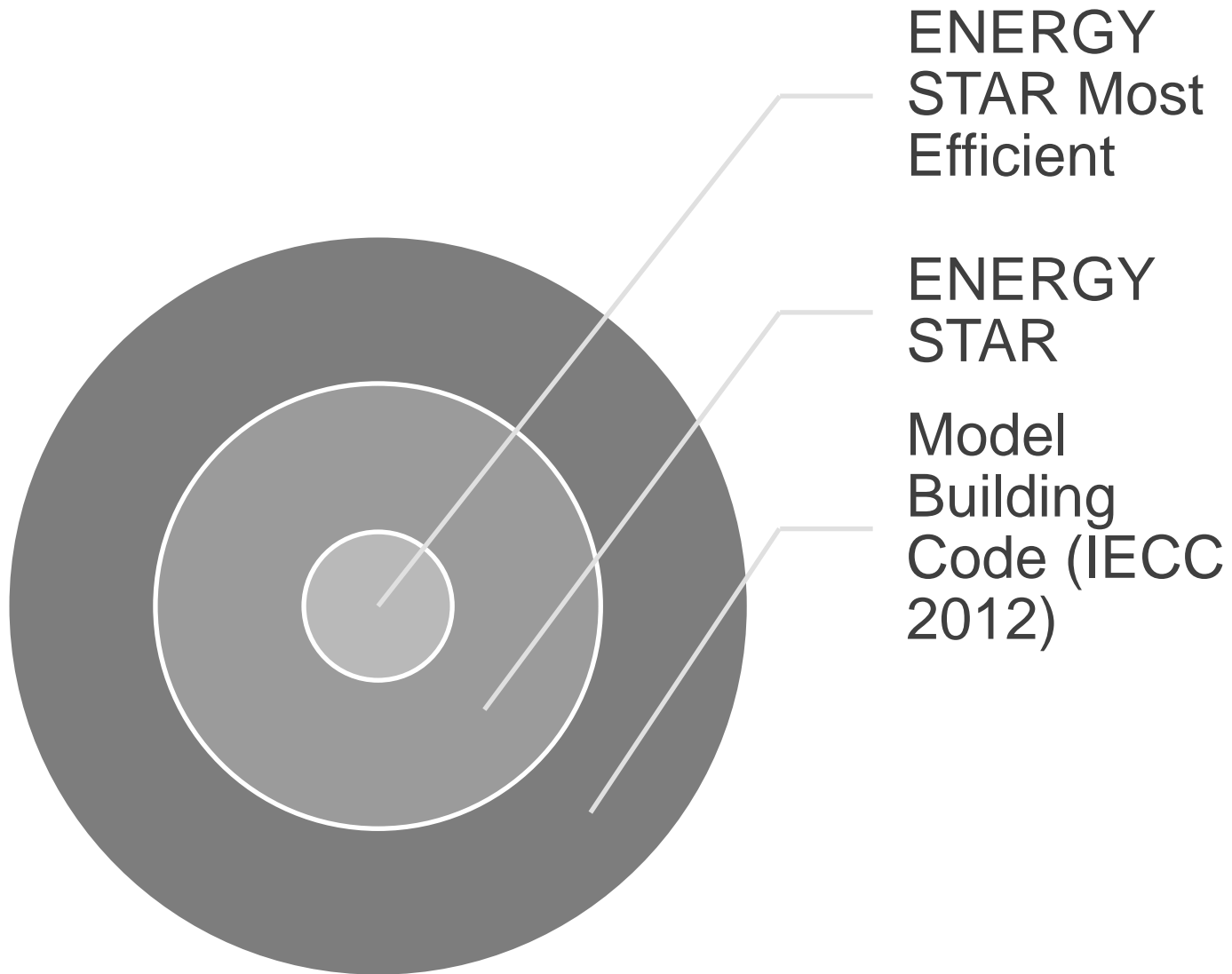
Brand Recognition



Purchased Product because of Label or Claim (% of 18+ online population/base: heard of any description)



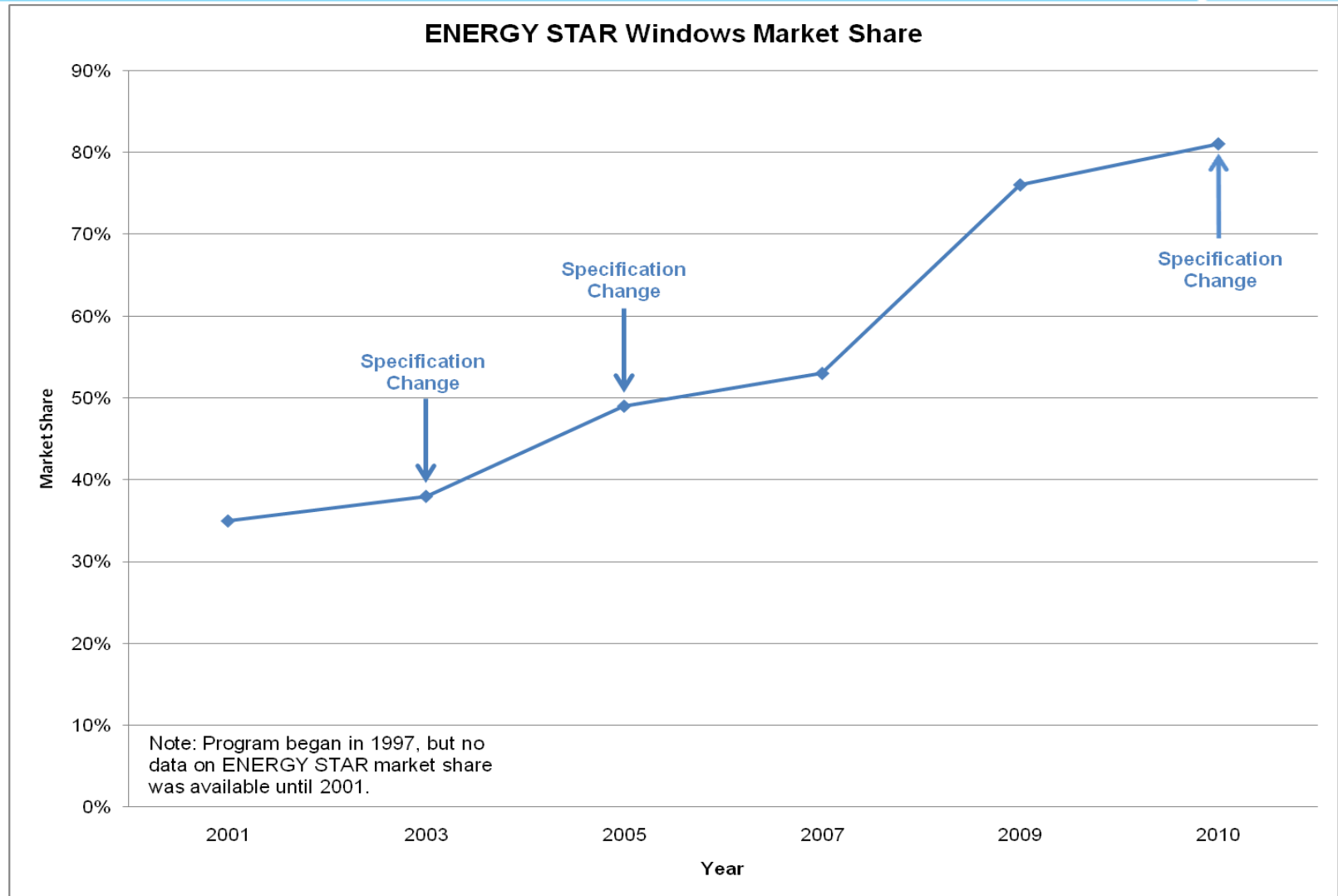
Code versus ENERGY STAR



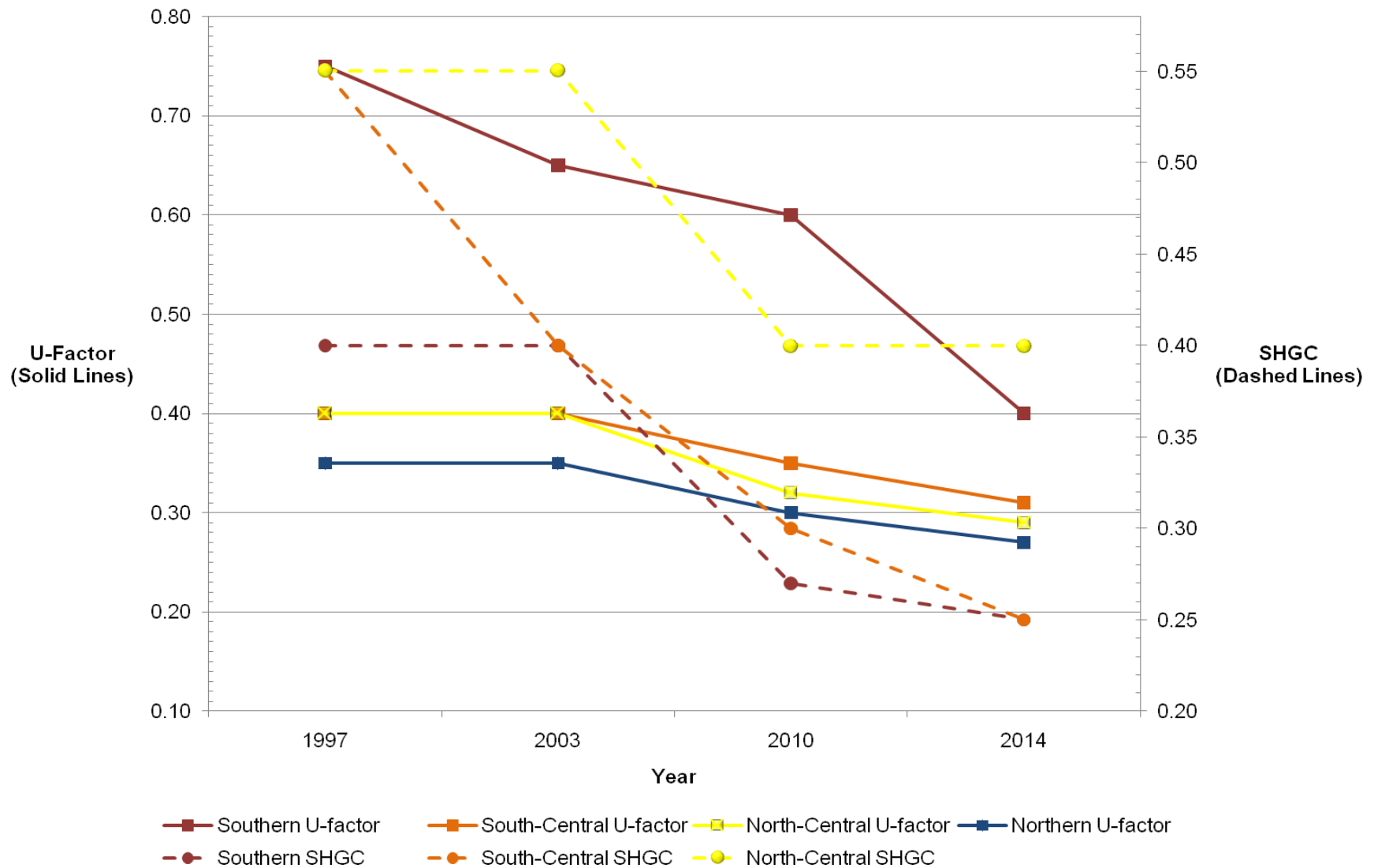
Guiding Principles

1. Significant national energy savings
2. Performance maintained or enhanced
3. Reasonable payback periods
4. Qualifying products are broadly available
5. Performance can be measured and verified with testing
6. Labeling effectively differentiates products

Market Share



ES Windows Criteria Over Time



Program Elements Considered for Adoption



- Structural Requirements
- Products Installed at High-Altitude
- Impact-Resistant Products
- Daylighting Criterion
- Lifecycle Analysis (LCA)

Structural Requirements



- NAFS-certifying organizations cited by stakeholders:
 - AAMA
 - WDMA
 - Keystone
 - NAMI
- Report summarizes comments received
- Structural requirements may be reconsidered for Version 7.0

High-Altitude Products

- Report summarizes findings from Version 5.0 criteria revision
 - < 3% of population at high elevation
 - “Sub-zones” too small for label
- Several manufacturers have found work-arounds
- Report summarizes comments, which largely support EPA decision

Impact-Resistant Products



- Small population
- Cost-effectiveness sought for most common products
- No database
- No manufacturers have volunteered data
- Impact-resistant products that meet the spec are available

Daylighting Criterion



- “Daylighting” is a property of a room or a whole building
- Evaluation of light-to-solar gain ratio
 - Does not correspond closely to VT
 - Does not appear to add value
- Additional SHGC and VT analysis to be highlighted later today

Lifecycle Analysis (LCA)



- Most stakeholders support exclusion at this time
- EPA agrees that industry participation is important
- EPA ENERGY STAR will focus on “use phase”
- EPA ENERGY STAR will work with other programs (some already at EPA) to address other phases of the lifecycle

Program Requirements



- Program Elements Remaining Unchanged
 - ENERGY STAR Climate Zones
 - Classification of Tubular Daylighting Devices
- New Additions to Program Requirements
 - Air Leakage – Matches 2012 IECC
 - ≤ 0.3 cfm/ft² for windows, sliding doors, skylights
 - ≤ 0.5 cfm/ft² for swinging doors
 - Installation Instructions
 - List of 7 elements to be included in instructions
 - Not a review and approve program, but could be “checkbox” item for verification testing

Installation Instruction Elements



1. List of hardware and tools needed
2. Diagram & description of products and parts
3. General guidance on removing old products and preparing opening (diagram optional)
 - Lead paint hazard should be mentioned
4. Flashing details or refer to flashing manufacturers instructions – diagram required
5. Shimming details (diagram optional)
6. Sealing and weather proofing details (diagram optional)
7. Variations of above based on product options



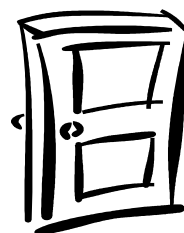
Emily Zachery
Dan Lauf

D&R International

Agenda



- Proposed Draft 1 Window Criteria
- Proposed Draft 1 Door Criteria
- Proposed Draft 1 Skylight Criteria
- Comment Period



Agenda



- Proposed Draft 1 Window Criteria



- Proposed Draft 1 Door Criteria



- Proposed Draft 1 Skylight Criteria



- Stakeholder Meeting



V6.0 Draft 1 Criteria



- Overview
- Technological Feasibility & Product Availability
- Cost-Effectiveness
- Aggregate National Energy Savings Potential
- Possible Considerations for V7.0



Proposed Criteria



Climate Zone	U-Factor	SHGC
Northern	≤ 0.27	Any
Trade-Off	$= 0.28$	≥ 0.32
North-Central	≤ 0.29	≤ 0.40
South-Central	≤ 0.31	≤ 0.25
Southern	≤ 0.40	≤ 0.25

Current Criteria

Climate Zone	U-Factor	SHGC
Northern	≤ 0.30	Any
Trade-Offs	$= 0.31$ $= 0.32$	≥ 0.35 ≥ 0.40
North-Central	≤ 0.32	≤ 0.40
South-Central	≤ 0.35	≤ 0.30
Southern	≤ 0.60	≤ 0.27



V6.0 Draft 1 Criteria



- Overview
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- Cost-Effectiveness
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- Possible Considerations for V7.0



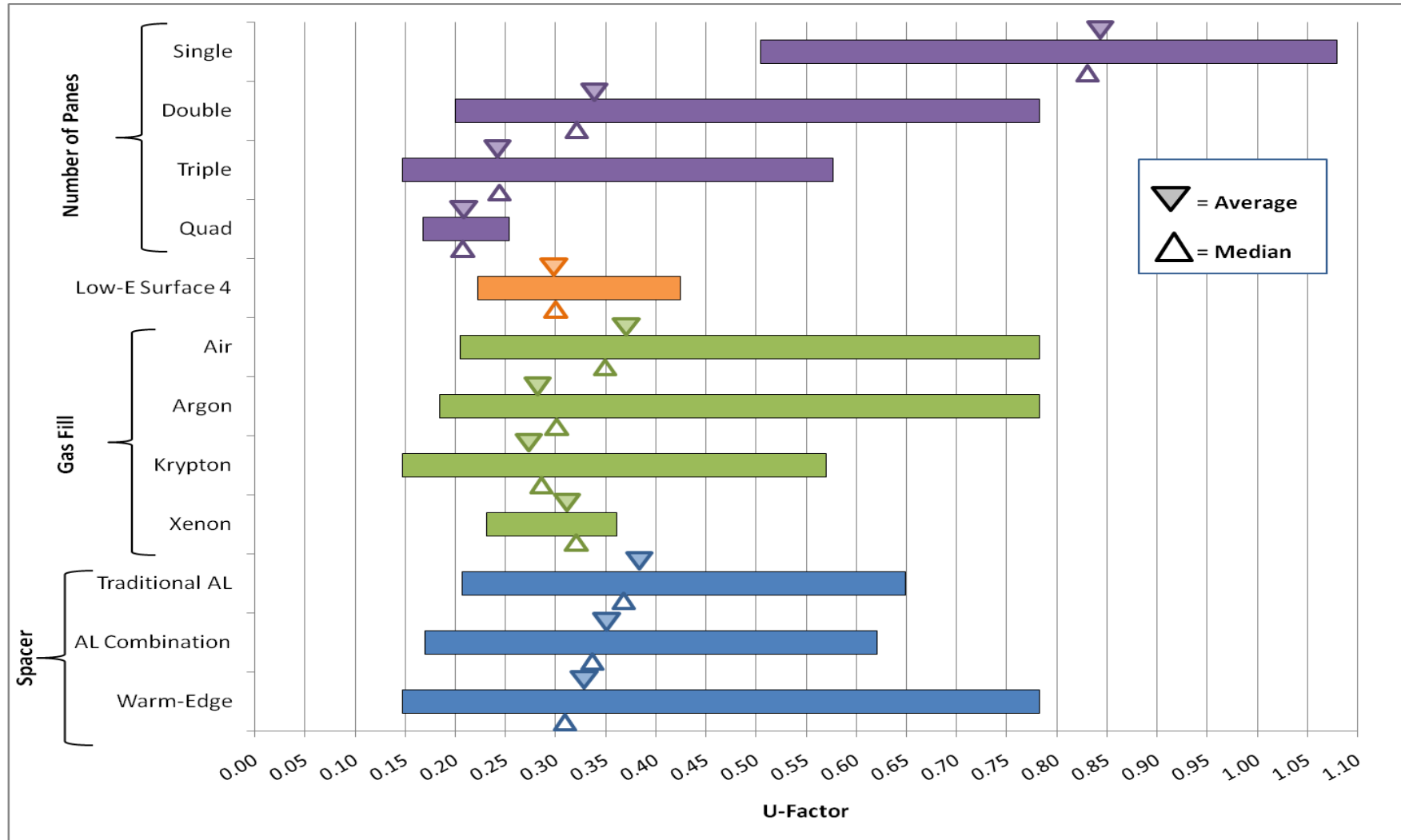
Technological Feasibility & Product Availability



- NFRC CPD Data Analysis
- Products Available for Sale Methodology
- Availability of Low U-Factor Windows
- Glazing Level and Gas Fill
- Glass Type
- Frame Materials
- Exploration of Select Alternate Proposals

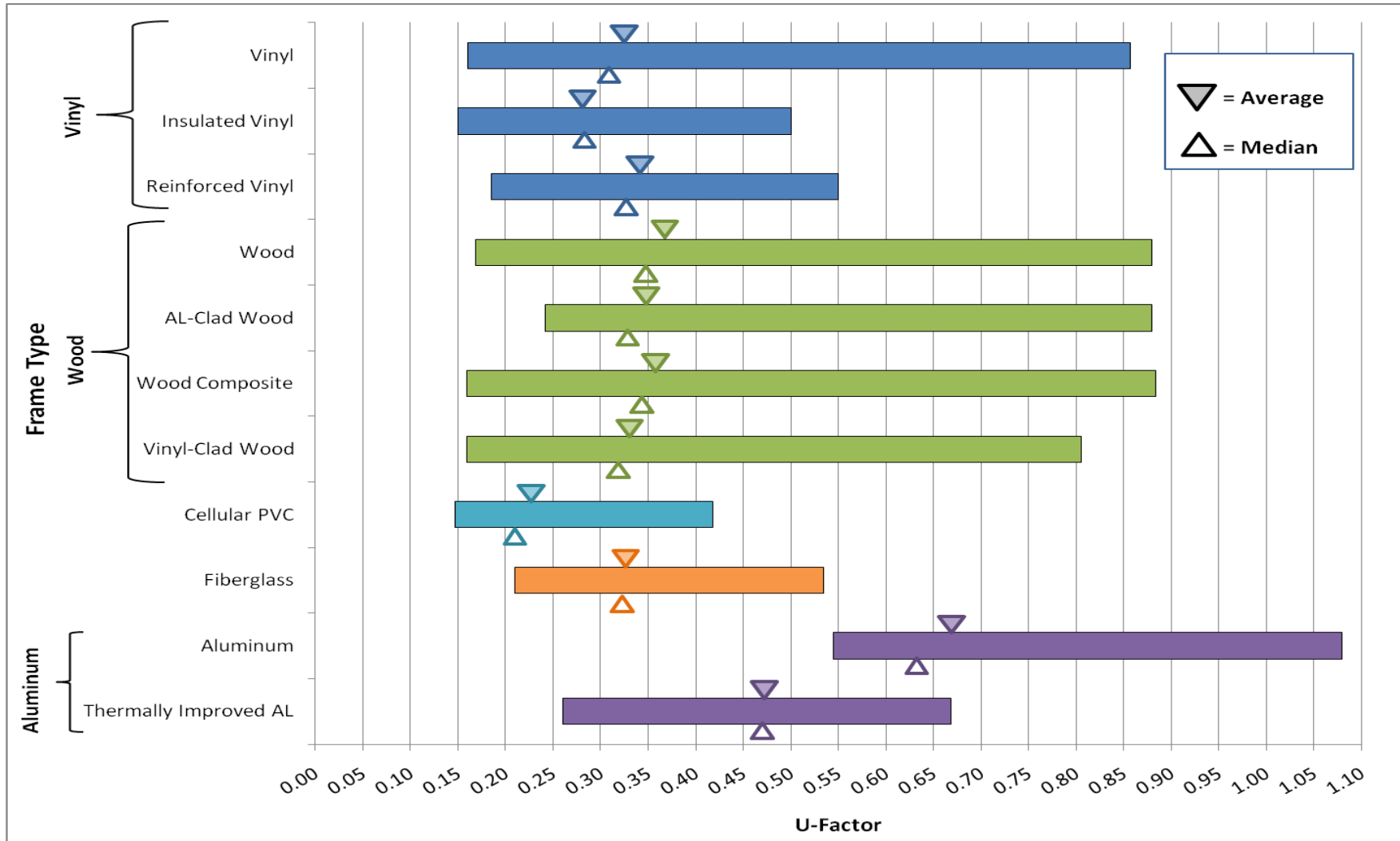


NFRC CPD Data Analysis



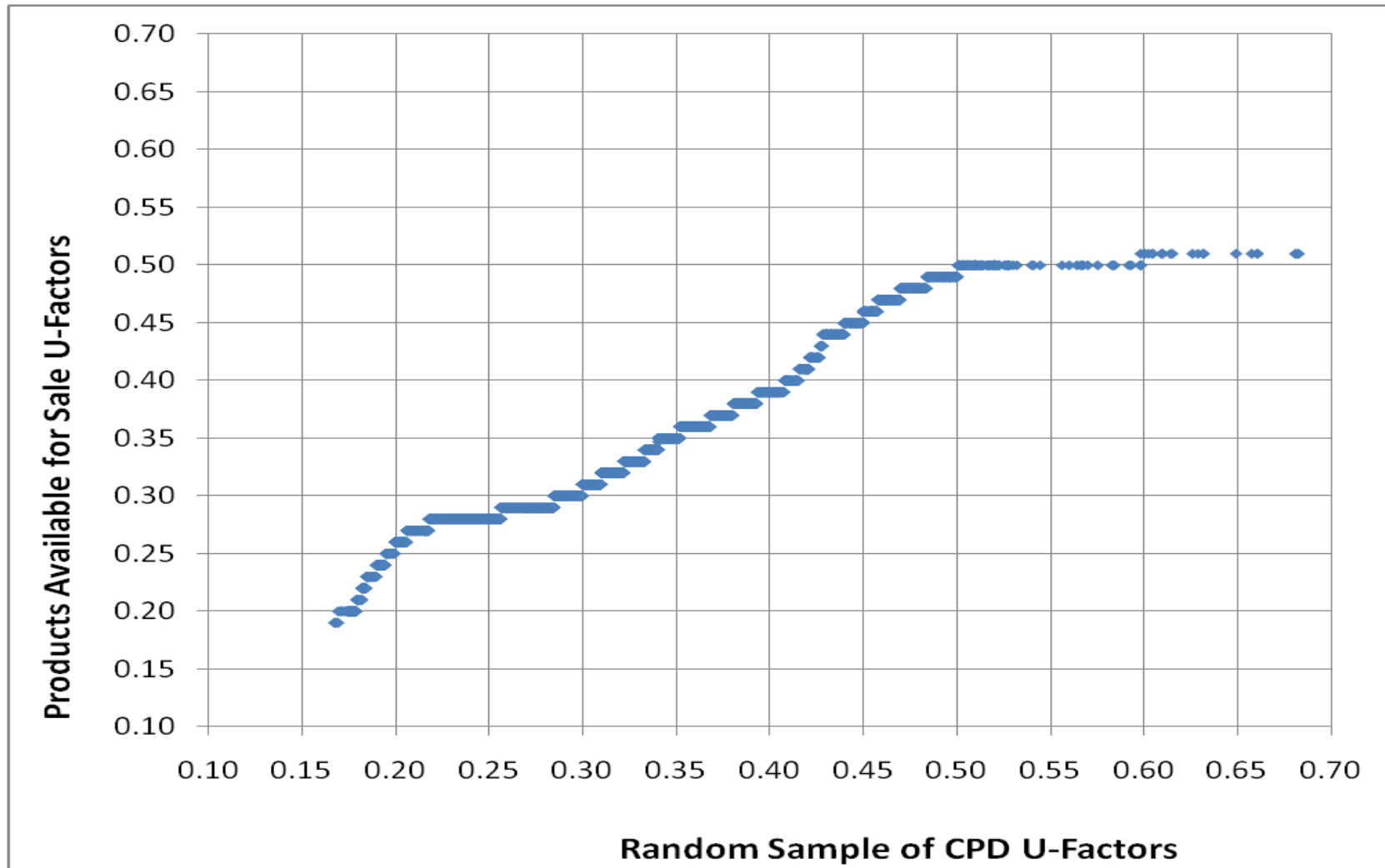


NFRC CPD Data Analysis



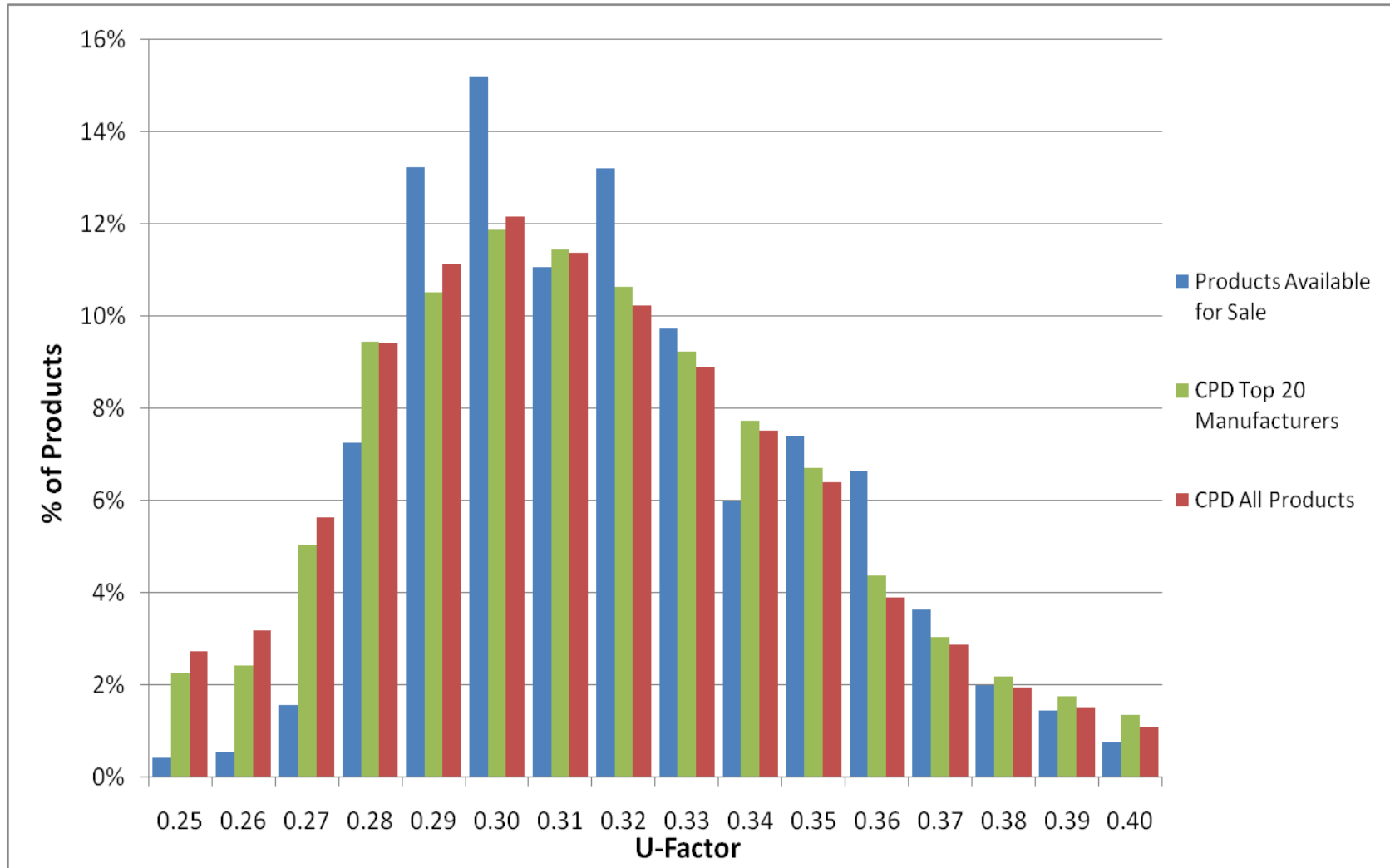


Products Available for Sale Methodology



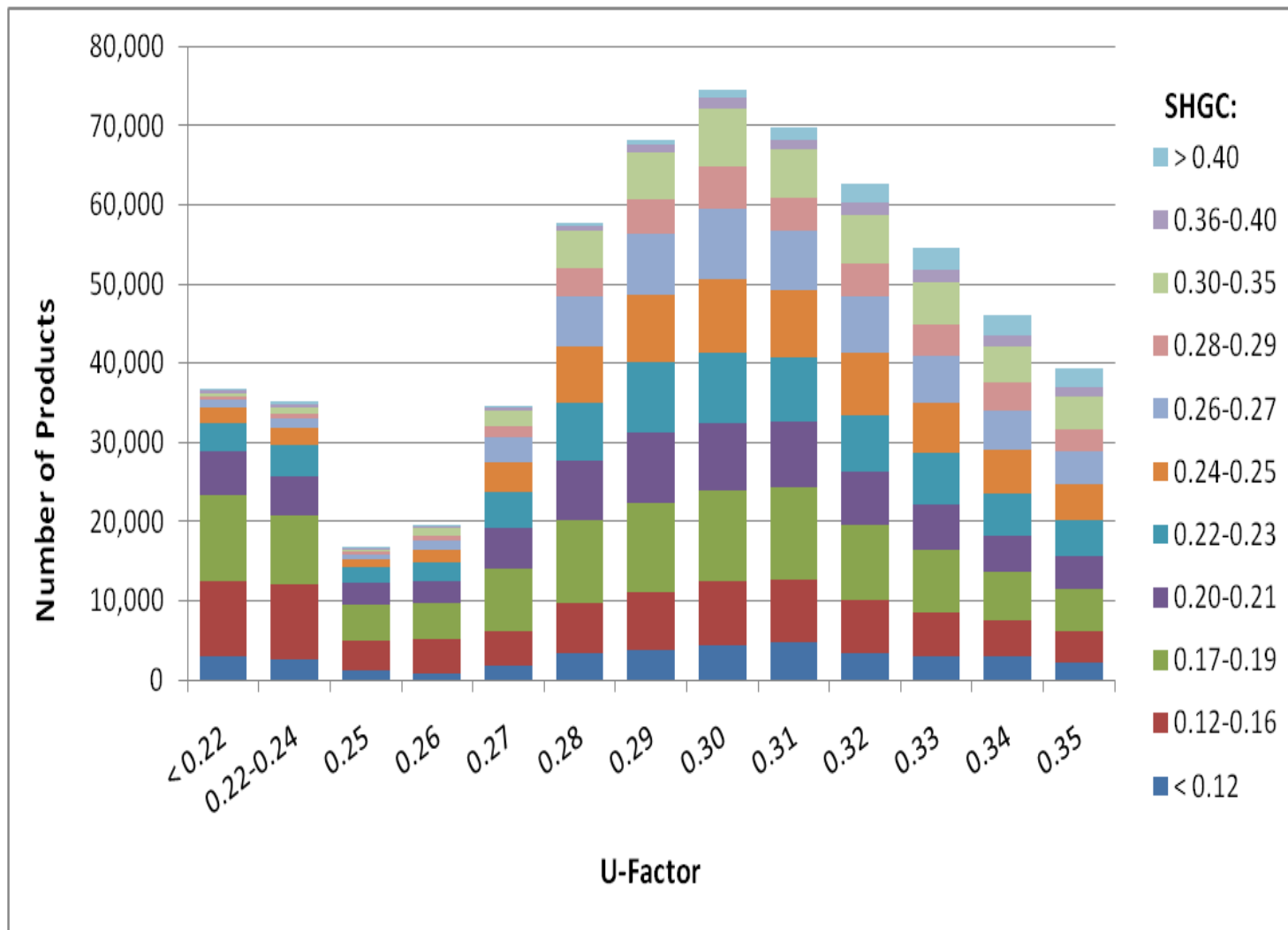


CPD versus PA Analysis



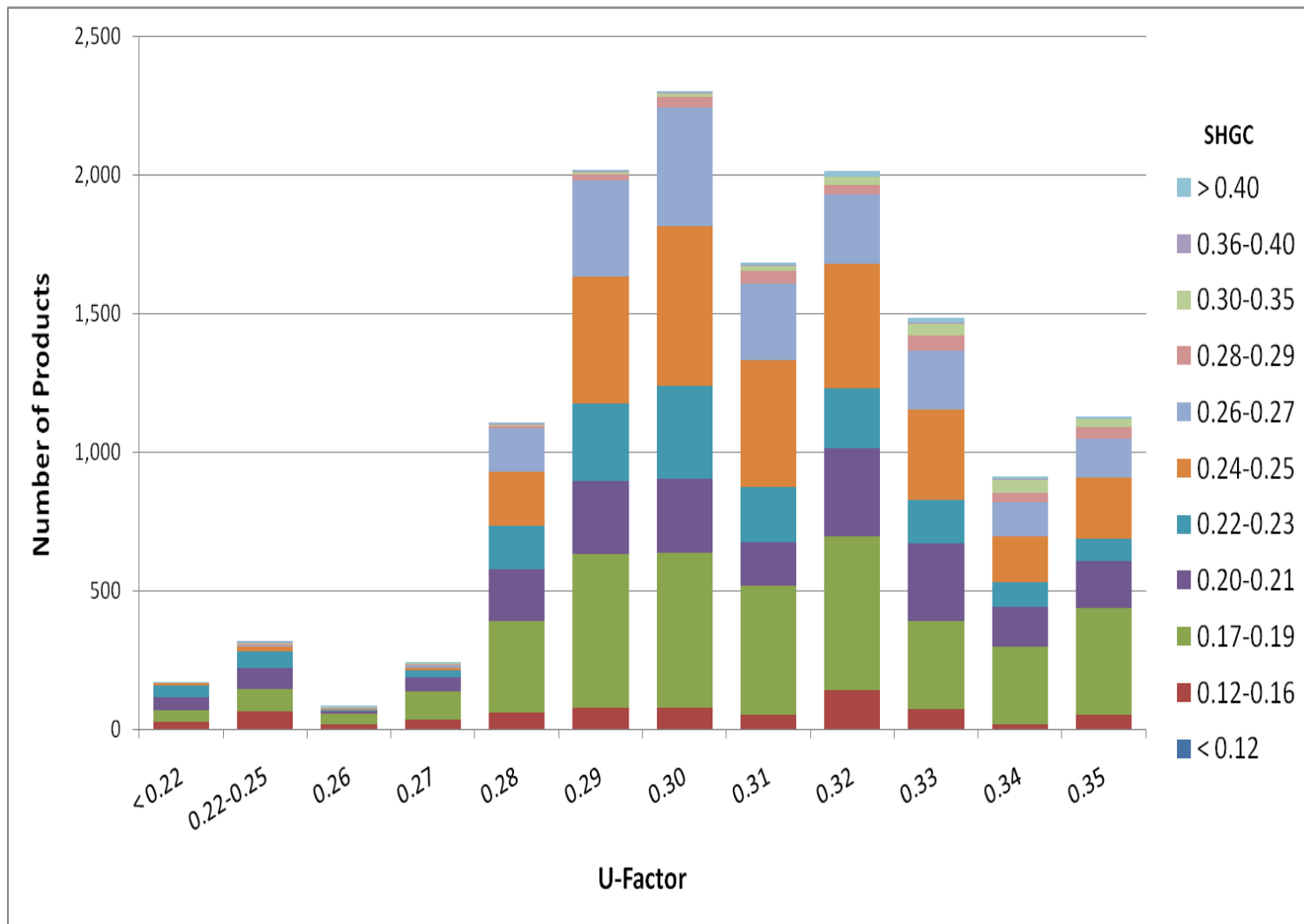


Availability of Low U-Factor Windows (CPD)



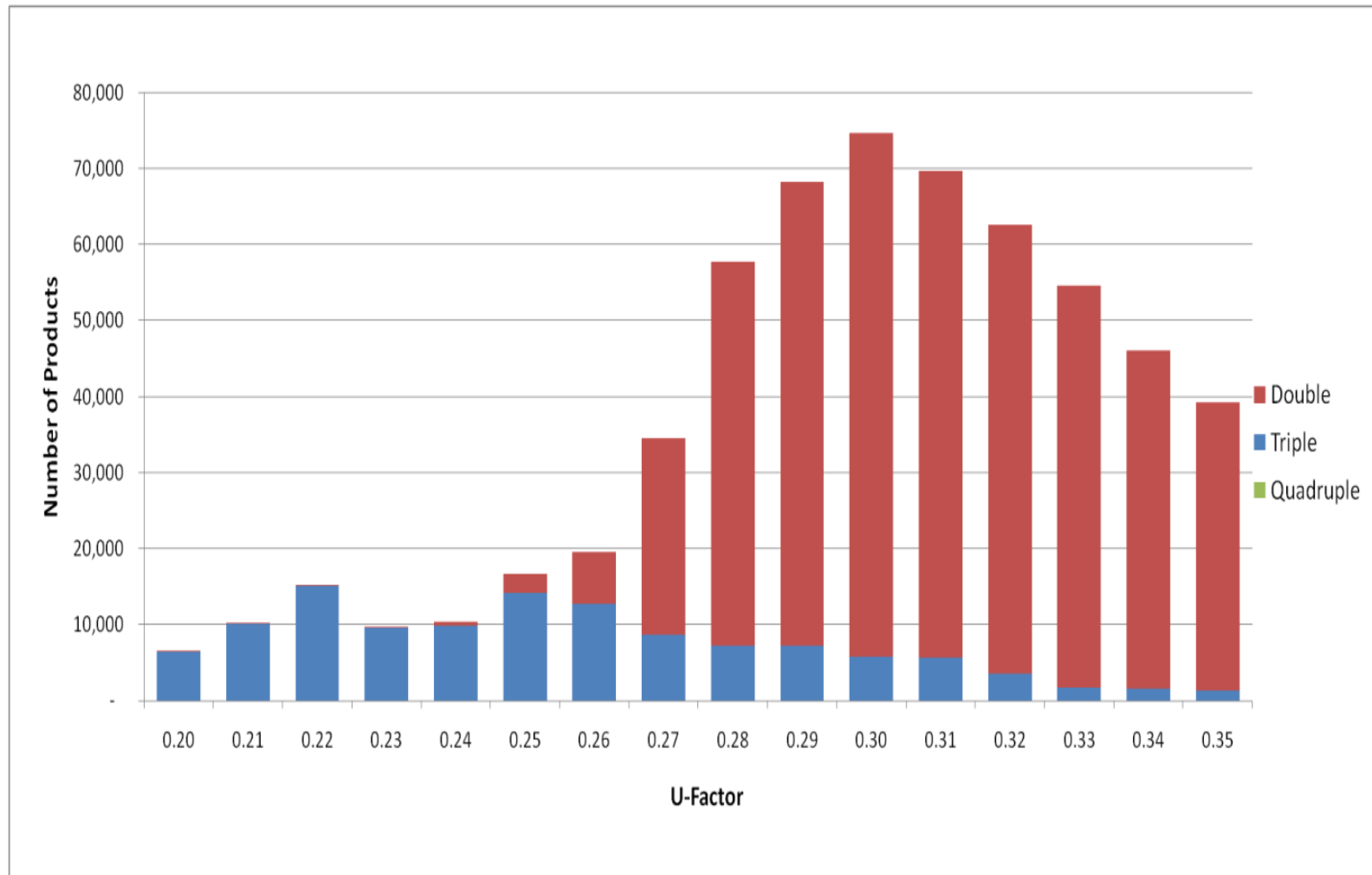


Availability of Low U-Factor Windows (PA)



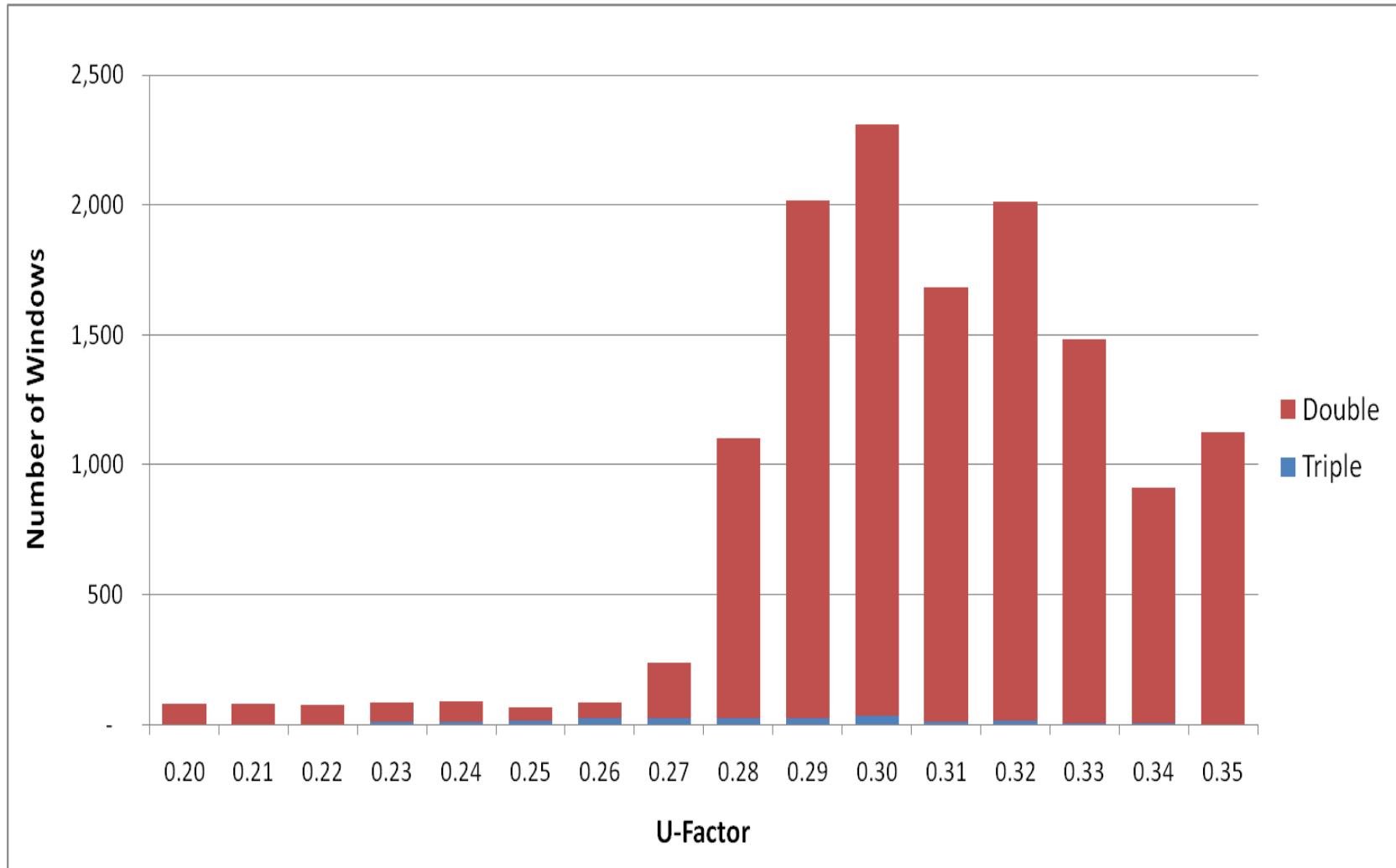


Glazing Level (CPD)



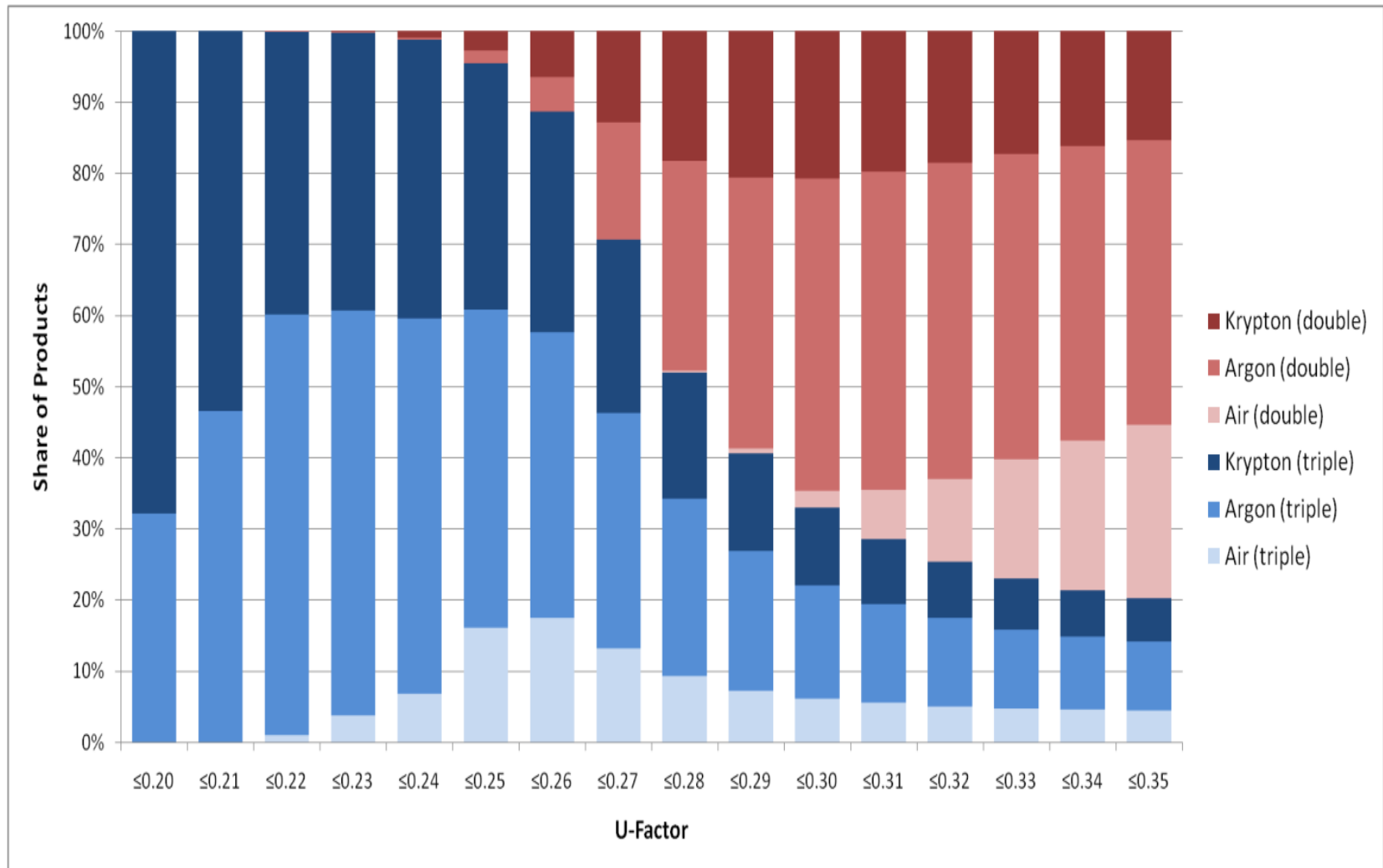


Glazing Level (PA)



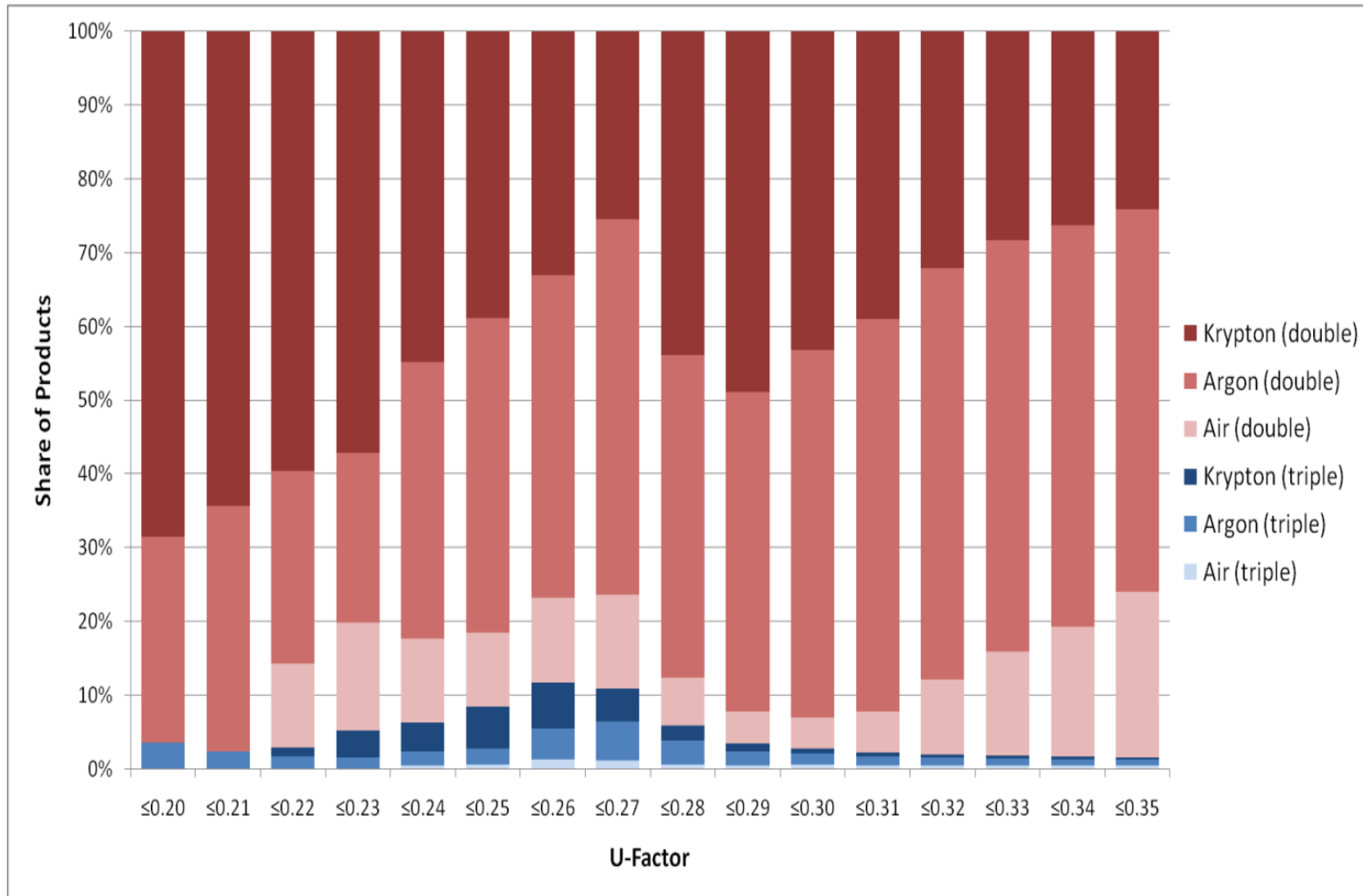


Glazing Level and Gas Fill (CPD)



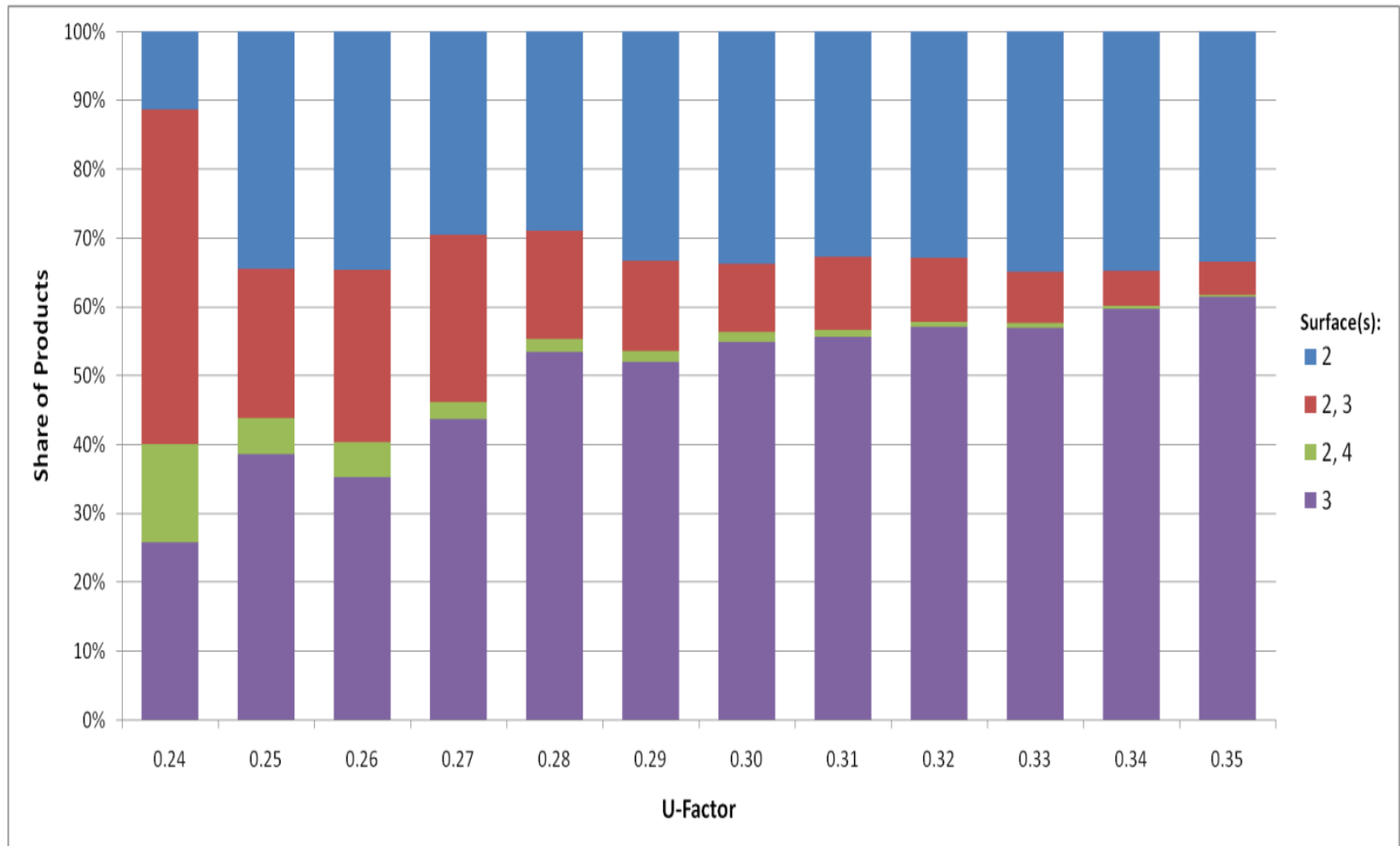


Glazing Level and Gas Fill (PA)



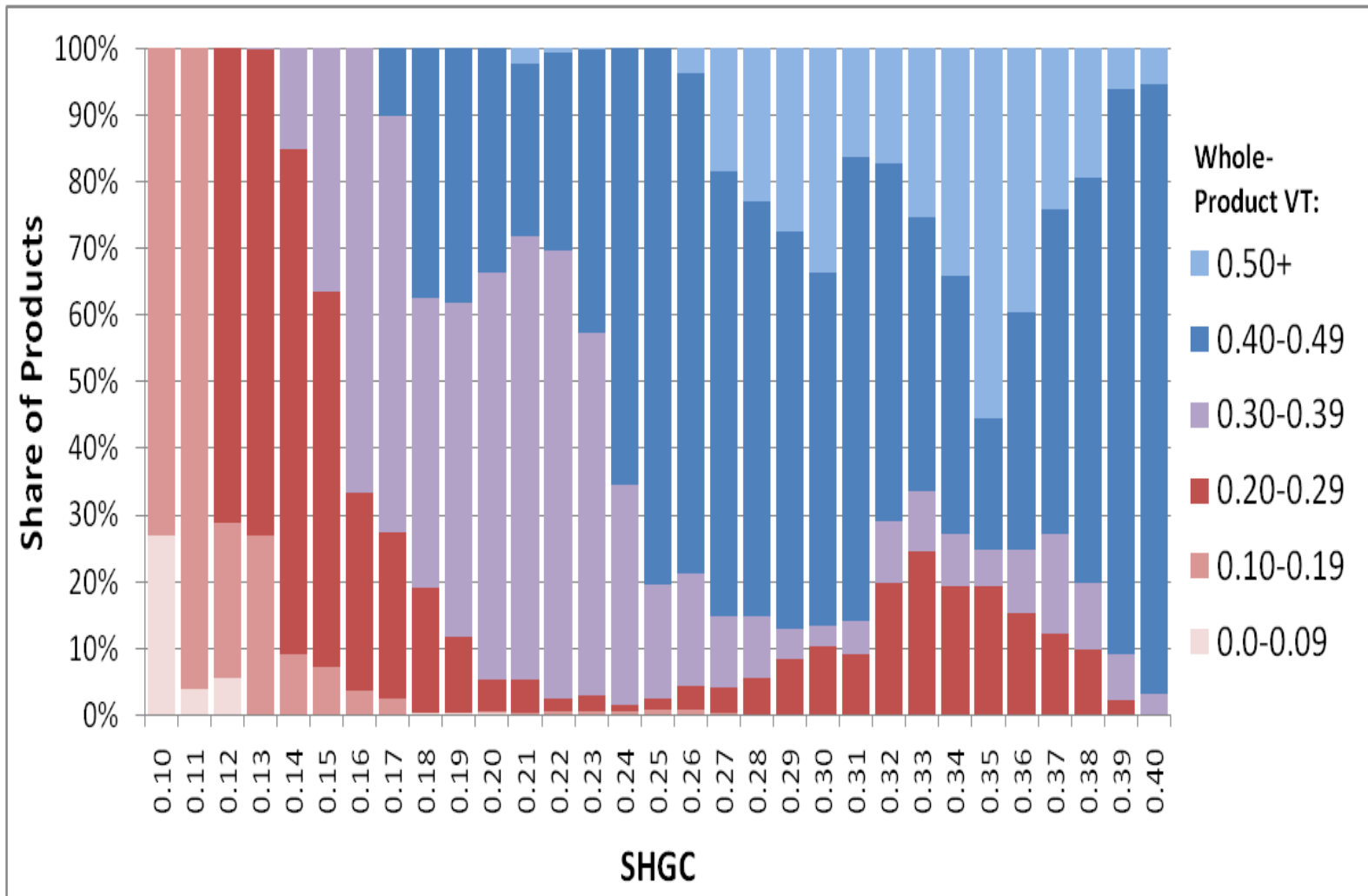


Glass Type: Surface 4 (CPD)



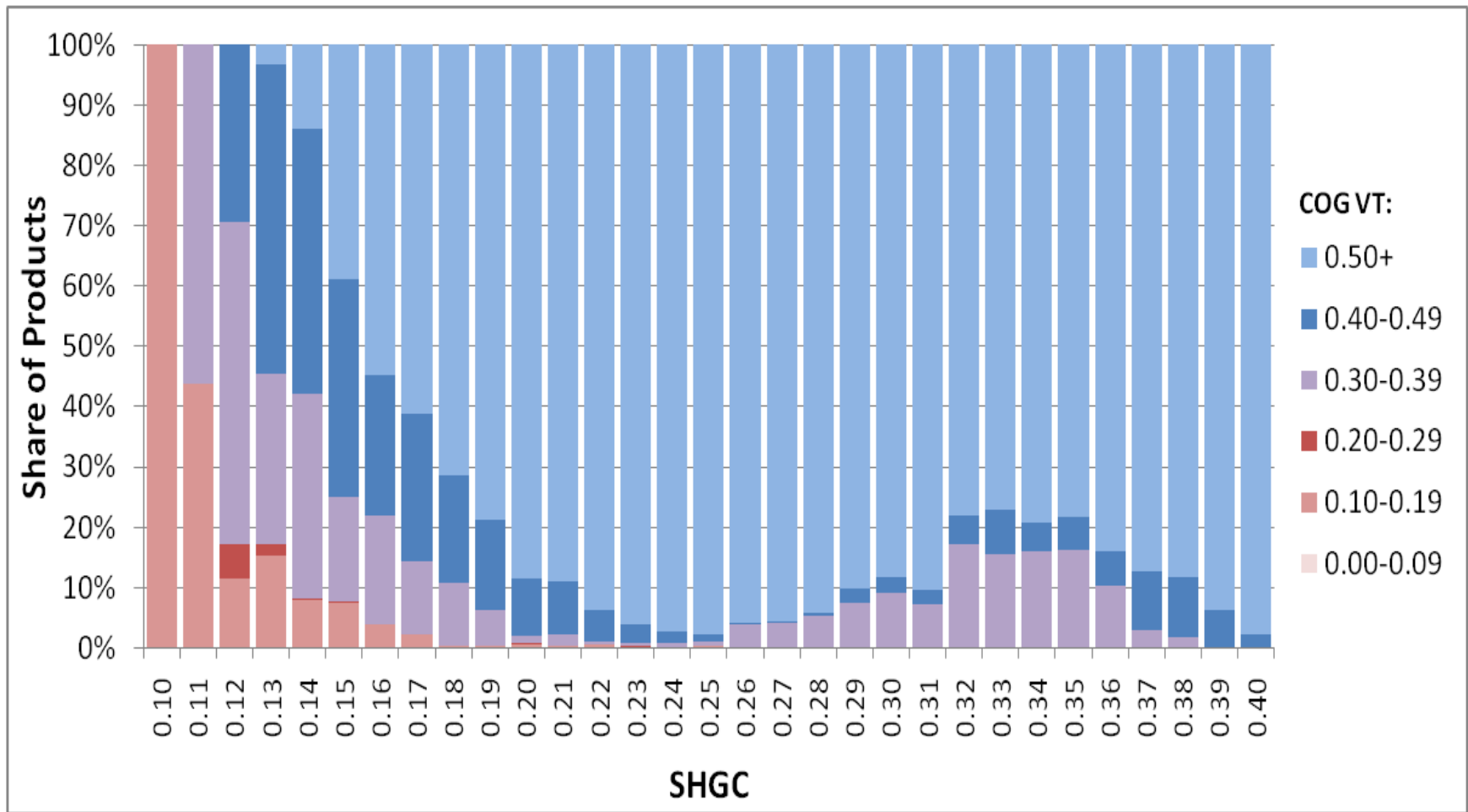


Glass Type: Whole-Product VT for Low SHGC (CPD)



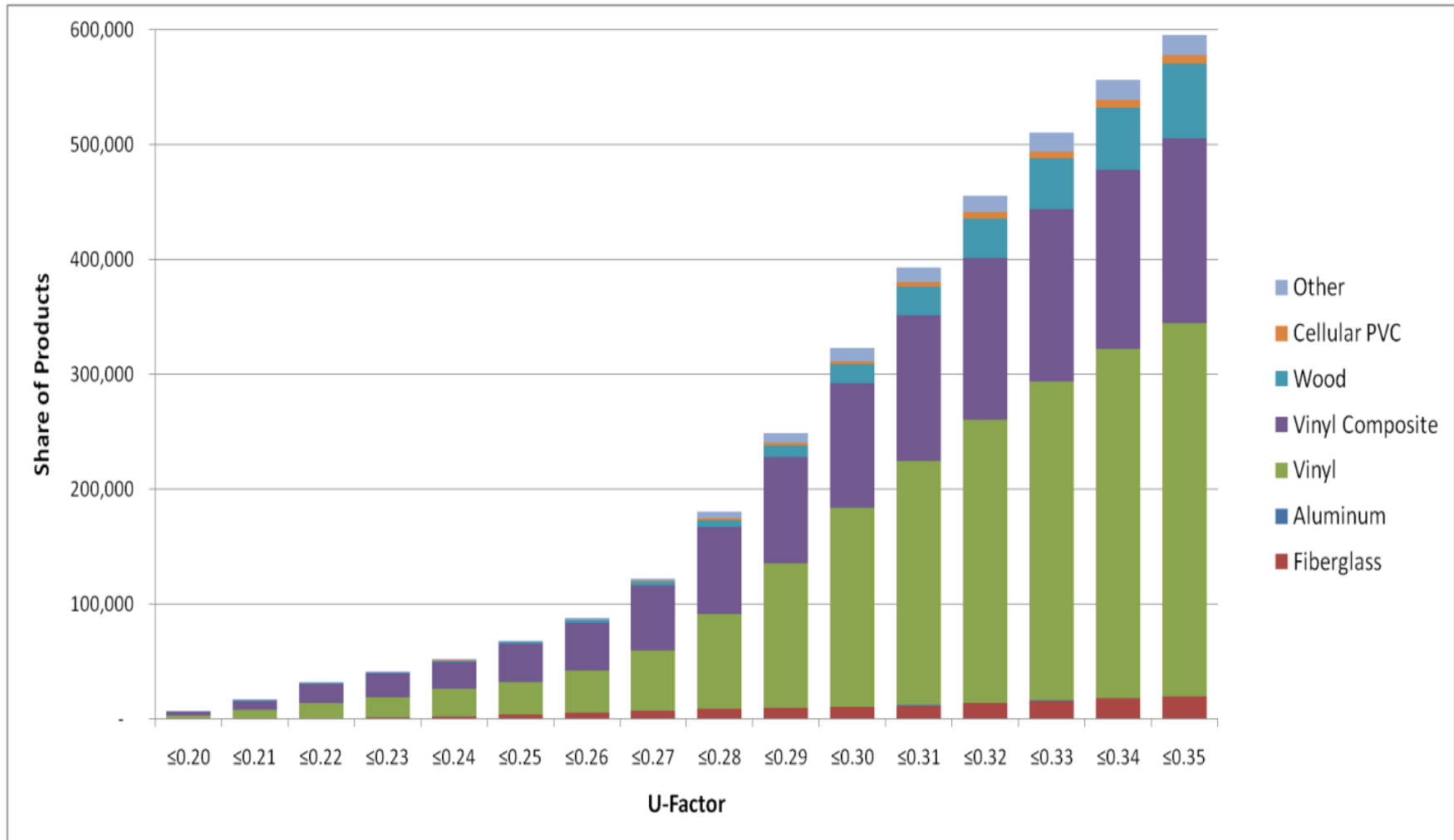


Glass Type: COG VT for Low SHGC (CPD)



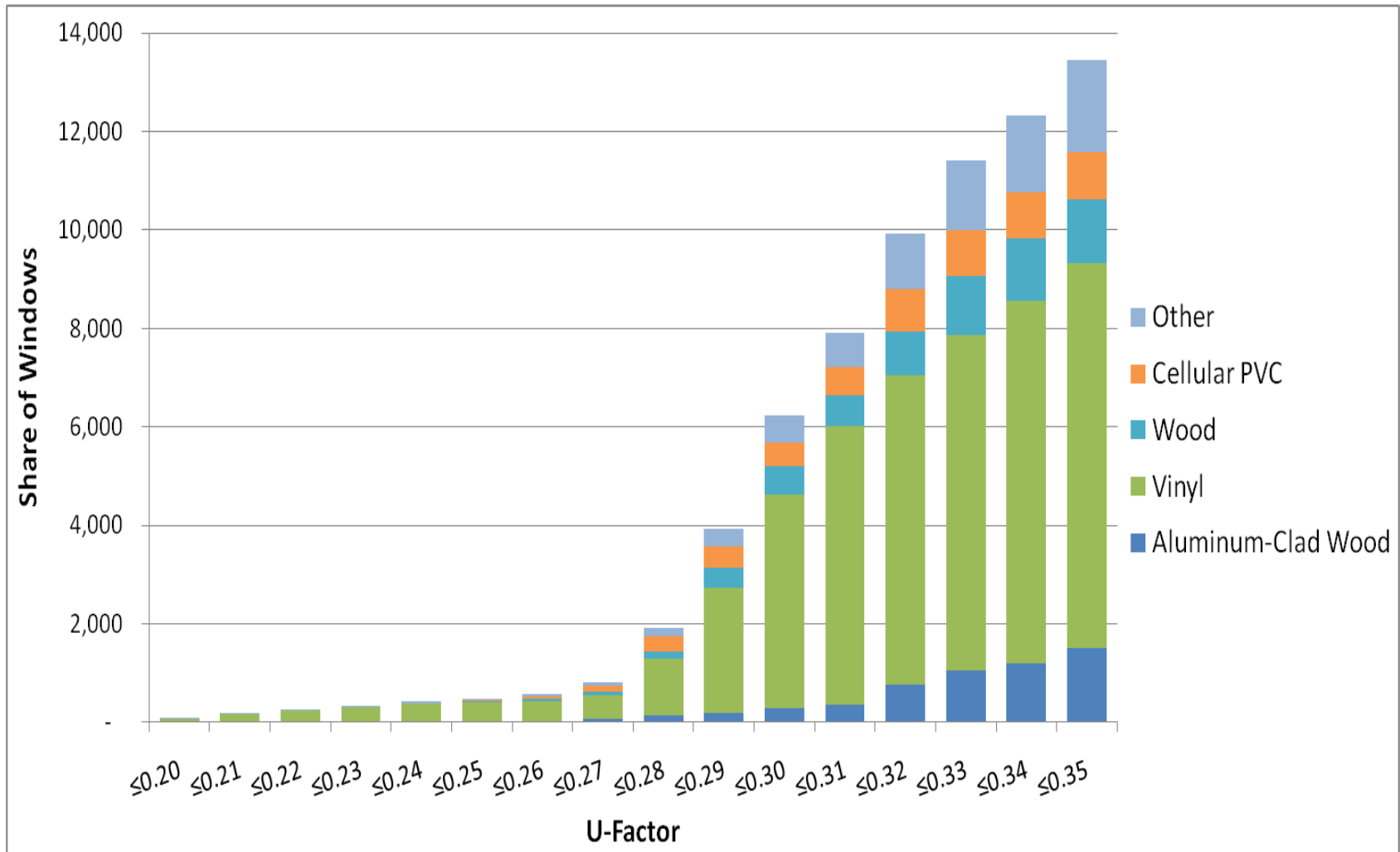


Frame Materials (CPD)





Frame Materials (PA)





Exploration of Select Alternate Proposals



- Allow any SHGC in North-Central
 - ES would not meet code
- Establish minimum SHGC in Northern Zone

Windows in CPD

U-Factor ≤ 0.27	Double- and Triple-Pane		Double-Pane Only	
	Number	Percent	Number	Percent
SHGC ≥ 0.32	4,562	0.77%	1,489	0.31%
SHGC ≥ 0.40	933	0.16%	87	0.02%

("Products Available for Sale" database contained no windows meeting these criteria)



V6.0 Draft 1 Criteria



- Overview
- Technological Feasibility & Product Availability
- **Cost-Effectiveness**
- Aggregate National Energy Savings Potential
- Possible Considerations for V7.0



Cost-Effectiveness



- Incremental Product Costs
- Household Energy Savings
- Payback



Incremental Product Costs



- Calculated two sets of incremental product costs
 - Cost increase from V5.0 to V6.0 (to evaluate manufacturer cost)
 - Cost increase from IECC 2009 to V6.0 (to calculate payback for consumer)

Zone	U-Factor	SHGC	V5 to V6	IECC '09 to V5	IECC '09 to V6
Northern	0.27	Any	\$34.00 \$173.00 (incl. trips)	+ \$20	\$54.00
North-Central	0.29	0.35	\$28.00	+ \$20	\$48.00
South-Central	0.31	0.25	\$21.00	+ \$20	\$41.00
Southern	0.40	0.25	\$13.00	+ \$20	\$33.00



Household Energy Savings



- Same methodology and assumptions as previous criteria revision
- Modeled two baselines
 - Single-pane clear
 - Double-pane clear
- Calculate marginal savings of V6.0 over both baselines
- Double-clear used to determine payback



Payback



- Average window lifetime 20-30 years
- Payback for Los Angeles Excluded
 - Extremely low baseline energy usage
- Median simple payback 11 years
- Mean simple payback 13 years

Climate Zone	Mean Payback Period
Northern	14 years
North-Central	16 years
South-Central	15 years
Southern	6 years



V6.0 Draft 1 Criteria



- Overview
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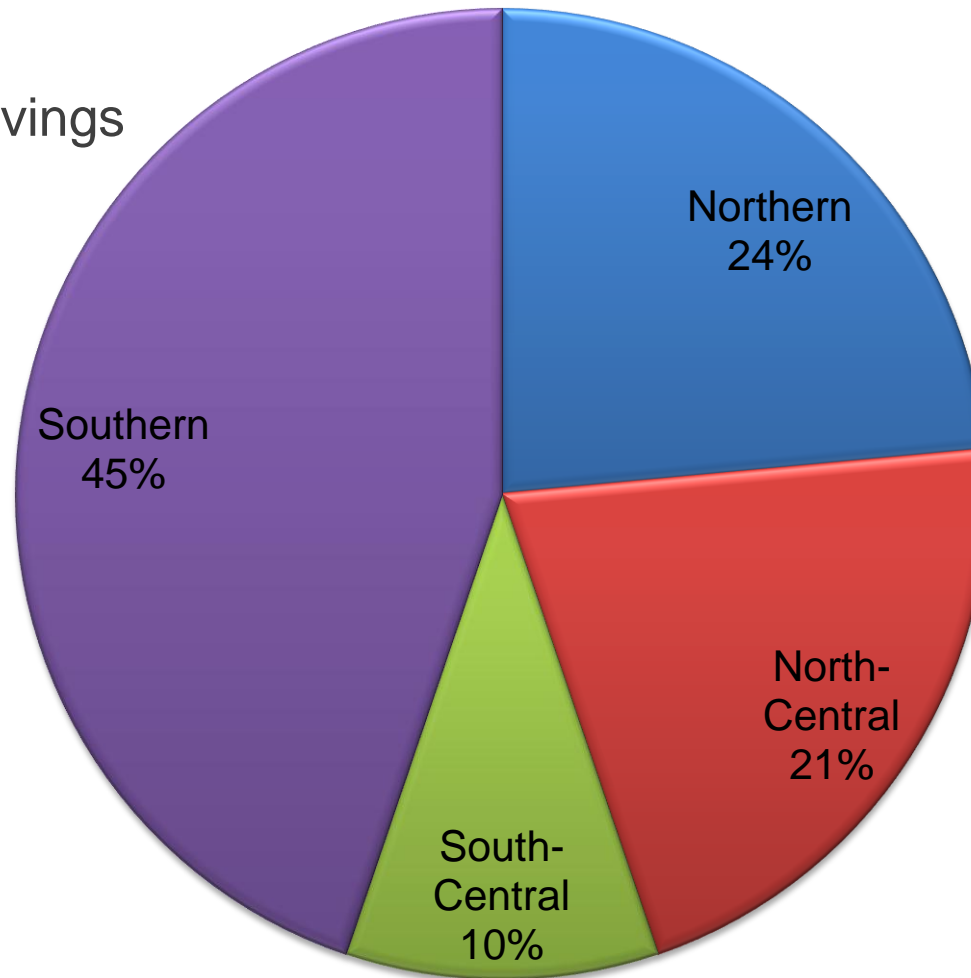


Aggregate National Energy Savings over V5



2.21 tBtu

Total First Year Savings





V6.0 Draft 1 Criteria



- Overview
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- Possible Considerations for V7.0



Possible Considerations for Version 7.0



- Program Elements Considered during Version 6.0 Criteria Revision
- Program Elements Unchanged during Version 6.0 Criteria Revision
- Future Codes
- Most Efficient Program
- Emerging Technologies

Agenda



- Proposed Draft 1 Window Criteria



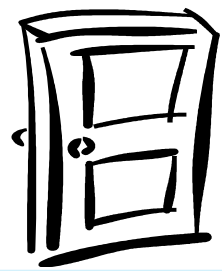
- Proposed Draft 1 Door Criteria



- Proposed Draft 1 Skylight Criteria



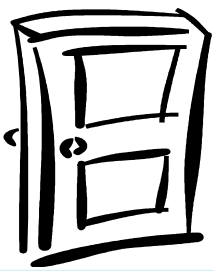
- Comment Period



V6.0 Draft 1 Criteria



- Overview
- Technological Feasibility
- Cost-Effectiveness



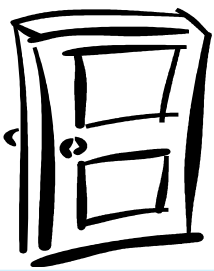
Proposed Criteria



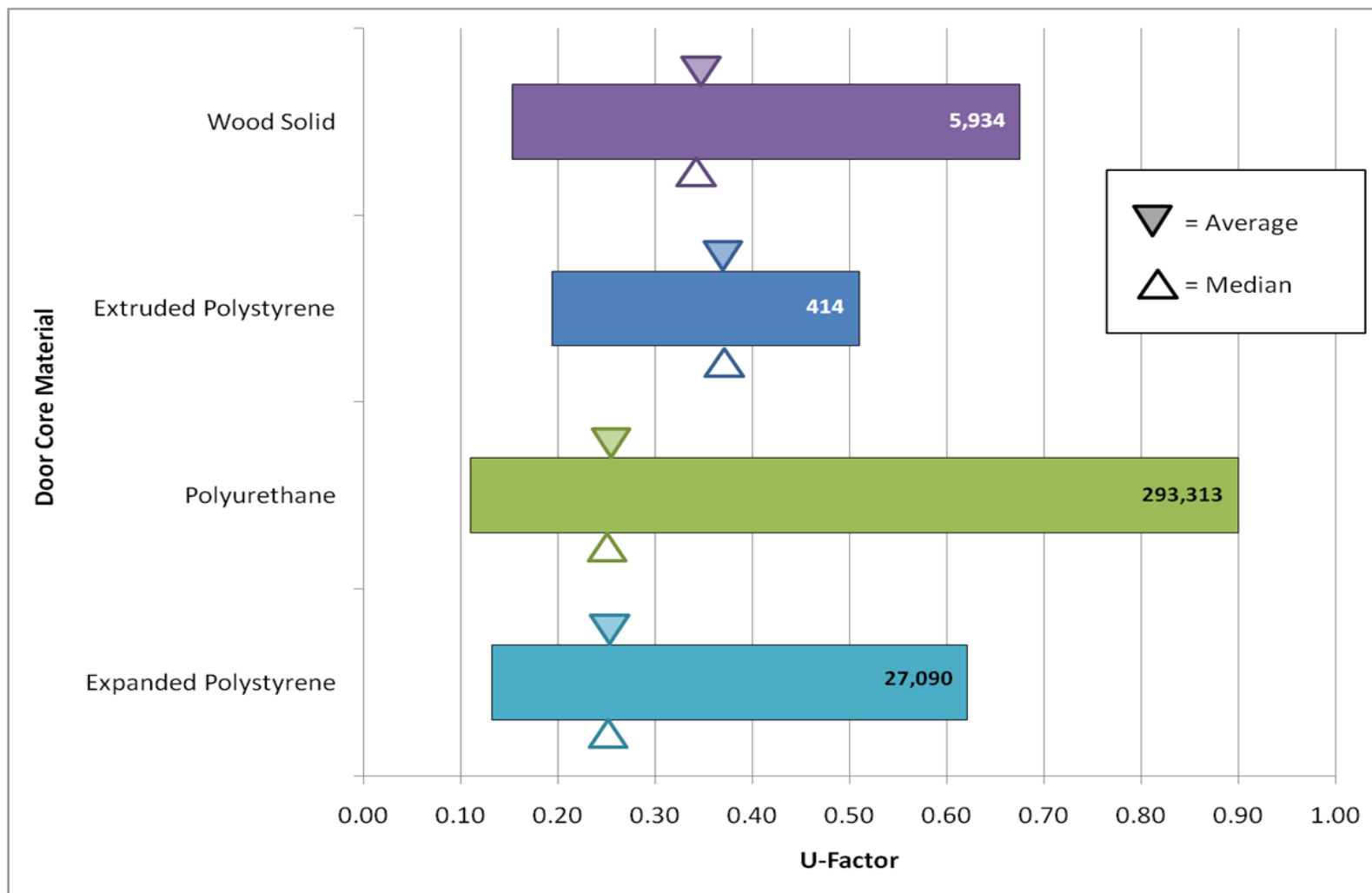
Glazing Level	U-Factor	SHGC
Opaque	≤ 0.17	No Rating
$\leq \frac{1}{2}$ -Lite	≤ 0.23	≤ 0.25
$> \frac{1}{2}$ -Lite	≤ 0.30	≤ 0.25

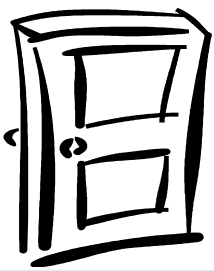
Current Criteria

Glazing Level	U-Factor	SHGC
Opaque	≤ 0.21	No Rating
$\leq \frac{1}{2}$ -Lite	≤ 0.27	≤ 0.30
$> \frac{1}{2}$ -Lite	≤ 0.32	≤ 0.30

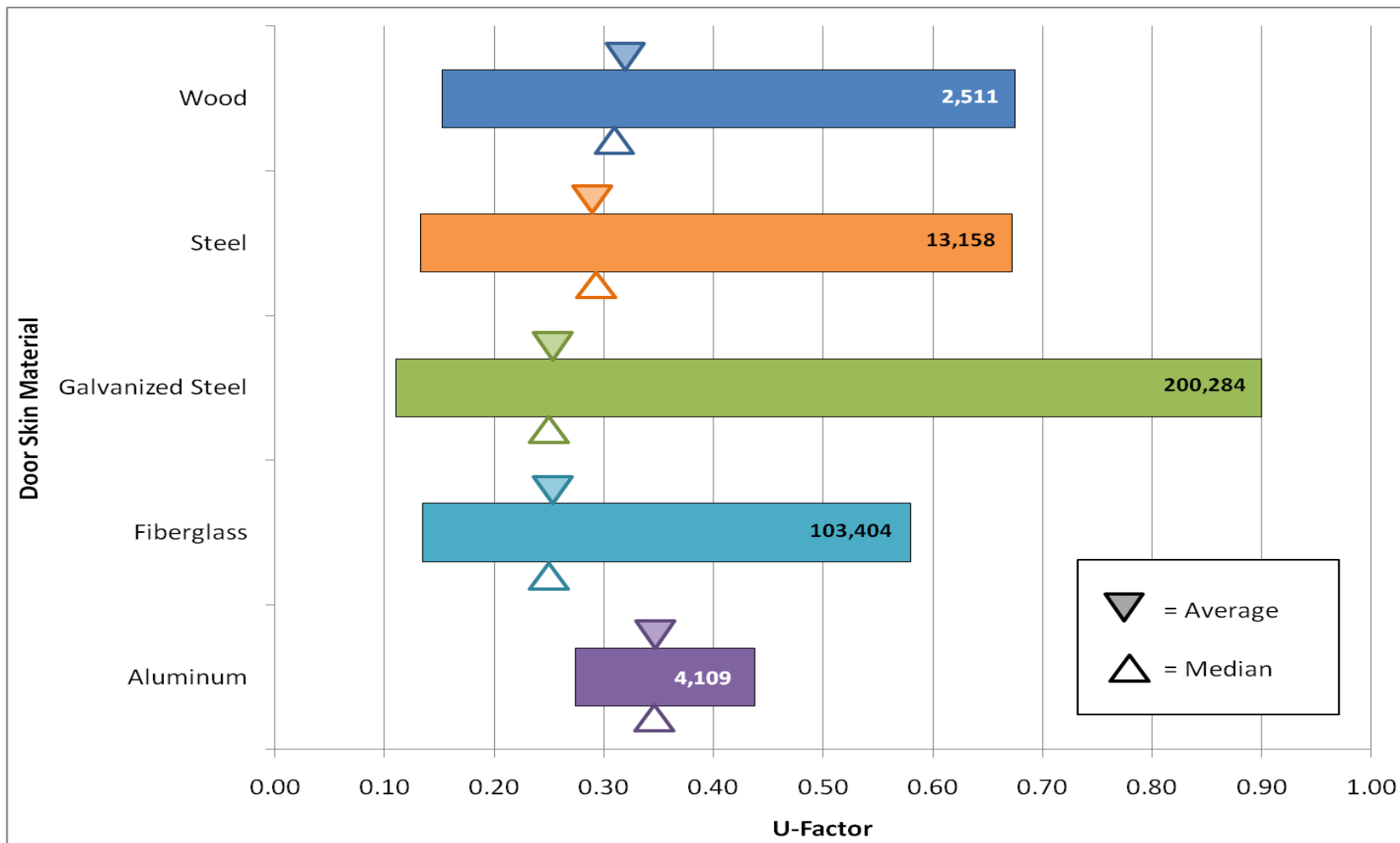


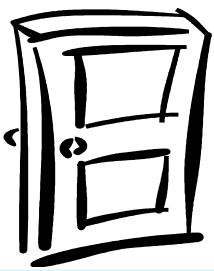
Technological Feasibility





Technological Feasibility

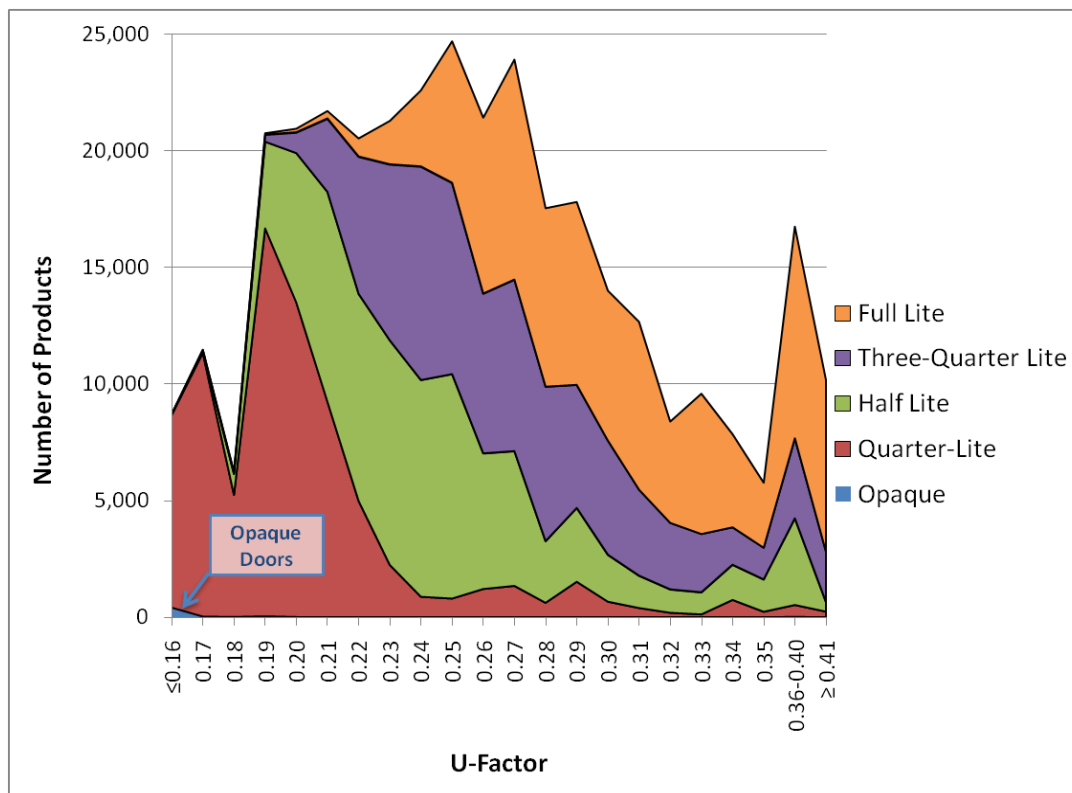


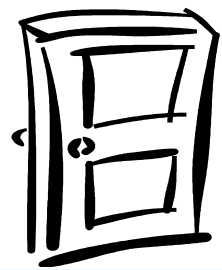


Technological Feasibility

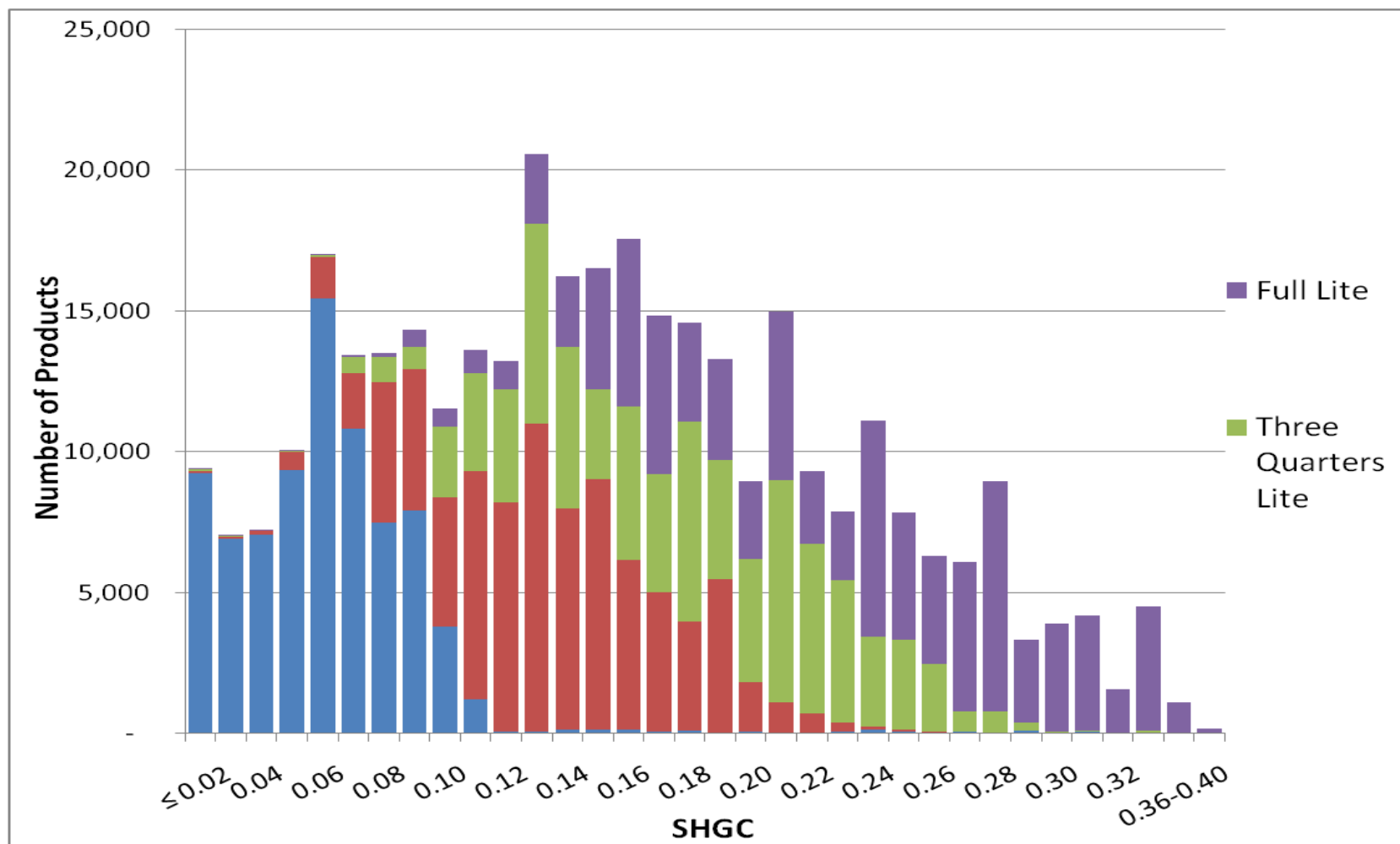


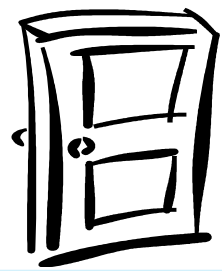
Glazing Level	Percent Qualifying
Opaque	77%
$\leq \frac{1}{2}$ -Lite	77%
$> \frac{1}{2}$ -Lite	67%





Technological Feasibility

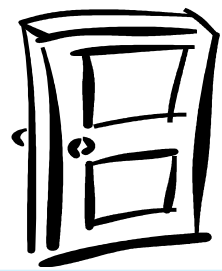




V6.0 Draft 1 Criteria



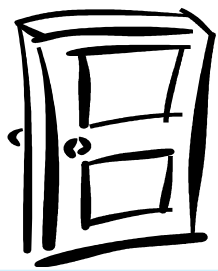
- Overview
- Technological Feasibility
- Cost-Effectiveness



Cost-Effectiveness



- Incremental Product Costs
- Household Energy Savings
- Payback

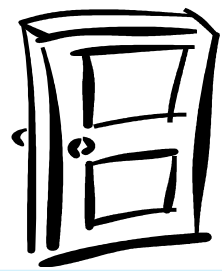


Incremental Product Costs



- Initial incremental product costs only included switching from V5.0 ES to V6.0
- For cost-effectiveness, IECC 2009 makes more sense as a baseline
- Requesting data accordingly in report
- Data shows spec change not cost-prohibitive for manufacturers

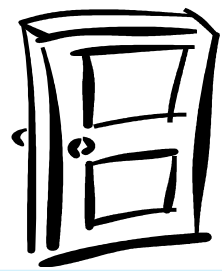
Glazing Level	U-Factor	SHGC	V5.0 to V6.0
Opaque	≤ 0.17	No Rating	None
$\leq \frac{1}{2}$ -Lite	≤ 0.23	≤ 0.25	\$13.00
$> \frac{1}{2}$ -Lite	≤ 0.30	≤ 0.25	\$30.00



Household Energy Savings



- Opaque Doors
 - V6.0 spec matches performance of best-selling products
 - No delta in spec = no energy savings
 - Also no marginal cost
- Less than/Equal to Half-Lite Doors
 - Zero to \$2 per year
- Greater than Half-Lite Doors
 - Marginal savings (RESFEN rounds to zero)



Payback



- Opaque Doors
 - N/A (No energy savings; No marginal cost)
- Less than/Equal to Half-Lite Doors
 - Average of 22 years
- Greater than Half-Lite Doors
 - N/A (Marginal savings)
 - Requesting incremental cost from IECC 2009

Agenda



- Proposed Draft 1 Window Criteria



- Proposed Draft 1 Door Criteria



- Proposed Draft 1 Skylight Criteria



- Comment Period



V6.0 Draft 1 Criteria



- Overview
- Technological Feasibility & Product Availability
- Cost-Effectiveness



Proposed Criteria



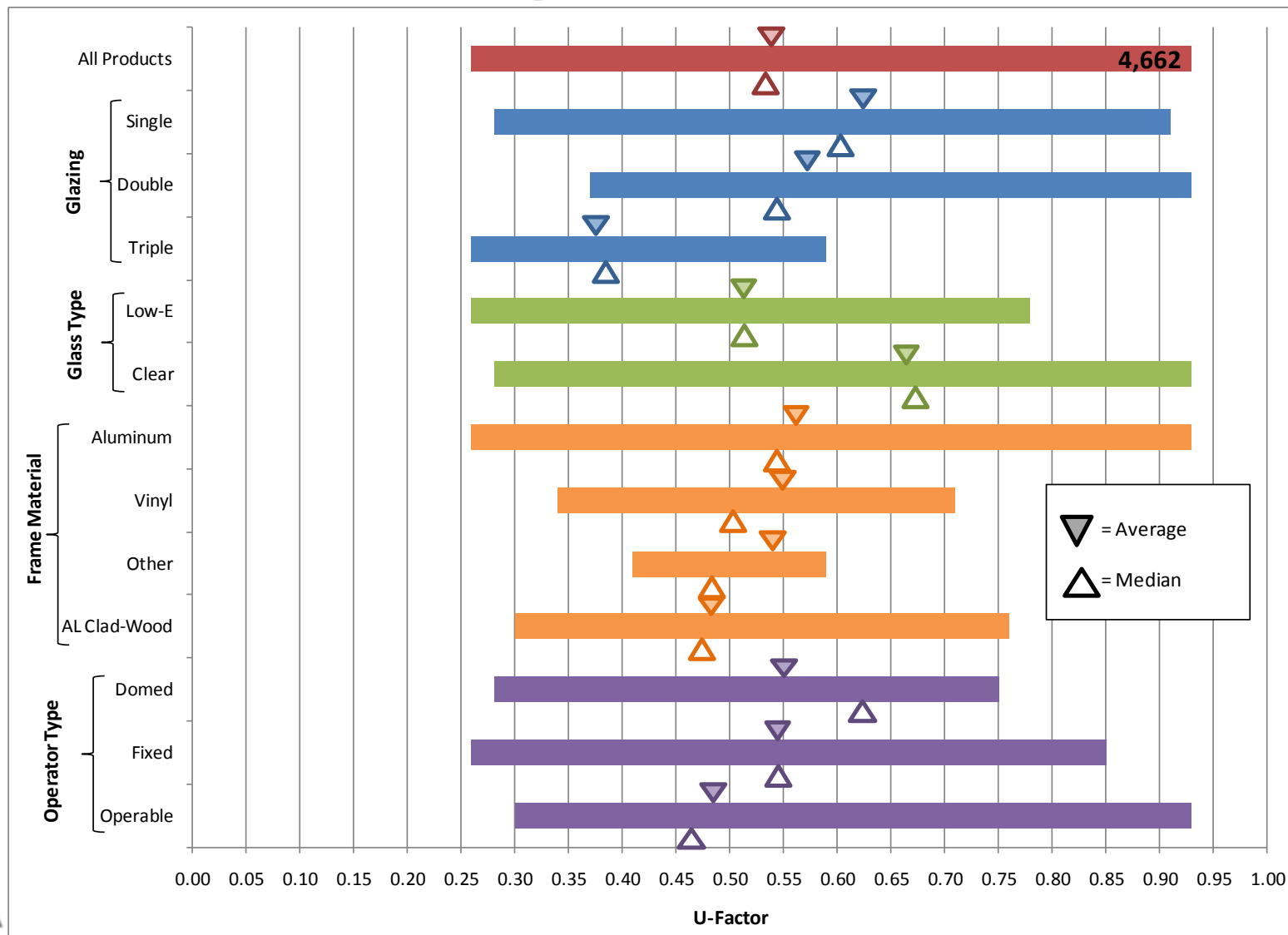
Climate Zone	U-Factor	SHGC
Northern	≤ 0.45	≤ 0.35
North-Central	≤ 0.47	≤ 0.30
South-Central	≤ 0.50	≤ 0.25
Southern	≤ 0.60	≤ 0.25

Current Criteria

Climate Zone	U-Factor	SHGC
Northern	≤ 0.55	Any
North-Central	≤ 0.55	≤ 0.40
South-Central	≤ 0.57	≤ 0.30
Southern	≤ 0.70	≤ 0.30

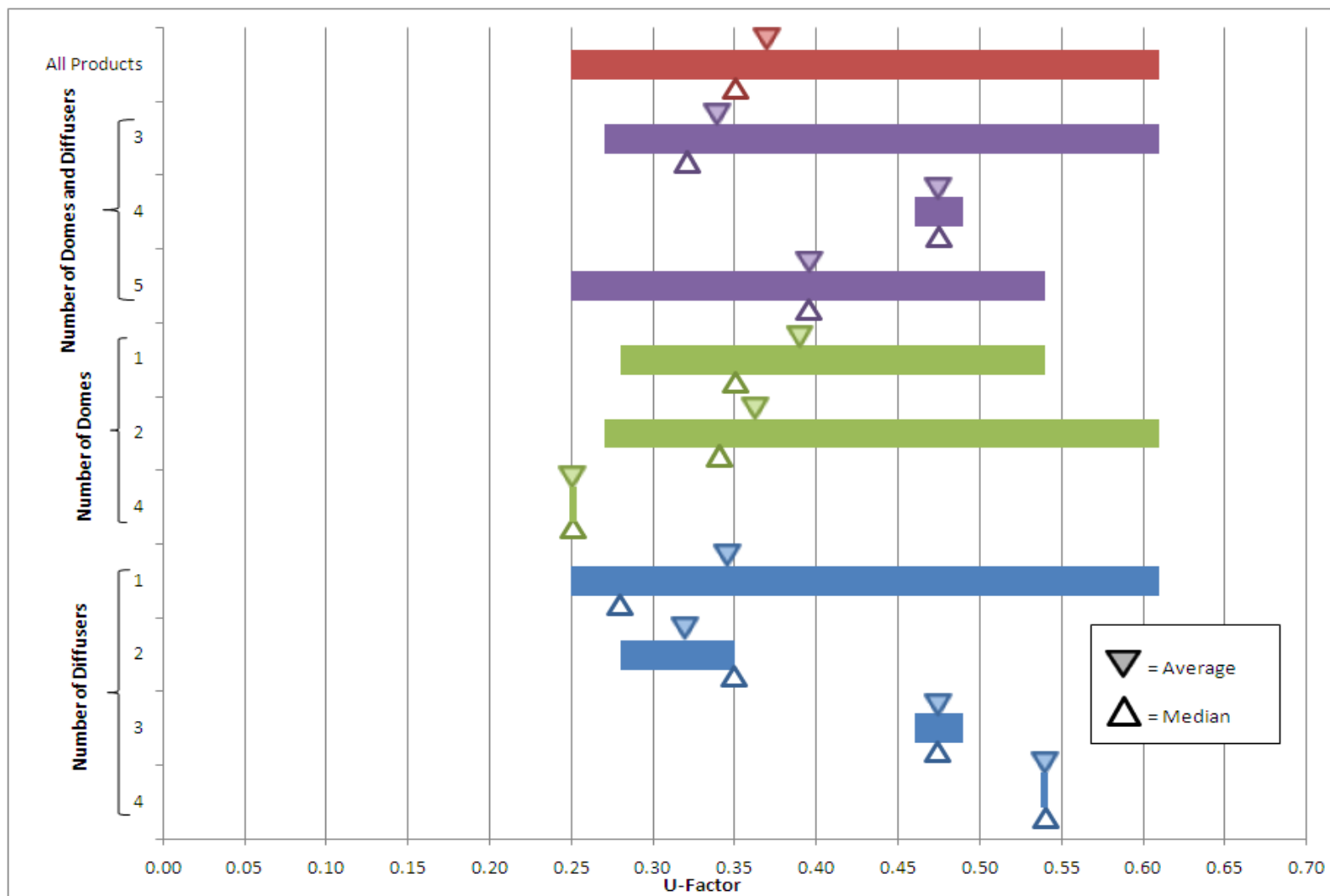


Technological Feasibility (CPD Skylights)



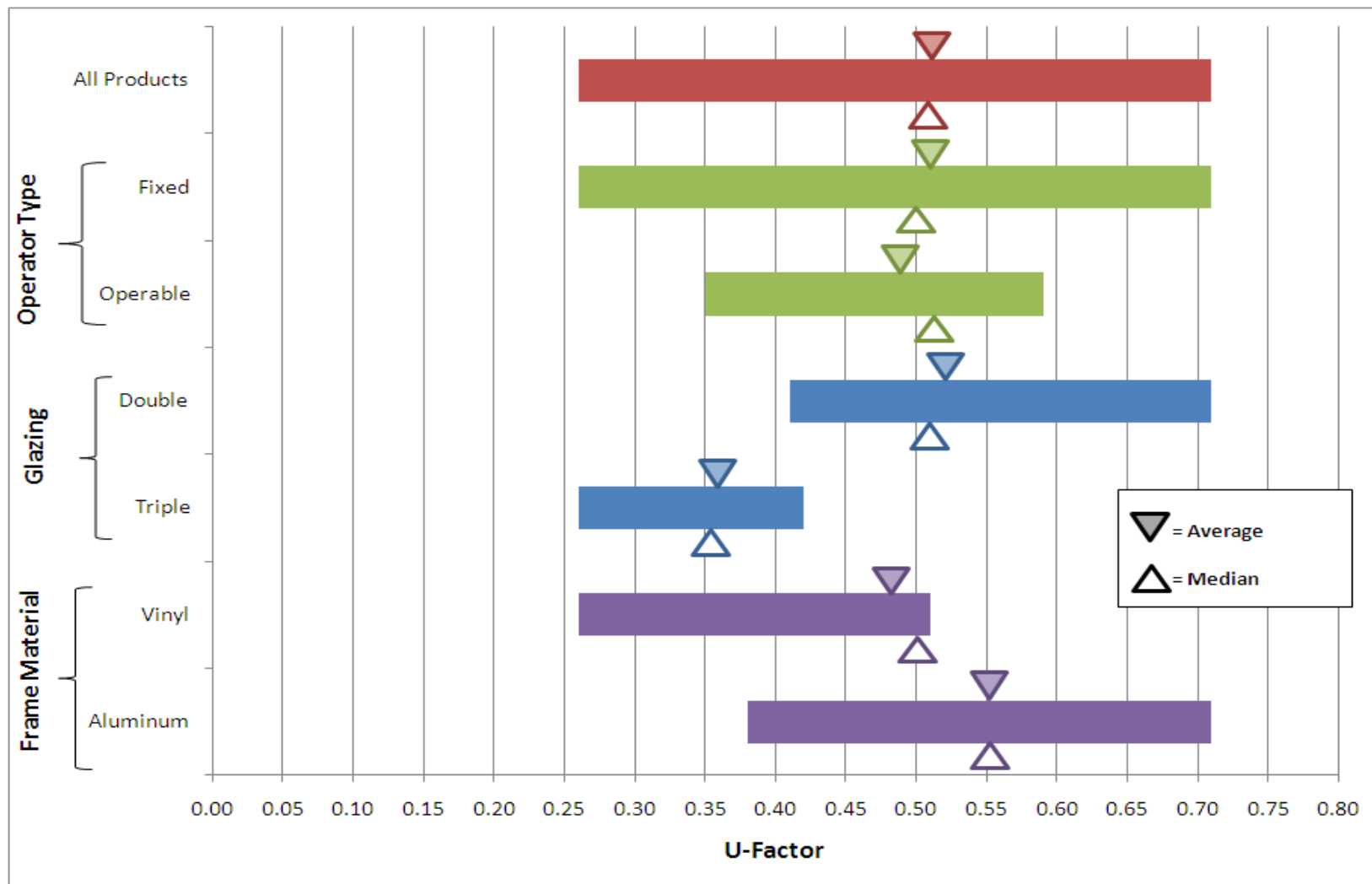


Technological Feasibility (CPD TDDs)



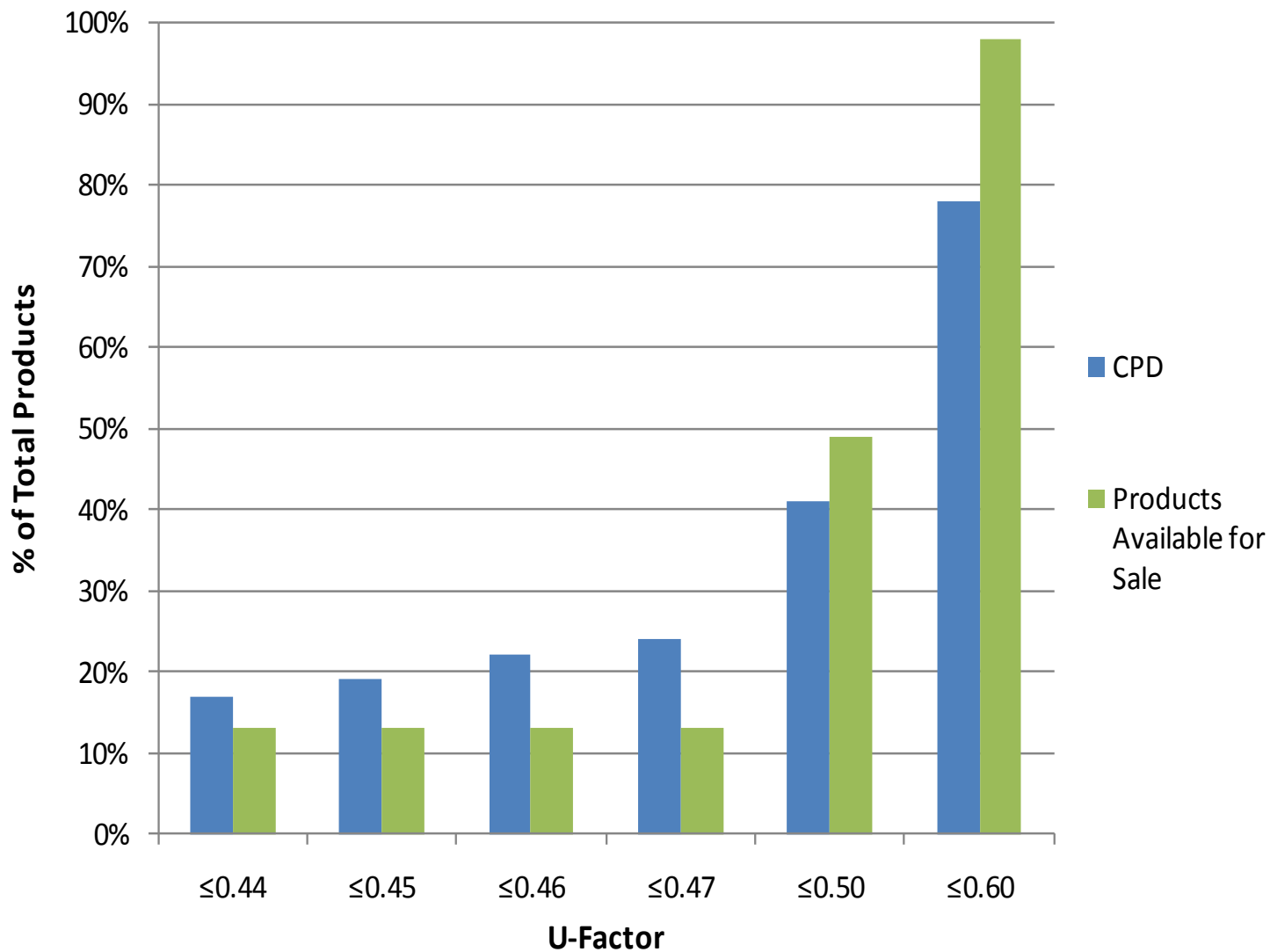


Product Availability Analysis



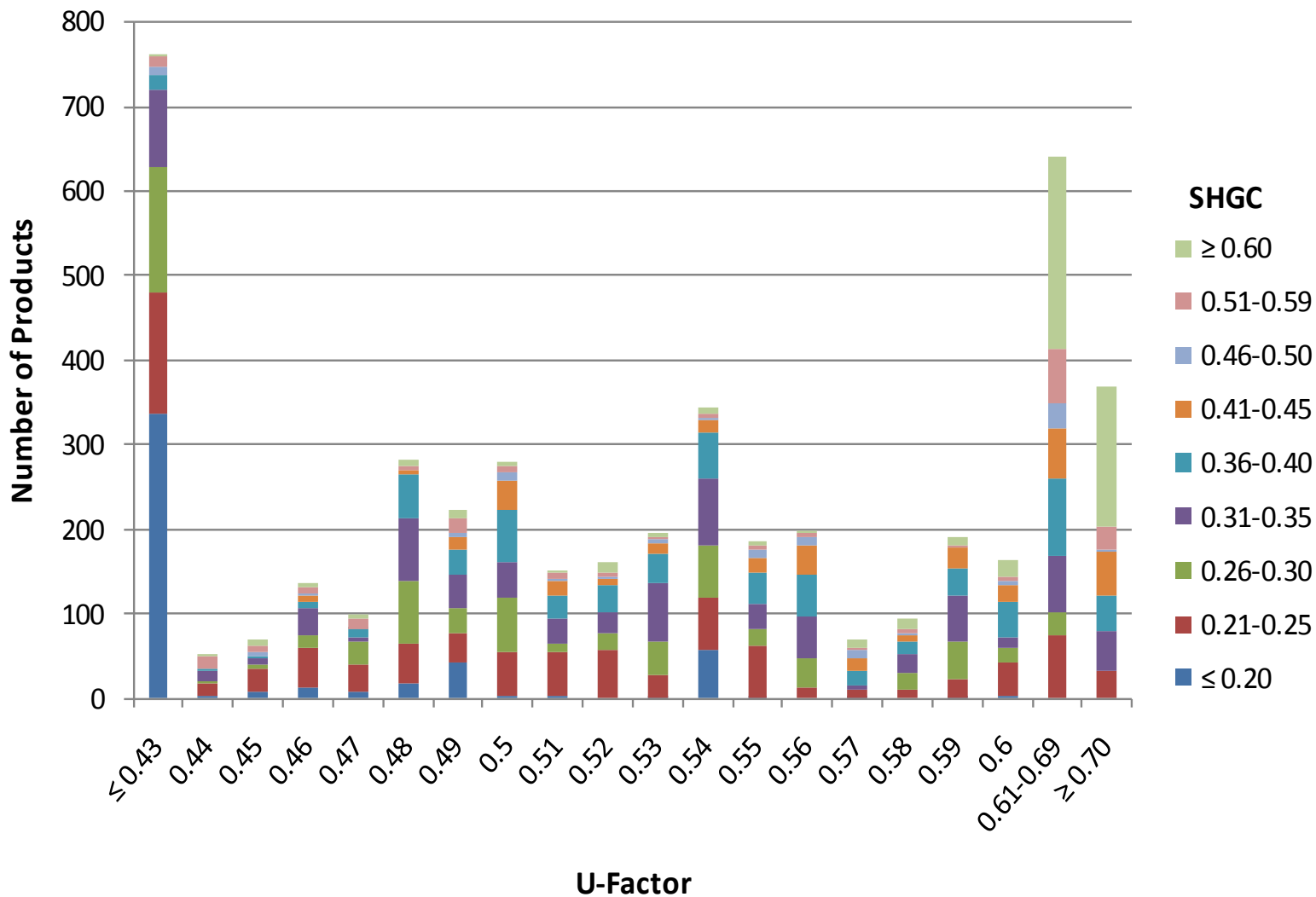


CPD versus PA Analysis



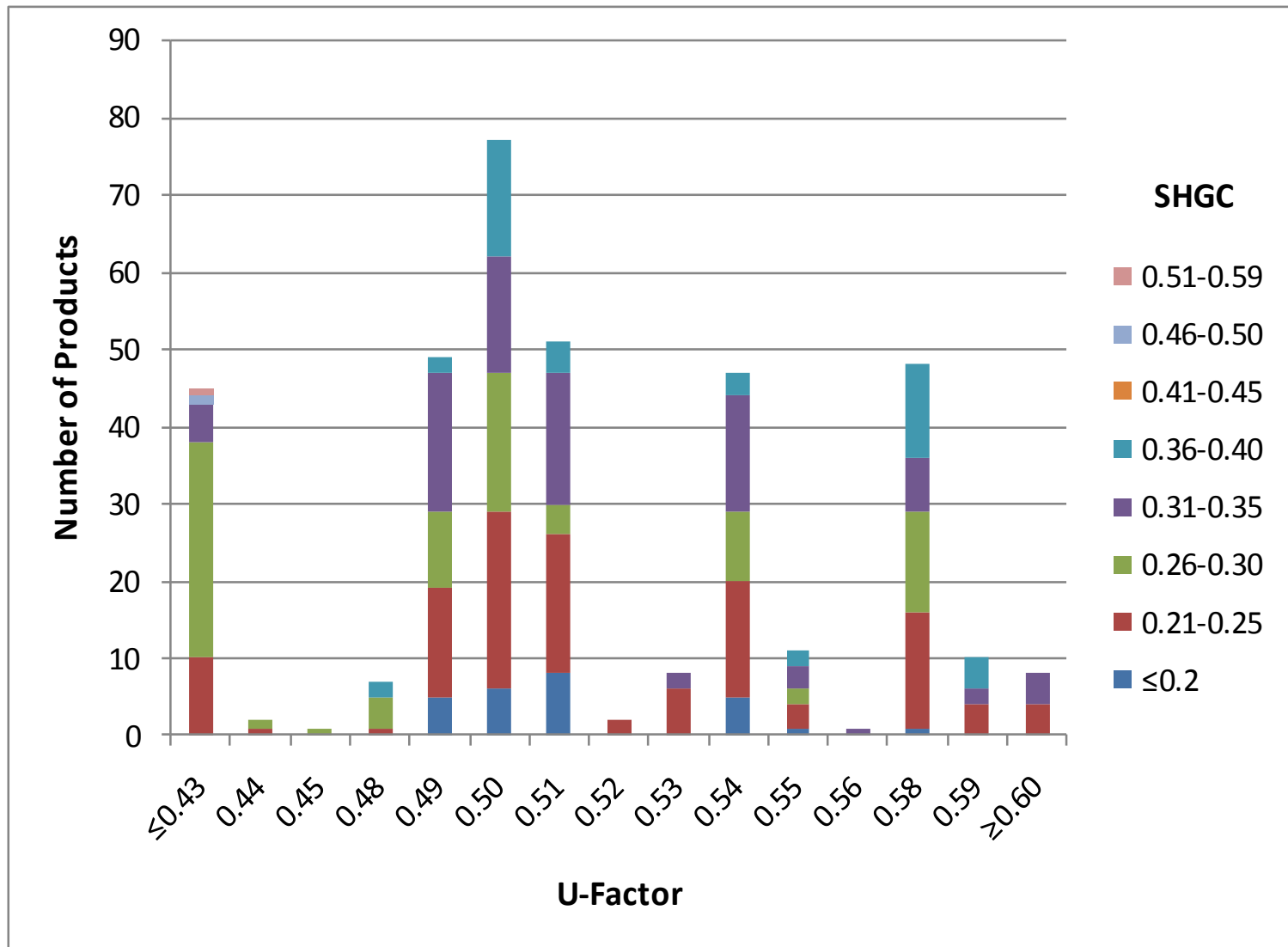


Technological Feasibility Analysis (CPD)





Product Availability Analysis





V6.0 Draft 1 Criteria



- Overview
- Technological Feasibility & Product Availability
- Cost-Effectiveness



Cost-Effectiveness



- Incremental Product Costs
 - Not enough skylight data received to publish
 - Too few TDDs to calculate

Zone	U-Factor	SHGC	V5.0 to V6.0
Northern	≤ 0.45	≤ 0.35	\$0-20
North-Central	≤ 0.47	≤ 0.30	\$0-20
South-Central	≤ 0.50	≤ 0.25	\$20-\$40
Southern	≤ 0.60	≤ 0.25	\$20-\$40

- Household Energy Savings
 - Zero to \$4 per year
- Average Payback of 29 years

Agenda



- Proposed Draft 1 Window Criteria



- Proposed Draft 1 Door Criteria



- Proposed Draft 1 Skylight Criteria



- Comment Period

Comment Period

- Send to windows@energystar.gov
- Mark as “Confidential” any files not to be posted
- All other comments will be posted to http://www.energystar.gov/index.cfm?c=revisions.residential_windows_spec
- Comments due **Friday, Sept. 28**



Gregory Homan Christian Kohler

Lawrence Berkley National Laboratory (LBNL)

Energy Star Program Savings Estimates

Gregory K. Homan
Richard E. Brown
Dariush Arasteh
Christian Kohler
Josh Apte
Steve Selkowitz

August 27, 2012

Windows & Daylighting Group
Lawrence Berkeley National Laboratory
Berkeley, California USA
Supported by U.S. Department of Energy

LBL's role



- LBNL performed national analysis
- Analysis purely based on energy (Btu) not cost (\$)
- Show where savings are possible
- Used to evaluate scenario's
- Analysis also used to help DOE with program planning

General Approach



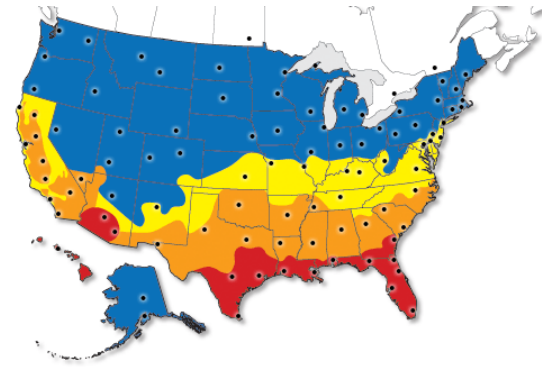
- This update uses the same basic framework and tools as the 2008 specification.
- Intent: keep the methodology as similar as possible to the previous analysis
- Computer Simulations of Window Performance in a Typical House used to assess energy savings potentials from Energy Star program (using DOE-2 annual energy simulation tool)

Energy Simulations



- DOE-2 energy simulations for homes
 - 98 Climates
 - 40+ window types per climate
 - Gas, Electric Resistance, and HP heating
 - Electric Air Conditioning
 - New and Existing, 1 and 2 story homes
 - RESFEN 6 available:

http://windows.lbl.gov/software/resfen/6/resfen_download.asp



- Converted simulation results to Equations
 - Heating/cooling data regressed for each climate as a function of U and SHGC
 - Regressions form the basis for National Energy Savings Model

Major Assumptions



House Type

Construction is modeled as frame. Both 1- and 2-story houses are modeled in all climates. Energy impact based on the fractions of 1- and 2-story homes in each climate, for New and Existing.

Foundation:

Based on location, and National Association of Home Builders (NAHB) data.
Basement, slab, and crawlspace foundation types are modeled

Floor Area	New	Existing
1 Story Homes	1700 sq. ft.	1700 sq. ft.
2 Story Homes	2800 sq. ft.	2600 sq. ft.
Insulation:	New is based on location using 2006 IECC requirements in Table 402.1.1 (except for fenestration).	Existing is modeled based on Ritschard et al. (1992).
Infiltration:	SLA = 0.00036	SLA = 0.00054

SLA = Standard Leakage Area = Effective leakage area / conditioned floor area.



Rationale: National Model



- DOE-2 models tell only part of the story:
 - Four buildings for each of 98 cities in database:
 - New vs. existing homes, 1 vs. 2 story
 - Also need to account for regional variation:
 - Population density
 - window sales patterns
 - Heating fuels
 - equipment penetration
- National sales model weights these regional patterns.

National Savings Model



- Estimates national and regional energy consumption
 - Estimates window sales based on Ducker shipment data.
 - Disaggregated by new homes / remodel and replacement
- Savings from window programs calculated by comparing scenarios.
 - The DOE-2 database allows wide range of U/SHGC simulations.
- Model handles translation among the different geographic areas
 - Efficiency: ENERGY STAR, IECC zones
 - Population, housing characteristics: Census
 - Sales: States
- Calibrated using RECS data

Reference Windows



- Double-pane, clear glass, vinyl frame
 - Used to represent low-end products and older code options,
- IECC criteria were used as the basis for the next sets of reference criteria
 - 2009 and 2012
 - Modifications to SHGC in modeling
- Also current ENERGY STAR (v. 5.0)
- Set penetration rates for each type based on existing and projected building code adoption.

Modeled Reference Windows



Zone		Criteria Maxima		Model Inputs	
		U-factor	SHGC	U-factor	SHGC
Double Clear	All	N/A	N/A	0.45	0.55
IECC 2009	8	0.35	NR	0.35	0.27
	7	0.35	NR	0.35	0.27
	6	0.35	NR	0.35	0.27
	5	0.35	NR	0.35	0.27
	4	0.35	NR	0.35	0.27
	3	0.5	0.3	0.5	0.27
	2	0.65	0.3	0.65	0.27
	1	1.2	0.3	1.2	0.27
IECC 2012	8	0.32	NR	0.32	0.27
	7	0.32	NR	0.32	0.27
	6	0.32	NR	0.32	0.27
	5	0.32	NR	0.32	0.27
	4	0.35	0.4	0.35	0.27
	3	0.35	0.25	0.35	0.25
	2	0.4	0.25	0.4	0.25
	1	NR	0.25	1.2	0.25
ENERGY	Northern	0.30	NR	0.30	0.27
STAR	North-Central	0.32	0.4	0.32	0.27
(2010)	South-Central	0.35	0.3	0.35	0.27
	Southern	0.6	0.27	0.6	0.27

Modeled Criteria Scenarios



To evaluate potential Version 6.0 ENERGY STAR criteria, several sets of candidate window specifications were developed.

- Complete criteria sets to evaluate overall programmatic impact potential
- Individual U-factor and SHGC criteria across the zones
- Understand trends in heating and cooling loads at various levels.

ENERGY STAR Climate Zone	U-Factor	SHGC
Northern	0.18-0.27	0.25-0.27
North-Central	0.22-0.30	0.27
South-Central	0.25-0.32	0.23-0.25
Southern	0.30-0.40	0.17-0.25

Modeling Variations



- Several ENERGY STAR Market Penetration variants were modeled
 - 10%, 5% and no MP reduction after new specification
- Savings presented are “first year” program savings; further MP over time was not modeled.
- What we present are results for the default-MP with calibration

Savings Results



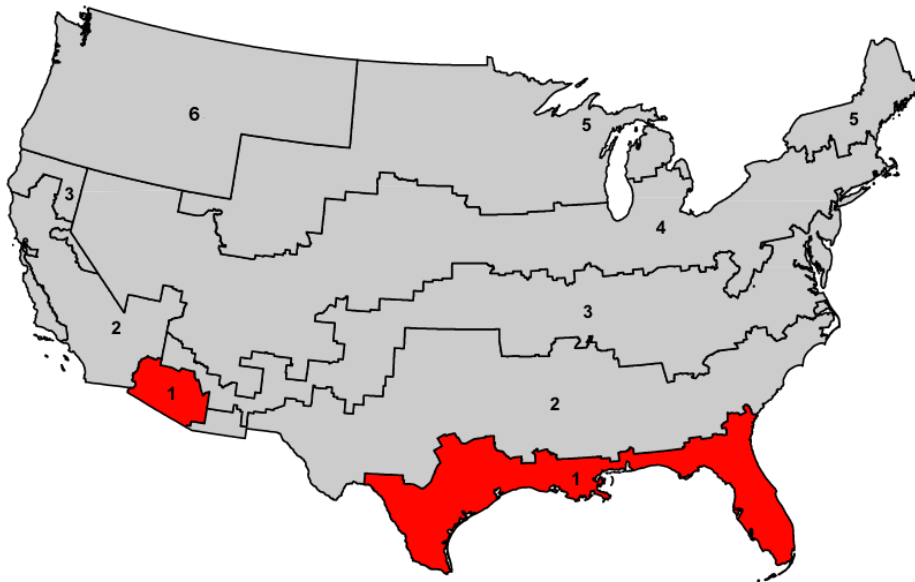
- Savings presented are “first year” program savings only.
 - Further market penetration over time not modeled
- Savings due to changed SHGC over existing Energy Star are small in most instances.
 - Higher than expected share of efficient windows
 - Very high market share of ENERGY STAR compliant products
- Zone savings $\approx 0.23 - 0.99$ trillion Btu per year

Zone 1 South



Specification	V. 5	V.6
U-value	0.60	0.40
SHGC (Criterion)	0.27	0.25
SHGC (as Modeled)	0.27	0.25

Trillion Btu Savings	
Total	0.99
Heating	0.93
Cooling	0.06



Remarks:

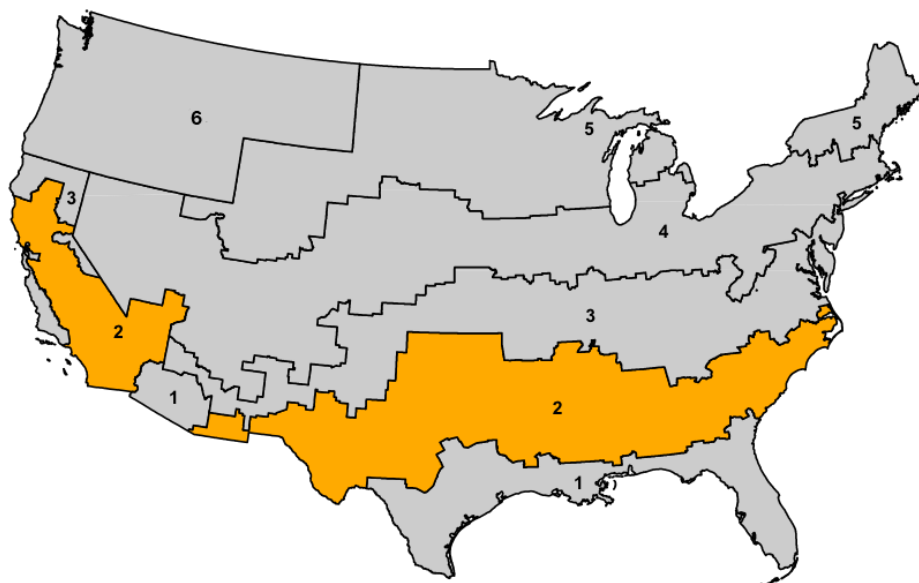
Heat savings quite substantial, partly due to relatively low existing penetration rate of high efficiency windows.

Zone 2 South Central



Specification	V5	V6
U-value	0.35	0.31
SHGC (Criterion)	0.30	0.25
SHGC (as Modeled)	0.27	0.25

Trillion Btu Savings	
Total	0.23
Heating	0.17
Cooling	0.06



Remarks:

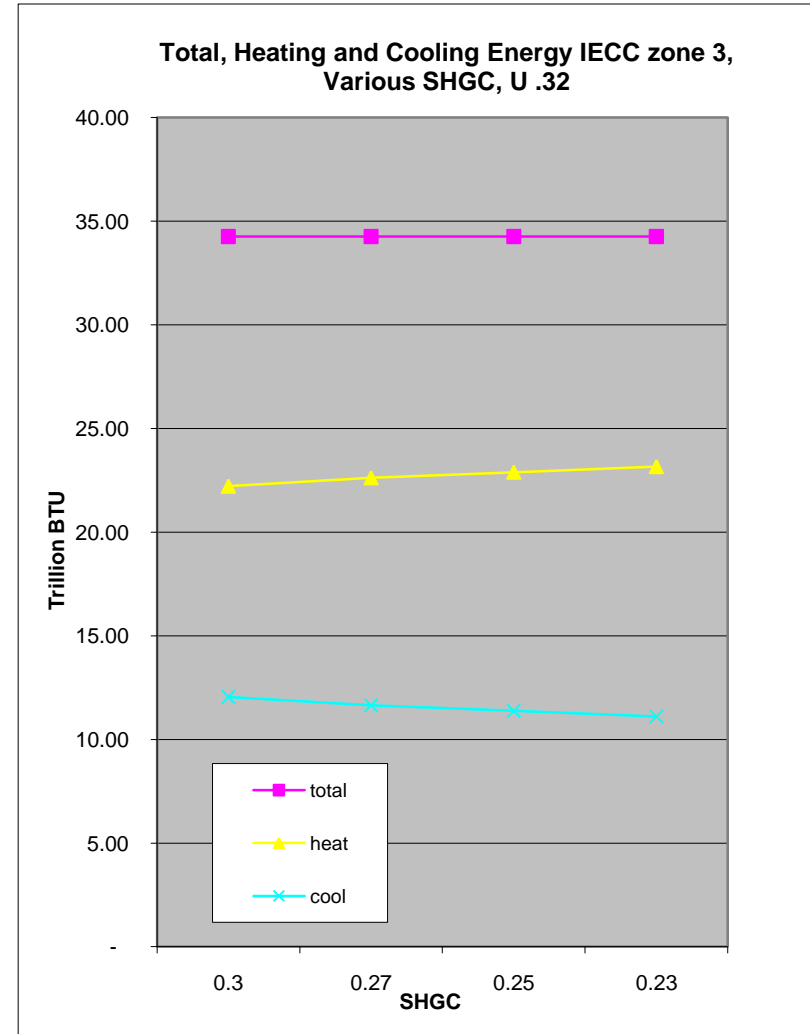
Proposal modestly improved in this zone, and savings correspond.

SHGC sensitivity in South Central zone



Changes in Heating and Cooling Energy due to changes in SHGC largely offset each other.

Same effect at U .32 and .35

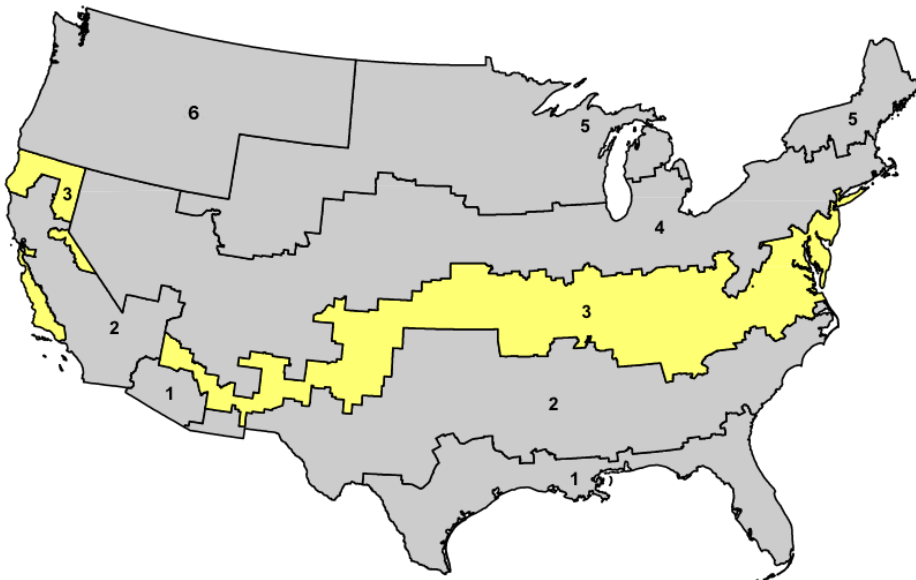


Zone 3 North Central



Specification	V5	V6
U-value	0.32	0.29
SHGC (Criterion)	0.40	0.40
SHGC (as Modeled)	0.27	0.27

Trillion Btu Savings	
Total	0.47
Heating	0.54
Cooling	(0.07)



Remarks:

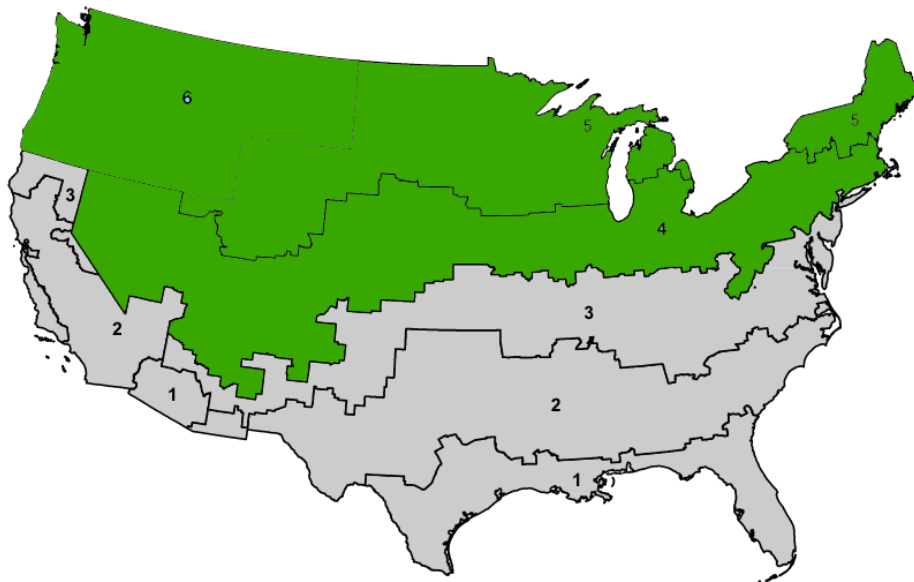
Heat savings dominate.
Improvement only in U-factor.
Modest cooling losses.

Zone 4 North



Specification	V5	V6
U-value	0.30	0.27
SHGC (Criterion)	Any	Any
SHGC (as Modeled)	0.27	0.27

Trillion Btu Savings	
Total	0.51
Heating	0.67
Cooling	(0.15)



Remarks:

Energy savings in heating, due to significant U-factor improvement.

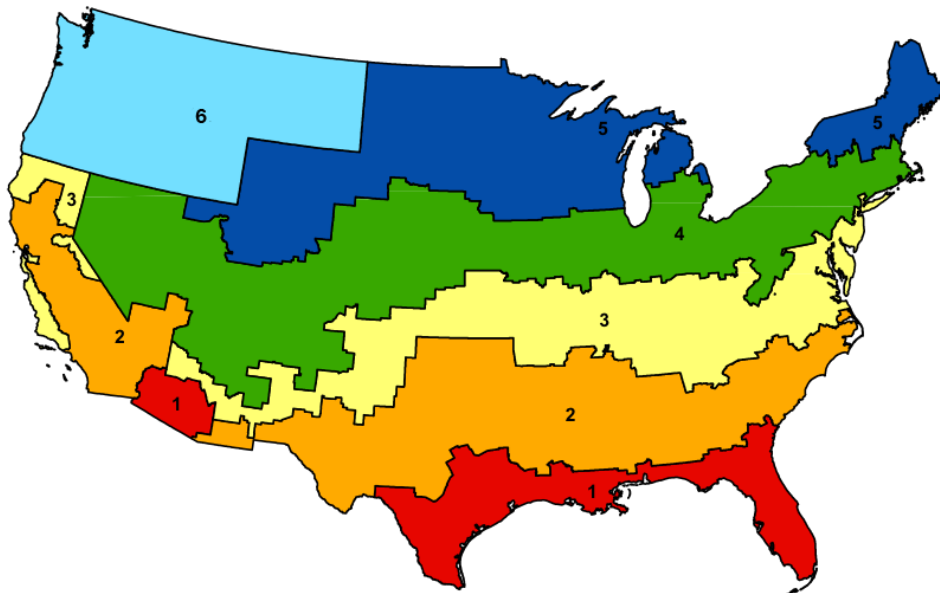
Most populous zone

National Savings



Trillion Btu Savings	
Total	2.21
Heating	2.31
Cooling	(0.10)

1 trillion Btu \approx \$18 million



Remarks:

Significant annual savings in heating energy, overall modest increase in cooling energy.

Even greater heating savings possible but might require shift to triples and minimum SHGC in the North.

Annual savings from program expected to increase in future years as penetration of ENERGY STAR products increases.

Trade-off analysis



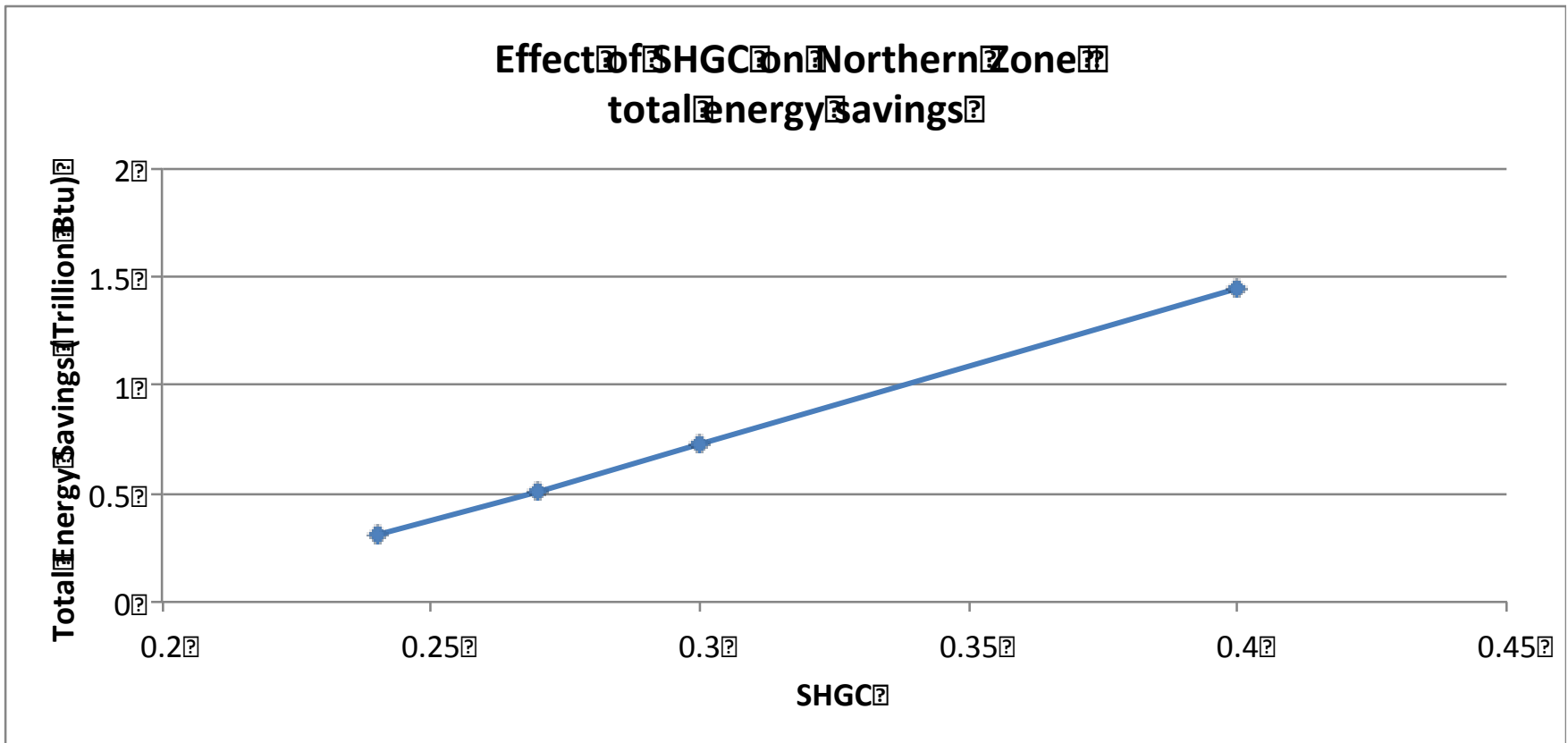
- In heating climates, equal annual energy performance can be achieved with different U/SHGC combinations.
 - Want to reduce overall energy consumption
 - Lower U – better thermal performance
 - Raise SHGC – increased “free” heat (but must be “useful” to offset net heating)
- How much do you have to raise SHGC to keep the same energy consumption with a higher U?
 - - 0.01 U = 0.xx SHGC
- Tradeoff analysis performed for Northern ENERGY STAR zone

Procedure



- Calculate overall energy consumption with spec U (0.27) and modeled SHGC (0.27)
- Then increase the U-factor by 0.01
- Calculate which SHGC will results in equivalent energy consumption
- Result: $U=0.28$, $SHGC=0.32$
- $0.01 U = 0.05 SHGC$

Effect of SHGC in the North



- SHGC=0.27 modeled in Northern Zone because of market availability of products
- Setting a minimum SHGC higher would result in significantly larger savings (e.g. double the savings for SHGC=0.35)

Sources



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Windows, Doors, and Skylights Stakeholder Meeting

Lunch Break

Most Efficient Update at 12:30 PM Eastern

Meeting resumes at 1:00 PM Eastern



Doug Anderson

U.S. Environmental Protection Agency

Project Manager

ENERGY STAR Window, Door, and Skylights



ENERGY STAR

Most Efficient Update



- EPA and DOE discussing proposal
- Windows will be folded into the existing ME program structure and format
- Individual products (not lines) will be listed in detail on web site (but not prices)
- No “Most Efficient” logos on products – only for marketing (web, brochures, signs)
- See www.energystar.gov/mostefficient



ENERGY STAR

Most Efficient Update



- Draft recognition criteria to be released early September
- Three-week comment period
- Stakeholder webinar mid September
- Final criteria released in October
- Recognized product lists for windows start January 2013



Thomas S. Zaremba

Roetzel & Andress

Executive Summary – Stakeholder Comments

- **The Addition of Minimum SHGCs in the Northern Zone**
- **Adding Equivalent U-Factor / SHGC Combinations in the Northern Zone**
- **Lowering U-Factor to 0.25 in the Northern Zone**

Minimum SHGC

- EPA's Report says that "high-gain, low U-factor products" are "extremely uncommon" and a minimum SHGC would violate the Energy Star principle that "products are broadly available." (Draft 1 Criteria and Analysis Report, pp. 26-27).

*******These statements are incorrect*******

- **EVERY** primary glass manufacturer offers a *high-solar gain* product for sale in the U.S. marketplace.
- The same primary glass makers supply both the U.S. and Canada.
- The Canadian Energy Star database, where high-solar gain products are encouraged, shows that over 20,000 high-solar gain products are available.
- Applying the regression model developed by LBNL in 2008, numerous high-solar gain products can readily be matched with U-factors to deliver equivalent energy performance to low U-factors in the north.

Product Availability - High-Solar Gain Low E

- PPG offers three high-solar gain products:
 - Sungate 400, Sungate 500 and Sungate 600
- Guardian offers four high-solar gain products:
 - ClimaGuard 75/68, 80/70, IS-15 and IS-20
- Cardinal offers two high-solar gain products:
 - LoE-180 and LoE-i81
- NSG/Pilkington offers one high-solar gain product – Energy Advantage
- AGC offers three high-solar gain products:
 - Comfort E2, E-PS and Ti-PS.
- Given that *13 different high-solar gain products* are available from *5 different manufacturers*, EPA's statement that such products are "extremely rare" is not correct.

Equivalent U-factor/SHGC Combinations in the North

- **The Draft 1 Criteria will unfairly *preclude* a number of equivalent energy performing products from bearing the Energy Star label.**
Currently, only ***one*** set of equivalent energy performing products will qualify for the Energy Star label, namely, a 0.28 U-factor with an SHGC ≥ 0.32 .
- **Pursuant to the regression model published in 2008 by LBNL, windows meeting these criteria will also deliver equivalent energy performance:**
 - ***U-factor = 0.29 with SHGC ≥ 0.37***
 - ***U-factor = 0.30 with SHGC ≥ 0.42 .***
- **There is also no legitimate basis upon which to discriminate against these equivalent energy performing windows by depriving them of an Energy Star label in the northern zone.**

Lower Northern U-Factors

- In a recent unofficial poll, Window and Door asked readers what they thought of EPA's Draft 1 criteria. As of 8/7/12, 61% of those responding thought the criteria should have been more stringent.
- The criteria issued by DOE in 2003 resulted in an aggregate national energy savings of 12.0 trillion Btus (tBtus).
- The last criteria revision issued by DOE in 2009 resulted in an aggregate national energy savings of 9.2 tBtus.
- EPA's Draft 1 Criteria will only result in an aggregate energy savings of 2.2 tBtus, or one-fourth of the savings resulting from the last Energy Star revision cycle.
- In the last revision cycle, the northern zone alone resulted in a 1.97 tBtu savings while EPA's Draft 1 criteria will only save 0.52 tBtus, or about one-fourth of the energy savings captured in the last cycle.

Lower Northern U-Factor

- Why are the aggregate energy savings so low in this cycle compared to earlier Energy Star cycles?
- In part, because EPA's northern U-factor criteria is so high that, instead of leading the market to the best performing products, it will continue to permit a full 41.5% of the products that are *currently* on the market to meet the new criteria. (See, Report, p. 20).
- This contradicts Energy Star's own stated goal of selecting "efficiency levels reflective of the top 25% of models available on the market." (See, Report, p. 7).
- What should be done?
- One thing that could greatly increase aggregate national energy savings in the northern zone is a reduction in U-factor to 0.25.
- EPA's own data clearly shows that 4th surface low-e double glazed units can easily achieve 0.26, 0.25 and even 0.24 U-factors.
- Figure 14 of the Report shows that 7% of the double glazed units in the CPD are 4th surface low-e windows with U-factors ≤ 0.25 . (See, Report p. 24).

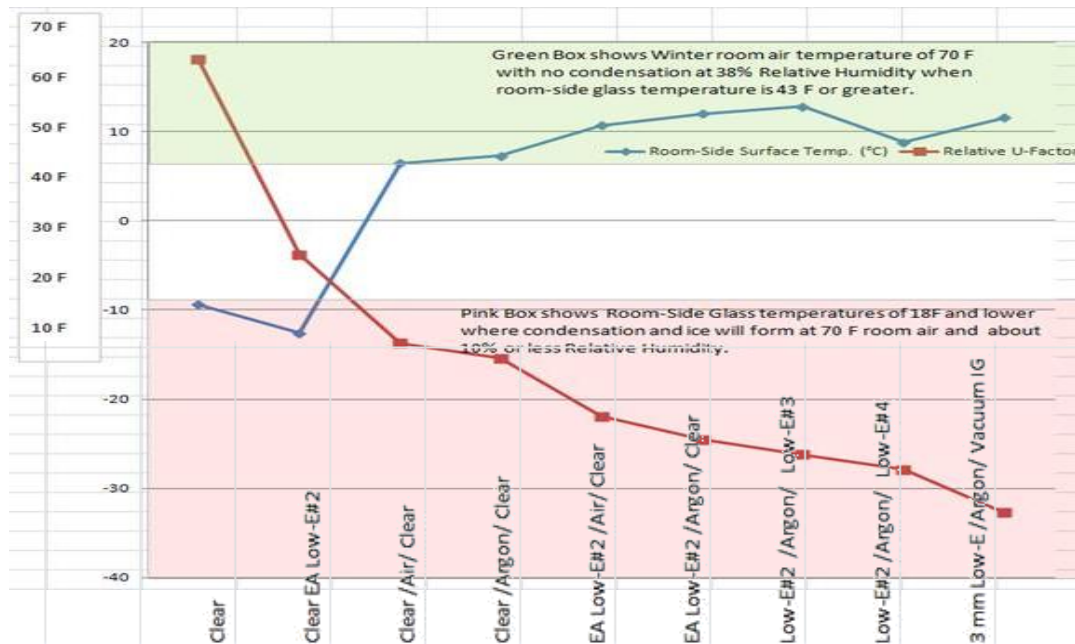
Passive Solar & 4th Surface Low E Coatings

- The chart below shows high-solar gain Low E coatings that are marketed by the U.S. primary glass manufacturers. Every one of the U.S. glass manufacturers offers at least one #4 surface window coating:

Manufacturer	Product Name	Coating Type	4th Surface
PPG	Sungate 400	Soft Coat	No
PPG	Sungate 500	Hard Coat	No
PPG	Sungate 600	Hard Coat	Yes
NSG / Pilkington	Energy Advantage	Hard Coat	Yes
Cardinal	LoE-180	Soft Coat	No
Cardinal	LoE-181	Soft Coat	Yes
Guardian	ClimaGuard 75/68	Soft Coat	No
Guardian	ClimaGuard 80/70	Soft Coat	No
Guardian	ClimaGuard IS-15	Soft Coat	Yes
Guardian	ClimaGuard IS-20	Soft Coat	Yes
AGC	Comfort E2	Hard Coat	Yes
AGC	Comfort EPS	Hard Coat	Yes
AGC	Comfort Ti-PS	Soft Coat	No

4th Surface Low E Products

- Some window manufacturers have expressed concern that condensation may be an issue with use of 4th surface low-e products.
- In fact, the surface temperature of these products are at least 4° F warmer at the center of glass than double pane clear glass with a 1/2" air gap.
- Over extensive use spanning more than 25 years, there is no documented evidence to support the notion that properly manufactured double pane clear units with a 1/2" air gap have experienced harmful condensation in cold climates.
- Given that 4th surface low-e products are 4° F warmer at the center of glass, if condensation exists, it will be related to the cooler frame and spacer surfaces, not the glass.



Contact Information

Thomas S Zaremba

Roetzel & Andress, LPA

1 Seagate, Suite 1700

Toledo, Ohio 43604

Phone: 419-254-5246

Tzaremba@RALaw.com

www.ralaw.com

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John H. Jervis

American Window & Door Institute (AWDI)

Who Is AWDI

John H. Jervis; Managing Director
1-800-488-AWDI – 8/27/2012

- AWDI, LLC – Since 1989, describing performance-based installation best practices for Replacement, Remodeling, Retrofit and new construction applications. Launched WIXSYS.com to offer online more than 48 application specific illustrated installation best practices.
- First described flashing practices basis for Method A/Method B recommendations in ASTM 2112
- First published Standards and Practices, first Certification Procedure, recommendation from Consumer Reports Magazine, first registered Certification Mark for installation.



Who Is AWDI

John H. Jervis; Managing Director
1-800-488-AWDI – 8/27/2012

- Founded, published and edited Window & Door Magazine
- Established Annual Top 100 Manufacturers
- Established Annual Crystal Achievement Awards
- Helped Home Depot establish At-Home Services for Window Replacement
- Installation Consultation w/ 30+ major Window Companies
- ASTM 2112 Task Force participant
- Member Florida Building Commission Window/Wall Workgroup



Retrofit Has Biggest Need

- Retrofit, Remodel and Replacement need installation most attention
- New Construction served by ASTM 2112 and building codes.
- When old windows are replaced with energy efficient ones, weather management in the existing opening is too often compromised resulting in reduced in-service performance*.



75% Mfrs Need Instructions

- “Top 100” manufacturers mentioned in § 3.2.2 of Directive are barely 10% of manufacturers to be considered
- Of the Top 1,000, 75% are small fabricators missing instructions.
- Half dozen PVC Extruders provide product design and parts for more than 700 fabricators. Think “Coca Cola regional bottlers.” They need to be accommodated.
- WIXSYS portal designed to be an immediate compliance solution and resource for other performance information
- WIXSYS can help avoid stragglers who would be in danger of losing Energy Star Rating and resistance to the Directive



Pushback from Manufacturers

- Reluctance to make instructions available to consumers
- Need to protect the Specialty dealer and professional installers in marketplace
- Concern for increased cost to post and comply
- Concern posting will increase liability for install
- Concern directive will raise cost to install

But – Historical Evidence suggests otherwise



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WIXSYS Portal is Adaptive

- For those who have all
- For those who have a few
- For those who have none
- WIXSYS library portal style meets full list of EPA/DOE criteria manufacturers can embrace 100% or selectively add to their stable to eventually replace with their own

www.wixsys.com/beta.html

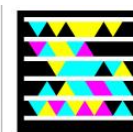
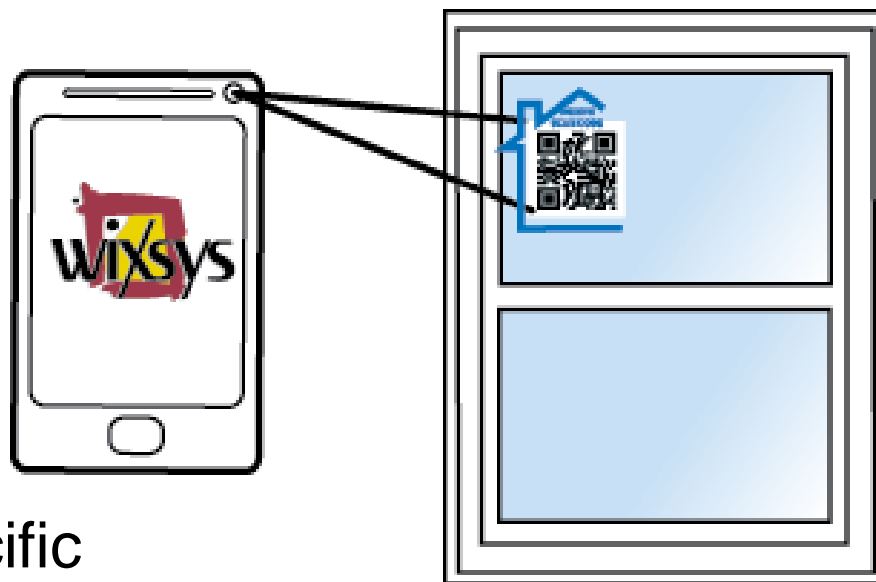


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- INSTRUCCIONES DE INSTALACIÓN PARA LA MAYORÍA DE LAS APLICACIONES DE VENTANERÍA**
- Enlaces**
Specifications ventana y Puertas
Usa y Cuidado
Fabricantes, distribuidores e instaladores
Información de Energía
Programa de utilidad y Reembolsos
Requisitos DOE
La selección de la VENTANERÍA ADECUADA PARA SU JARDÍN
Laboratorios de ensayo
Auditorías para toda la casa
Información Fiscal
Libros
- AVDI BETA DEL SITIO**
- ENCUCLADA / DOUBLE HUNG**
• Split Casings
• Full Frame
• Fin / Inside
... más
- DESIZADORES**
• Box Frame
• Split
• Fin / Inside
... más
- CASIMIERE / TOLDO**
• Frame In
• Frame / Sillido
• Tilt-Turn
... más
- BAY / BOW / JARDIN**
• Bodega adecuada
• Techo Construcción
• Sill Support
... más
- VENTANA DE ALUMINIO**
• Aluminio Extrusion en Brick
• Tipos de ventanas
• Embarcaciones
... más
- VENTANA DE ALUMINIO**
• Frame In
• Hacienda palanca Marco
• Antigua
• Nuevo Sill
... más
- Formas y FILAS**
• Tipo Caspi
• Windows Picture
• Transoms
... más
- COMBINADO / CASIMIERE con espaldas**
• Split Mull
• 16-Mull
• Structural Mull
... más
- BE CAREFUL!**
While it is possible to do basic repairs, making an error might mean you'll have to replace the window or door. You may get new operating parts in place, but the old unit may not be the same.
- D.I.Y. or PRO?**
- FATIO Y ENTRADA DE PUERTAS**
• Back
• Alca Clavada
• Brick Mould
... más
- SOTANO Y SERVICIOS PUBLICOS**
• Control deslizante
• Especialidades
... más
- CORTERA DE WINDOWS**
• Caspi / Abertura
• Impacto Acristalamiento
• Codigos
... más
- VORIO Y CRISTALES**
• Lower / Gas de refresco
• Impacto
• Triple acristalamiento
... más
- REGISTRARSE**
Nombre
E-mail
Submit
- MEJORA EXACTA**
• Ancho primero, y luego Altoza
• Box, Corona, Planar
• Puntal, Nivel Plana
... más
- ALBAÑILERIA / BLOQUE**
• Caspi
• Back Wood
• Aluminio directo w / clips
... más
- Instalar seguros PLANO**
• Techo Estructura adecuada
• La construcción y el aislamiento
• EDA y reglas de OSHA
... más
- GESTIÓN DEL AGUA**
• Desviar, Secar, Secar
• Reestructurando a Barreras
• Impacto Ruido
... más
- TORMENTA DE INSTALACIÓN VENTANA**
• Programa de Climatización
• Asiste al cliente
• Panel único vidrio Low-E
... más
- AFUERA EN SUSTITUIR**
• Exterior Expander
• Sello Acristalamiento y Sill
• Preservar el interior Seguro
... más
- MARCO MARCO IN OUT IN**
• Fin del arco va al interior
• Trozos y conexiones
... más
- CONTROL DE SONIDO**
• Acristalamiento acústico
• Decibelios y Comfort
• Aislamiento exterior en el exterior
... más
- PUERTAY VENTANA**
- 12

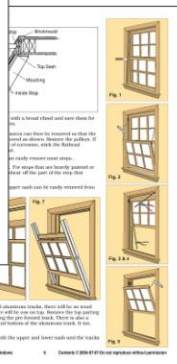
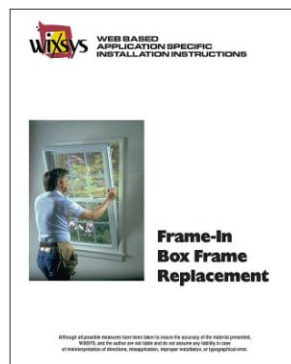
Delivery of Instructions

- Access to instructions need to be available from the window itself
- QR or Smart Code will allow direct link to Manufacturer's personal WIXSYS site
- Code can be product and/or application specific
- Each use can be tracked down to product and place

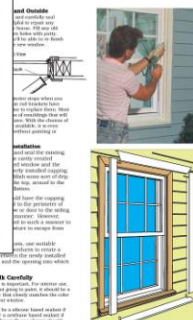
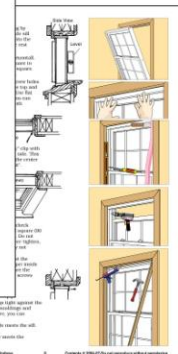
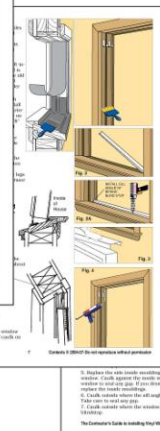


So Many Applications – So Few Instructions

- Instructions need to cover hundreds of application specific conditions
- Need to be performance-based rather than prescriptive
- Only comprehensive library available



Each section fully illustrated
with line art and sequential
photos based on tests,
standards and best practices



WIXSYS Portal provides:

- Illustrated List of Tools and Hardware
- Detailed, Comprehensive 5-Plane Measurement
- Lead-Safe Testing, Installing and Cleanup Methods
- Illustrated Window, Wall and Door Parts & Components
- Illustrated Guidance for Removal of Existing Windows
- Detailed Illustrated Flashing & Shimming Instructions
- How to Seal and Weatherproof all 5 barriers
- All Application-specific and Mounting-specific Variables





Jeff Inks

**Window & Door Manufacturers Association
(WDMA)**



Introductory Remarks

WDMA member manufacturers:

- Committed to improving energy efficiency of fenestration & achieving efficiency goals for the built environment
- Historically invested and committed to the ENERGY STAR® Program
- Concerned about guiding principles & future of the program



Introductory Remarks

Among issues of particular concern to WDMA member manufacturers:

- Provisions for:
 - Certain Energy Efficiency Requirements & basis for them
 - Air Leakage Requirements
 - Installation Instructions
- Consistent basis for skylight criteria
- Aspects of Analysis Report
- Future revisions & process
- Others



Air Leakage Requirements

- Concurrence with inclusion
- Values appropriate
- Issues with labeling



Installation Instructions

- If a requirement is included, simple is adequate, e.g. manufacturers must provide
- Proposed list of what must be included problematic
 - ambiguous
 - some impractical
 - no compliance measures
- Issue already covered by building code
- Unrealistic to expect industry associations to provide



Analysis Report

- Caution on relying too heavily on Ducker & NFRC database
- Exclusion of triple pane from analysis
- Analysis should be updated
- Others




Guiding principles

- Industry perception/position of the intent of the program
- Concerns over EPA's perspective and current intent of program
- EPA needs to re-evaluate direction
- Reduction of energy consumption needs to be priority
- Ensuring consumers have sound, reliable guidance on window, door and skylight selection needs to be priority
- Market penetration is not a bad thing



Revision Timing & Process

- Current revision process needs to be maintained
 - Windows, doors & skylights different than other program products
- Frequency of revisions – needs to consider many factors
- Potentially pushing unproven technologies

A collage of images related to windows and doors, including a wooden door handle, a stained glass door, and a window view.

ENERGY STAR® for Windows, Doors, and Skylights

Version 6.0 – Draft 1

Preliminary WDMA Comments



Jeff Inks
Vice President –
Code & Regulatory Affairs
Window & Door Manufacturers
Association
jinks@wdma.com



**ENERGY STAR® for Windows,
Doors, and Skylights**
Version 6.0 – Draft 1
Stakeholder Meeting
August 27th, 2012



Ray Garries

JELD-WEN Inc



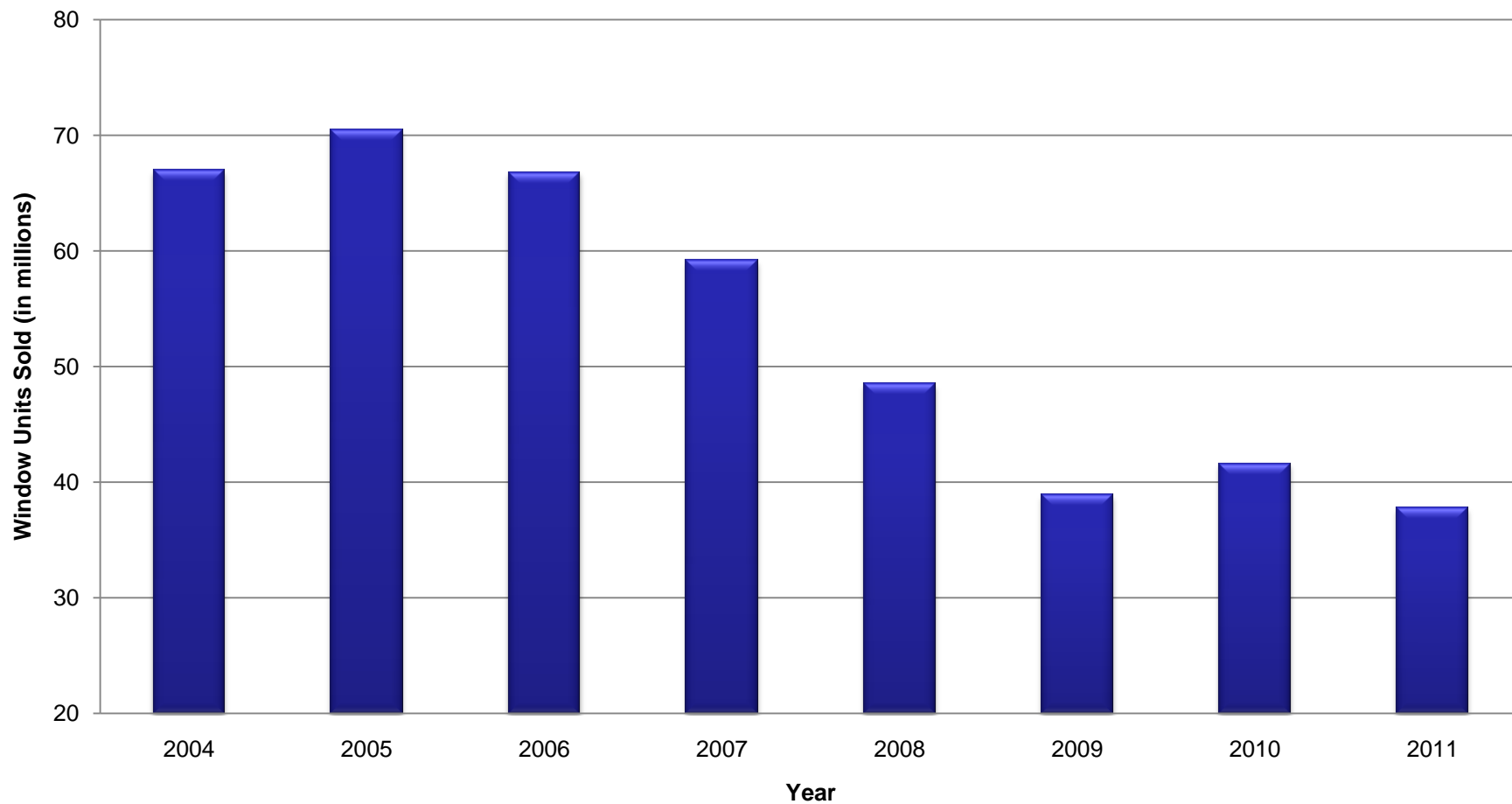
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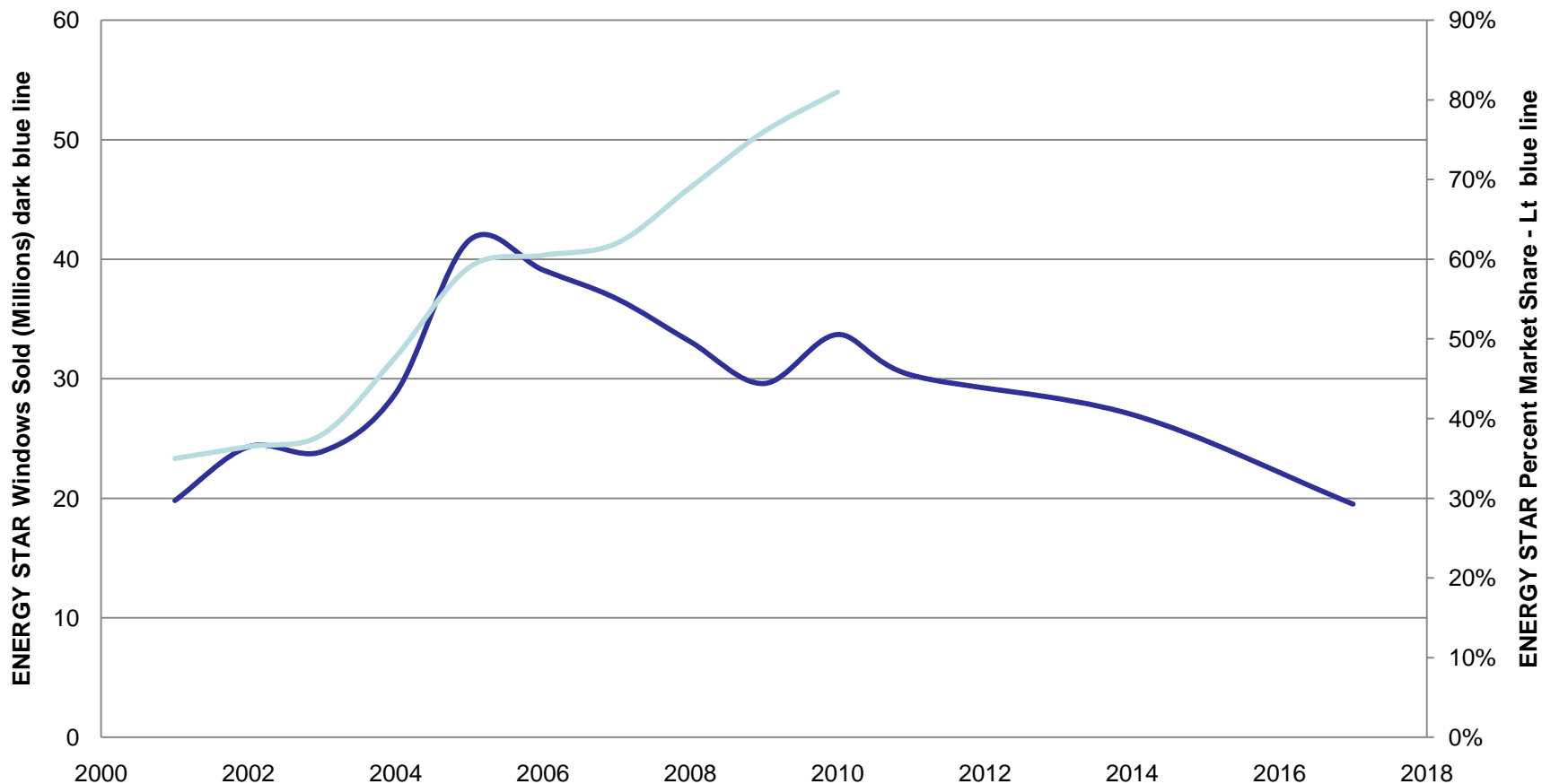
Key Points

- JELD-WEN, inc. has been a partner since ENERGY STAR's beginning in 1998 and is a two-time Partner of the Year
- ENERGY STAR™ is the largest brand in our industry for energy efficient products
- Primary concerns include the protection of the brand and increased sales of branded products to reduce energy costs to consumers
- An estimated one billion single-glazed windows and doors in North America still in use and in need of replacement

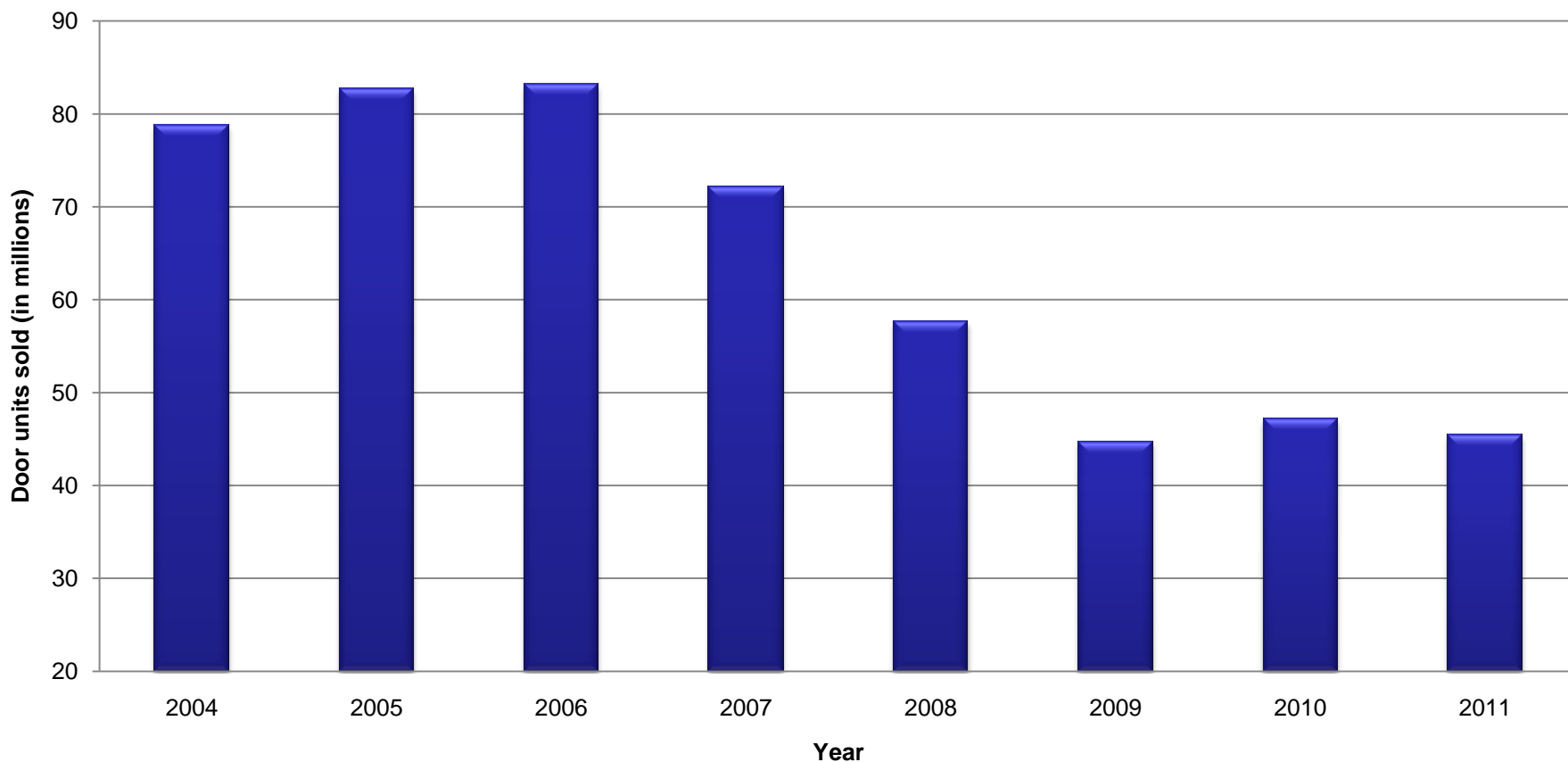
Total Window Units Sold Over Last Decade



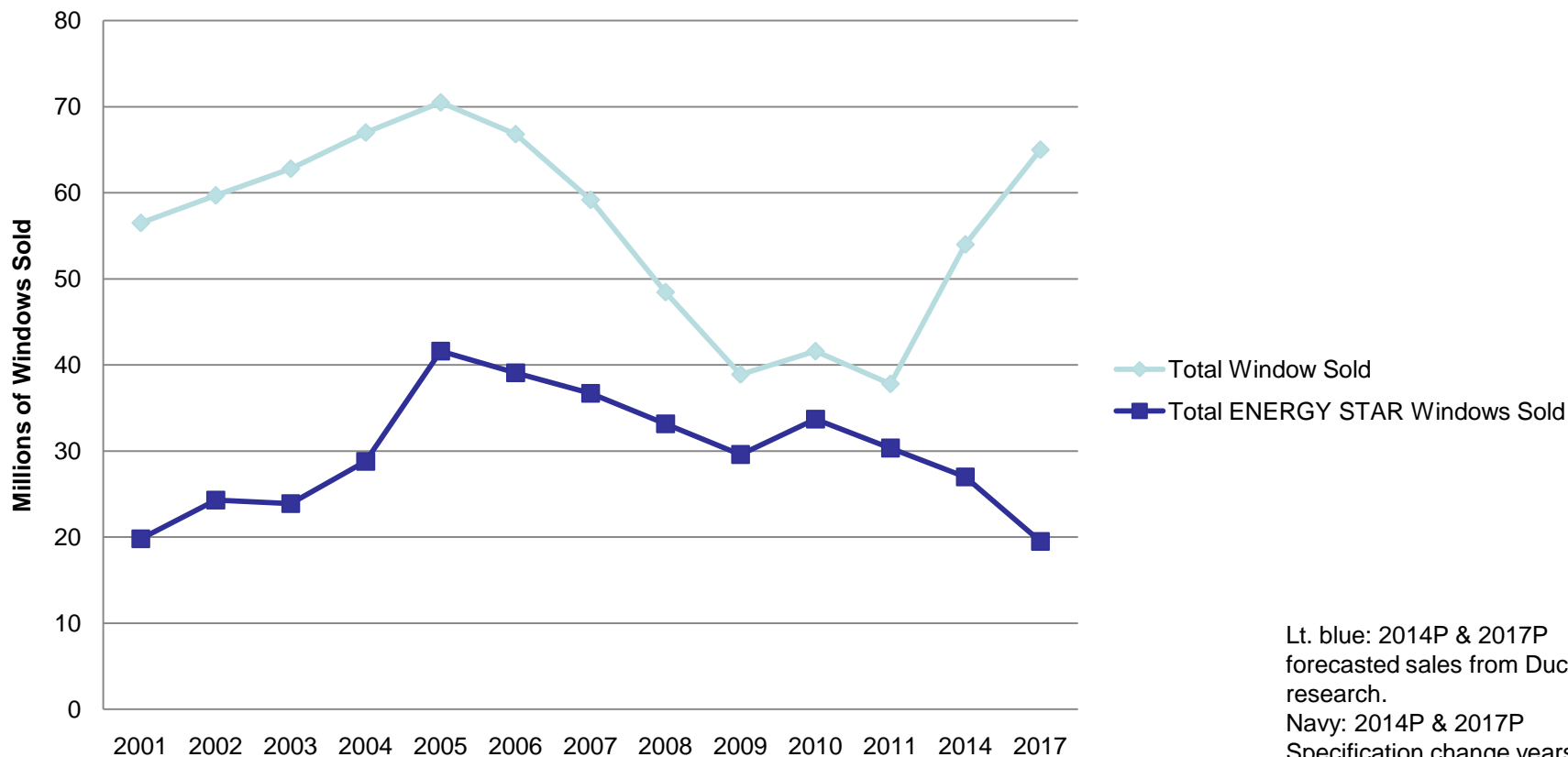
ENERGY STAR Sales vs. Market Share



Total Door Units Sold Over Last Decade

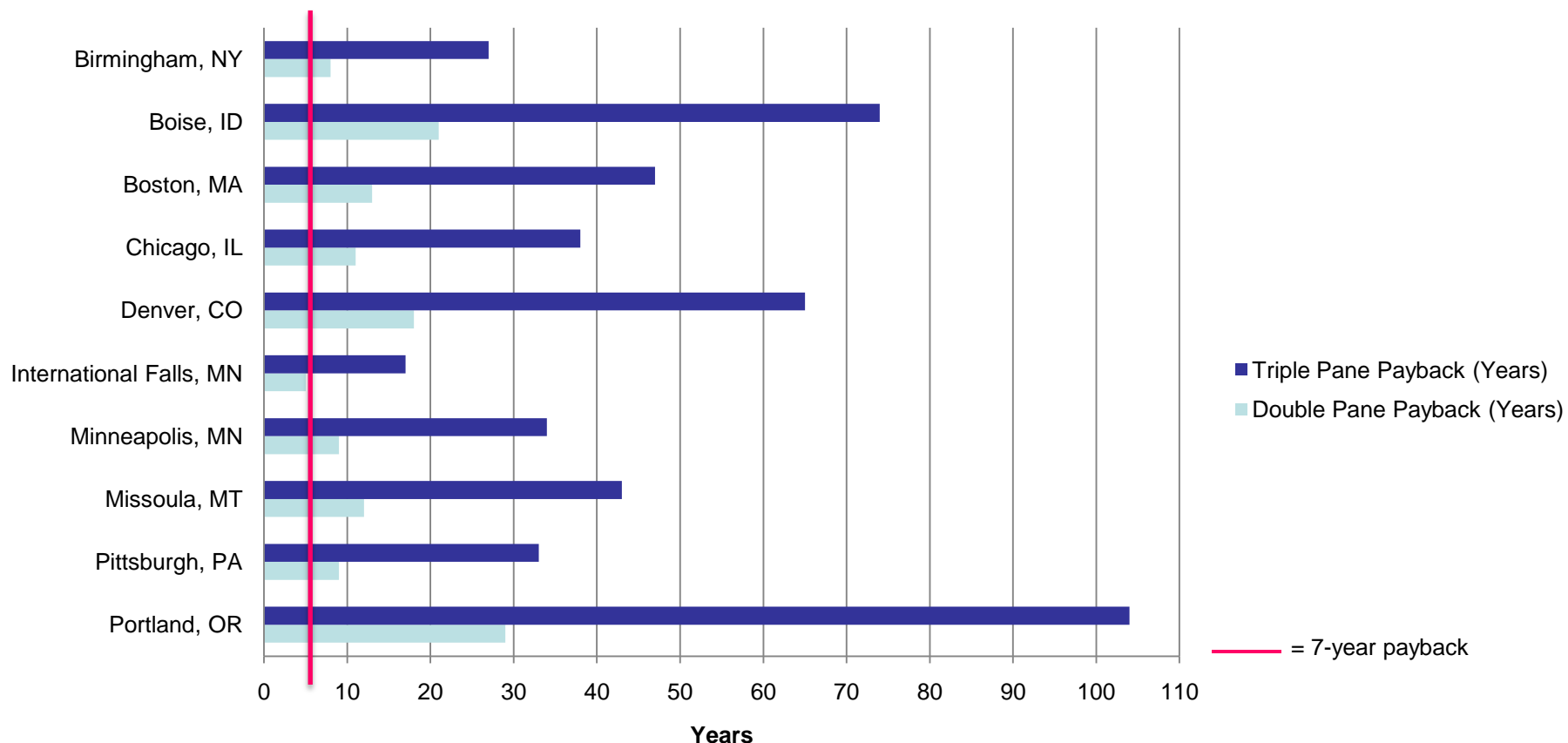


Total Window Sales vs. ENERGY STAR Window Sales



Lt. blue: 2014P & 2017P
forecasted sales from Ducker
research.
Navy: 2014P & 2017P
Specification change years
resulting in reduced ENERGY
STAR market share.

Version 6 criteria effect- Years Required to Recoup Costs for Windows in Whole House in the Northern Zone



Key point review;

- A larger market share is not a bad thing for consumers.
- The market share has grown by severe total sales loss
- Real Affordability must be the primary driver of the program
- The Housing Depression is still in effect



Our recommendations; balance the program considering a maximum 5-7 year payback and driving innovation, Move the program start to 2015, and adjust limits as shown.

– **Windows:**

- Northern U-Factor ≤ 0.29
- North Central U-Factor ≤ 0.31 and SHGC ≤ 0.40



– **Doors:**

- Opaque U-Factor ≤ 0.19
- $\leq \frac{1}{2}$ lite U-Factor ≤ 0.25
- $> \frac{1}{2}$ lite U-Factor ≤ 0.30
- $> \frac{1}{2}$ lite SHGC ≤ 0.27

Thank you for the opportunity to present our concerns to improve the program and your commitment to this process.

Contact: Ray Garries
Corporate Manager
RayGa@jeld-wen.com
JELD-WEN, inc.



Rich Walker

**American Architectural Manufacturers
Association (AAMA)**

Agenda



- **Base window packages**
- **Calculation of simple payback**
- **NFRC CPD data**
- **AAMA and NFRC air certification database**



Ray Dill

ODL, Inc.



Learn more at energystar.gov

EPA Draft 1 Version 6.0 Criteria and Analysis Stakeholders Meeting

Recommendations submitted by
ODL, Inc., Zeeland, MI
August 27, 2012

Door and Skylight issues

1. Door: “29.8 percent glazing” confusing
2. Door: Inconsistency between full lite and half lite U-factors
3. Skylight: TDD listed and recent test results need considered to finalize ES U-factor

1. “29.8 percent glazing” = ½ lite

Conflicts with industry ratings

- Per NFRC 100-2010, page 40
 - ½ lite = 560mm x 915mm (22X36)
 - Full lite = 560mm x 1625mm (22X64)

Percentage not used in industry

Confusing to industry and consumer

1. “29.8 percent glazing” = ½ lite (continued)

Recommend:

- “29.8 percent glazing” be eliminated
- Maintain current NFRC rating sizes
 - ½ lite = 560mm x 915mm (22X36)
 - Full lite = 560mm x 1625mm (22X64)

2. Full lite and 1/2 lite inconsistent

Consistency expectation

If an IG construction in a specific door meets ES
in a full lite . . .

. . . a ½ lite of the same IG construction in the
same door should also meet ES

2. Full lite and 1/2 lite inconsistent (continued)

Many examples in the NFRC's CPD, i.e.,

0.17 Opaque door – **meets ES**

0.30 Full lite IG with hard coat low e – **meets ES**

0.25 ½ lite, same IG construction – **does not meet ES**

Note: soft coat & argon required for ½ lite to achieve 0.23

Recommendation:

0.17 opaque, 0.30 full lite, 0.25 half lite

Note: same issue occurred last time ES revised - when understood . . . 0.32 kept for full lite, ½ lite changed to 0.27

3. TDD U-factor Testing

Reference Figure 26 on Page 43

- Based on CPD . . . nearly all averages and medians below 0.40

Recent changes

- U-factor simulations replaced by physical testing
- Physical test results vary since test equipment began use
- Recent tests demonstrate these low values not repeatable or achievable with same designs

3. TDD U-factor Testing (continued)

Recommend:

- Prepare to revise 0.45 U-factor proposal
- Revise ES requirement based on results communicated during Comment Period 3



Question and Answer Session

Comment Period

- Send to windows@energystar.gov
- Mark as “Confidential” any files not to be posted
- All other comments will be posted to http://www.energystar.gov/index.cfm?c=revisions.residential_windows_spec
- Comments due **Friday, Sept. 28**