



U.S. Department of Energy
ENERGY STAR Program

Windows, Doors, and Skylights
Stakeholder Meeting
August 13, 2008

U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585



Department of Energy

Washington, DC 20585

ENERGY STAR Criteria Revision for Windows, Doors, and Skylights Meeting Agenda

August 13, 2008

8:30 AM – 4:30 PM

Large Auditorium – Room GE-086

Purpose of meeting: To discuss the proposed criteria for the ENERGY STAR Windows, Doors, and Skylights Program and gather stakeholder feedback.

8:30 AM – 8:45 AM	DOE welcome and opening remarks
8:45 AM – 9:05 AM	DOE presentation of criteria and process timeline
9:05 AM – 9:50 AM	D&R presentation of window rationale for levels, technological feasibility, cost effectiveness analysis, and market impacts
9:50 AM – 10:30 AM	LBNL and D&R presentation of window energy savings analysis
10:30 AM – 10:45 AM	Break
10:45 AM – 11:45 AM	Scheduled stakeholder comments (see reverse)
11:45 AM – 12:00 PM	Develop list of topics stakeholders want to discuss after lunch
12:00 PM – 1:00 PM	Lunch
1:00 PM – 2:30 PM	Topical discussion of window proposal
2:30 PM – 2:45 PM	Break
2:45 PM – 3:15 PM	D&R presentation of door and skylight analyses
3:15 PM – 3:50 PM	Scheduled stakeholder comments (see reverse)
3:50 PM – 4:15 PM	Stakeholder discussion of door and skylight proposal
4:15 PM – 4:30 PM	DOE closing comments

Scheduled Stakeholder Comments
Window Proposal
10:45 AM – 11:45 AM

Order	Presenter	Organization
1	Margie Lynch	Consortium for Energy Efficiency (CEE)
2	John W. Lewis, Jr.	American Architectural Manufacturers Association (AAMA)
3	Tom Culp	Aluminum Extruders Council (AEC)
4	TBD	Glazing Industry Code Committee (GICC)
5	Terry Rex of BF Rich	Northeast Window and Door Association (NWDA)
6	Nils Petermann	Alliance to Save Energy/Efficient Windows Collaborative
7	Mike Fischer	Window and Door Manufacturers Association (WDMA)
8	Thom Zaremba	Advanced Building Coalition (ABC)

Scheduled Stakeholder Comments
Door and Skylight Proposal
3:15 PM – 3:50 PM

Order	Presenter	Organization
1	Jeff Burton	Association of Millwork Distributors (AMD)
2	Steve Schreiber	Masonite Corporation
3	Christopher Nolt	ProVia Door
4	Steve Jaspersen	ThermaTru Doors
5	Ray Garries	JELD-WEN
6	Roger LeBrun	VELUX America
7	Dave DeBlock	ODL

Draft Criteria

Draft Criteria for ENERGY STAR Qualified Windows and Sliding Glass Doors						
Climate Zone	Phase 1			Phase 2		
	U-Factor ¹	SHGC ²	Energy Performance	U-Factor	SHGC	Energy Performance
ES5a	≤ 0.30	≤ 0.55	-	-	-	See Figure 7
ES5	-	-	See Figure 5			
ES4	-	-	See Figure 6			
ES3	≤ 0.33	≤ 0.40	-	≤ 0.30	≤ 0.40	-
ES2	≤ 0.35	≤ 0.30	-	≤ 0.30	≤ 0.30	-
ES1	≤ 0.50	≤ 0.25	-	≤ 0.45	≤ 0.20	-

Window: An assembled unit consisting of a frame/sash component holding one or more pieces of glazing functioning to admit light and/or air to an enclosure. May be fixed or operable. For ENERGY STAR criteria, this category includes sliding glass doors.

Sliding glass door: A door that contains one or more manually operated glass panels that slide horizontally within a common frame.

Products must be NFRC rated, certified, and labeled for U-factor and SHGC. Products that use a sealed IGU must have IGU certification once the NFRC IGU certification program is fully implemented.

¹ Btu/hr-ft²-°F.

² Fraction of incident solar radiation.

Insulating Glass Unit (IGU) Certification

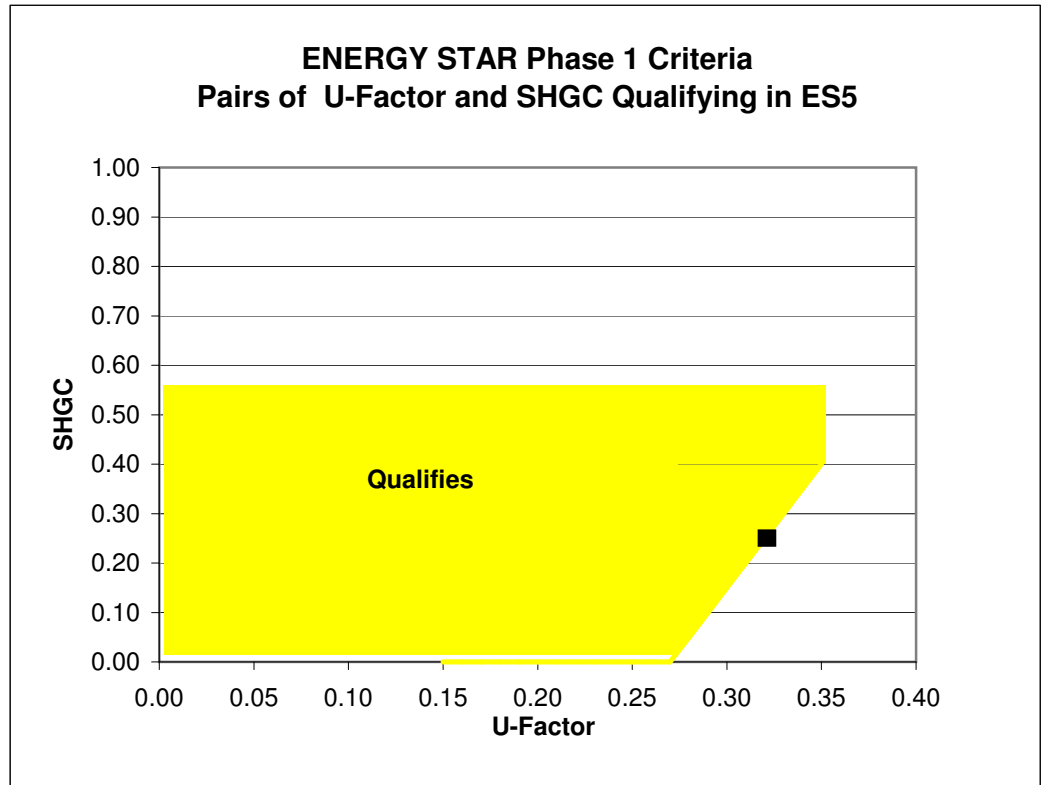
The U.S. Department of Energy expects that IGU certification recognized by the National Fenestration Rating Council (NFRC) will include six elements:

- All IGU models for use in NFRC certified products shall be certified in a 3rd party IGU certification program acceptable to NFRC, which complies with ISO Guide 65. Proof of certification shall be validated at annual NFRC plant audits by demonstrating current listing of the IGU model in the accepted IGU certification program's current certified products directory or by supporting documentation from the IGU certifier.
- Mandatory IGU testing at least once every 2 years utilizing independent testing laboratories that are accredited to ISO 17025. IGU Certification Programs will provide as part of their documentation submission to NFRC, testing laboratory approval process for specific test procedures and their list of approved test facilities.
- All IGUs must pass the requirements of ASTM E2190 or CGSB 12.8. The CGSB 12.8 standard will be acceptable until the ASTM E2189 fog box test requirements meet or exceed the requirements in the CGSB 12.8 standard.
- Proof of gas content certification to an average minimum initial 90 percent insulating gas fill content and an average minimum of 80 percent insulating gas fill content following completion of respective IGU durability testing. Demonstration of gas content for argon shall qualify other gases providing the same gas filling method is used.
- The testing lab approval process shall include inspections as needed, with a minimum of once every two years, to ensure the testing laboratory is in full compliance with ASTM E2190 or CGSB 12.8.
- Certification agencies will perform least two (2) audits per year of program participant's IGU fabrication facilities.

Draft Criteria for ENERGY STAR Qualified Windows and Sliding Glass Doors, continued

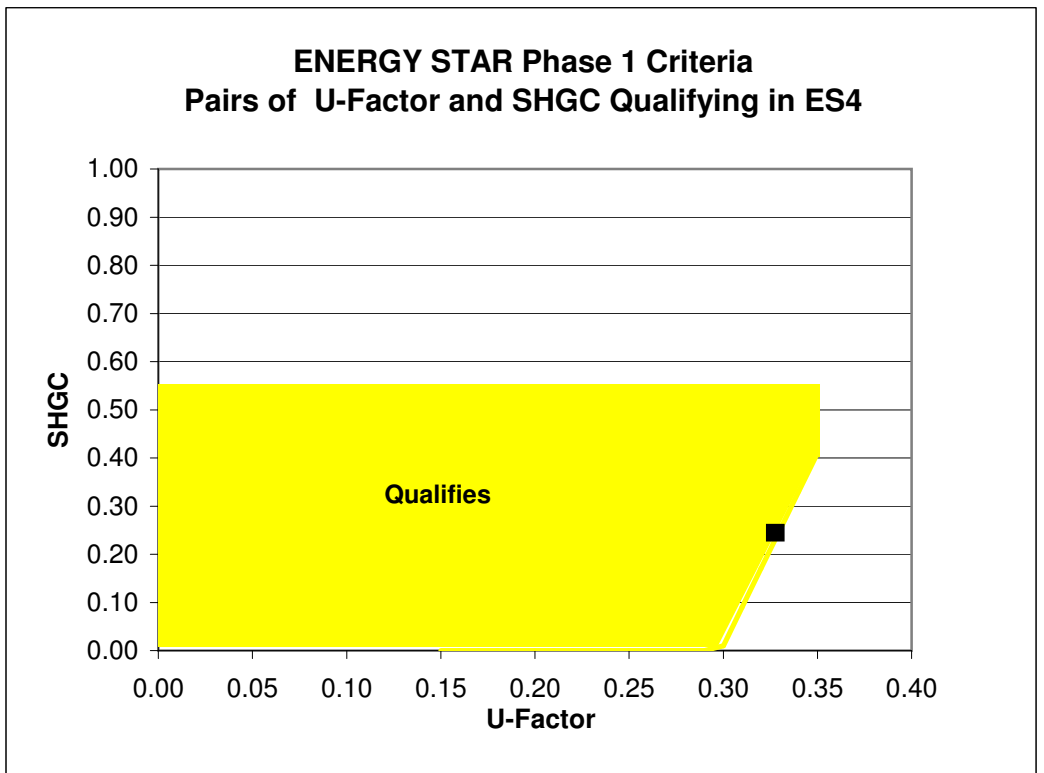
Phase 1: ES5

U-factor	SHGC (>X and < 0.55)
	X
0.35	0.40
0.34	0.35
0.33	0.30
0.32	0.25
0.31	0.20
0.30	0.15
0.29	0.10
0.28	0.05
0.27	0.00
0.26	0.00
0.25	0.00
0.24	0.00
0.23	0.00
0.22	0.00
0.21	0.00
0.20	0.00
0.19	0.00
0.18	0.00
0.17	0.00
0.16	0.00
0.15	0.00



Phase 1: ES4

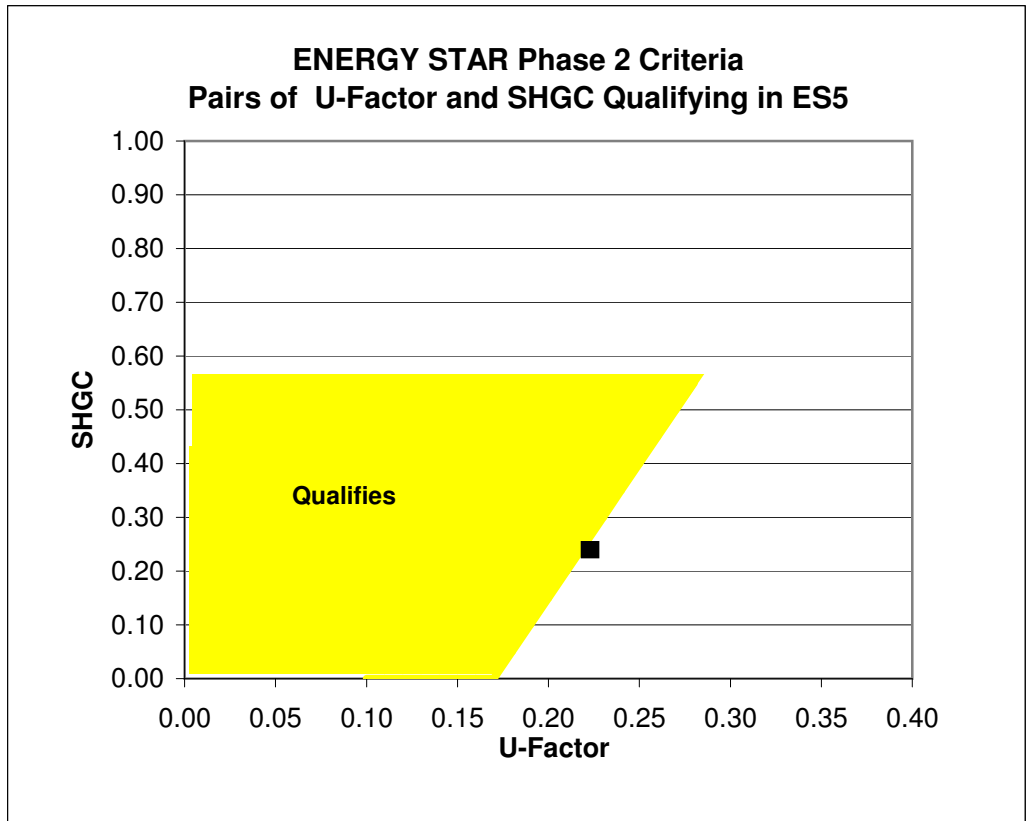
U-factor	SHGC (>X and < 0.55)
	X
0.35	0.41
0.34	0.33
0.33	0.25
0.32	0.17
0.31	0.09
0.30	0.01
0.29	0.00
0.28	0.00
0.27	0.00
0.26	0.00
0.25	0.00
0.24	0.00
0.23	0.00
0.22	0.00
0.21	0.00
0.20	0.00
0.19	0.00
0.18	0.00
0.17	0.00
0.16	0.00
0.15	0.00



Draft Criteria for ENERGY STAR Qualified Windows and Sliding Glass Doors, continued

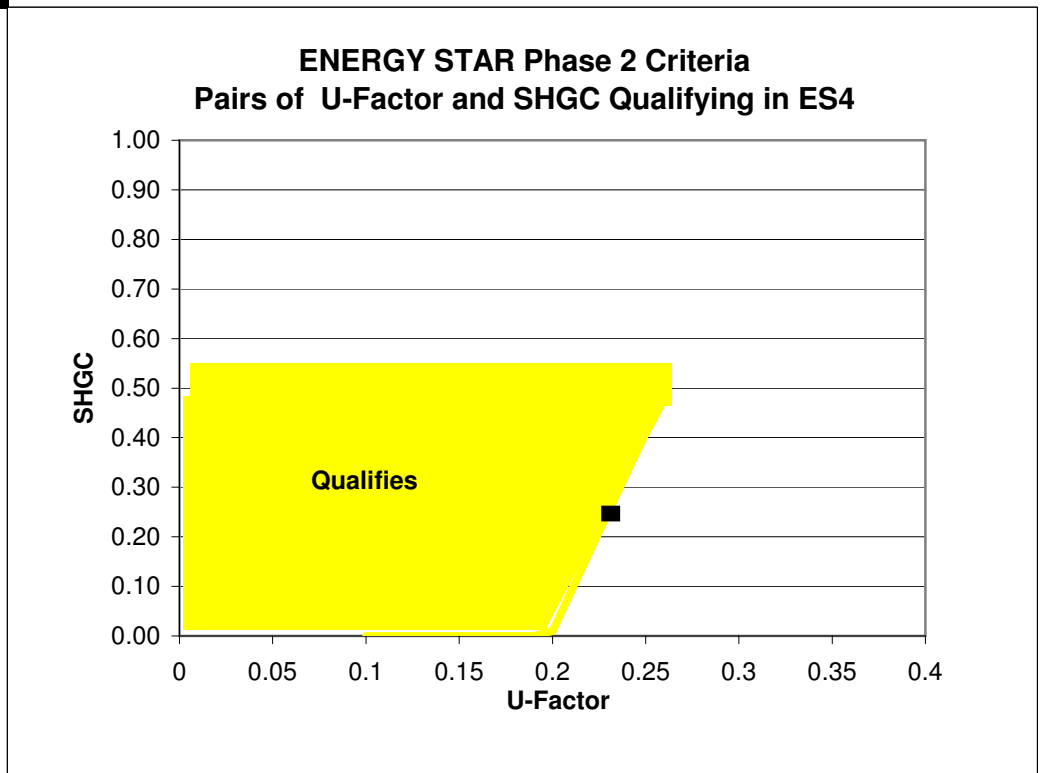
Phase 2: ES5

U-factor	SHGC (>X and < 0.55)
	X
0.28	0.55
0.27	0.50
0.26	0.45
0.25	0.40
0.24	0.35
0.23	0.30
0.22	0.25
0.21	0.20
0.20	0.15
0.19	0.10
0.18	0.05
0.17	0.00
0.16	0.00
0.15	0.00
0.14	0.00
0.13	0.00
0.12	0.00
0.11	0.00
0.10	0.00



Phase 2: ES4

U-factor	SHGC (>X and < 0.55)
	X
0.26	0.49
0.25	0.41
0.24	0.33
0.23	0.25
0.22	0.17
0.21	0.09
0.20	0.01
0.19	0.00
0.18	0.00
0.17	0.00
0.16	0.00
0.15	0.00
0.14	0.00
0.13	0.00
0.12	0.00
0.11	0.00
0.10	0.00



Draft ENERGY STAR Criteria for Swinging Entry Doors

Glazing	Phase 1		Phase 2	
	U-Factor	SHGC	U-Factor	SHGC
Opaque	≤ 0.21	NR	≤ 0.16	NR
≤ 1/2-Lite	≤ 0.25	≤ 0.30	≤ 0.20	≤ 0.30
> 1/2-Lite	≤ 0.32	≤ 0.30	≤ 0.28	≤ 0.30

Swinging entry doors: A door system having, at a minimum, a hinge attachment of any type between a leaf and jamb, mullion, or edge of another leaf or having a single, fixed vertical axis about which the leaf rotates between open and closed positions.

ENERGY STAR recognizes three categories of doors:

Opaque: No lite.

≤ 1/2-Lite: A swinging entry door with ≤ 29.8% glazing. Includes 1/4-lite and 1/2-lite doors.

1/2-Lite: A swinging entry door with > 29.8% glazing. Includes 3/4-lite and fully glazed doors.

Products must be NFRC rated, certified, and labeled for U-factor and SHGC. Glazed doors using a sealed IGU must have IGU certification once NFRC IGU certification is implemented.

Draft Criteria for ENERGY STAR Qualified Skylights

Climate Zone	Proposed for Phase 1		Proposed for Phase 2	
	U-Factor	SHGC	U-Factor	SHGC
ES 5a	≤ 0.50	NR	≤ 0.42	NR
ES 5	≤ 0.50	NR	≤ 0.42	NR
ES 4	≤ 0.50	NR	≤ 0.42	NR
ES 3	≤ 0.55	≤ 0.40	≤ 0.47	≤ 0.30
ES 2	≤ 0.55	≤ 0.30	≤ 0.47	≤ 0.20
ES 1	≤ 0.55	≤ 0.30	≤ 0.57	≤ 0.20

Skylight: A window designed to provide daylighting and/or ventilation for sloped or horizontal applications.

Products must be NFRC rated, certified, and labeled for U-factor and SHGC. Products that use a sealed IGU must have IGU certification once NFRC IGU certification is fully implemented.

Errata as of August 11, 2008 for *Windows, Doors, and Skylights: Draft Criteria and Analysis* (August 6, 2008)

Page 2

Original text: Setting the effective date for 2012 should provide manufacturers adequate time to design, test, and produce these new products.

Corrected text: Setting the effective date for 2013 should provide manufacturers adequate time to design, test, and produce these new products.

Page 24 (Table 9)

Original:

	ES1	ES2	ES3	ES4	ES5	ES5a
Spacer*	75% non-metal foam spacers 25% use stainless steel spacers	86% use metal-polymer spacers 14% use stainless steel spacers	30% use non-metal/foam spacers 25% use stainless steel spacers	30% use non-metal/foam spacers 21% use stainless steel spacers	30% use non-metal/foam spacers 20% use metal-polymer spacers	53% use non-metal/foam spacers 24% use stainless steel spacers
*Spacer construction was absent or ambiguous for about half of the products sampled. D&R International, Ltd. 2008. Findings for ES1 and ES2 are based on analysis of the NFRC database. Findings for ES3, ES4, ES5, and ES5a are based on analysis of a sample of vertical sliders for sale with U-factors < 0.35. Data are consistent with manufacturer input.						

Corrected:

	ES1	ES2	ES3	ES4	ES5	ES5a
Spacer*	46% foam spacers 29% tin-plated spacers 11% thermally improved spacers 8% stainless steel spacers	43% foam spacers 30% tin-plated spacers 12% thermally improved spacers 8% stainless steel spacers	30% non-metal/foam spacers 25% stainless steel spacers 16% metal-polymer 4% tin-plated	30% non-metal/foam spacers 21% stainless steel spacers 17% metal-polymer 5% tin-plated	30% non-metal/foam spacers 20% metal-polymer spacers 17% stainless steel 4% tin-plated	53% non-metal/foam spacers 24% stainless steel spacers
*Spacer construction was absent or ambiguous for 25% of products for sale data (ES3-ES5a). Spacers with frequencies less than 4% not reported. D&R International, Ltd. 2008. Findings for ES1 and ES2 are based on analysis of the NFRC database. Findings for ES3, ES4, ES5, and ES5a are based on analysis of a sample of vertical sliders for sale with U-factors < 0.35. Data are consistent with manufacturer input.						

Errata as of August 11, 2008, continued

Page 26

Original text: Although DOE expects marginal costs to be negligible in all regions except ES5a, even at a marginal cost of 4 percent, consumers will earn healthy returns on their investment in nearly all zones (Table 11).

Corrected text: Although DOE expects marginal costs to be negligible in all regions except ES5a, even at a marginal cost of 3 percent, consumers will earn healthy returns on their investment in nearly all zones (Table 11).

Page 27 (Table 11)

Original:

Table 1 : Cost-Effectiveness of Phase 1 ENERGY STAR Window Criteria for Twenty Representative Cities When Marginal Cost is Not Zero						
Climate Zone	City	Annual Energy Cost Savings (dollars)	Marginal Cost Rate (percent)	Total Marginal Cost (dollars)	Savings to Cost Ratio (percent)	Simple Payback Period (years)
ES5a	Portland, OR	11.47	10	600	30	52.3
	Seattle, WA	10.94	10	600	29	54.8
ES5	Burlington, VT	85.95	4	180	752	2.1
	Madison, WI	68.11	4	180	596	2.6
	Minneapolis, MN	73.22	4	180	641	2.5
ES4	Boston, MA	85.49	4	180	748	2.1
	Chicago, IL	50.33	4	180	440	3.6
	Denver, CO	46.84	4	180	410	3.8
ES3	Albuquerque, NM	10.13	4	180	89	17.8
	Kansas City, MO	10.92	4	180	96	16.5
	San Francisco, CA	9.84	4	180	86	18.3
	Washington, DC	13.80	4	180	121	13.0
ES2	Atlanta, GA	33.85	4	180	296	5.3
	Ft Worth, TX	38.99	4	180	341	4.6
	Las Vegas, NV	43.69	4	180	382	4.1
	San Diego, CA	10.73	4	180	94	16.8
ES1	Tampa, FL	77.00	4	180	674	2.3
	Lake Charles, LA	75.74	4	180	663	2.4
	Phoenix, AZ	101.10	4	180	885	1.8

Source: D&R International, Ltd., 2008. Annual energy cost savings are the difference between the average of multiple simulations of Phase 2 ENERGY STAR and 2009 IECC reference skylights calculated using DOE2.E and RESFEN6 assumptions. DOE selected simulations that reflect the range of typical energy consumption of local housing stock for each city. Lifetime savings were calculated for 24 windows over 20 years at a 3-percent discount rate. Total marginal cost was calculated using the marginal cost rate for 24 windows with a base price of \$250 per window. Total marginal cost is 3 percent of the window with a base price of \$250 for all zones except ES5a, where it is 10 percent. Product price excludes installation. The savings-to-cost ratio is based on 20 years of annual energy cost savings, with a discount rate of 3 percent, over total marginal cost. The simple payback period is based on marginal cost divided by annual energy cost savings, with no discounting.

Errata as of August 11, 2008, continued

Corrected:

Table 2 : Cost-Effectiveness of Phase 1 ENERGY STAR Window Criteria for Twenty Representative Cities When Marginal Cost is Not Zero						
Climate Zone	City	Annual Energy Cost Savings (dollars)	Marginal Cost Rate (percent)	Total Marginal Cost (dollars)	Savings to Cost Ratio (percent)	Simple Payback Period (years)
ES5a	Portland, OR	11.47	10	600	30	52.3
	Seattle, WA	10.94	10	600	29	54.8
ES5	Burlington, VT	85.95	3	180	752	2.1
	Madison, WI	68.11	3	180	596	2.6
	Minneapolis, MN	73.22	3	180	641	2.5
ES4	Boston, MA	85.49	3	180	748	2.1
	Chicago, IL	50.33	3	180	440	3.6
	Denver, CO	46.84	3	180	410	3.8
ES3	Albuquerque, NM	10.13	3	180	89	17.8
	Kansas City, MO	10.92	3	180	96	16.5
	San Francisco, CA	9.84	3	180	86	18.3
	Washington, DC	13.80	3	180	121	13.0
ES2	Atlanta, GA	33.85	3	180	296	5.3
	Ft Worth, TX	38.99	3	180	341	4.6
	Las Vegas, NV	43.69	3	180	382	4.1
	San Diego, CA	10.73	3	180	94	16.8
ES1	Tampa, FL	77.00	3	180	674	2.3
	Lake Charles, LA	75.74	3	180	663	2.4
	Phoenix, AZ	101.10	3	180	885	1.8

Source: D&R International, Ltd., 2008. Annual energy cost savings are the difference between the average of multiple simulations of Phase 2 ENERGY STAR and 2009 IECC reference skylights calculated using DOE2.E and RESFEN6 assumptions. DOE selected simulations that reflect the range of typical energy consumption of local housing stock for each city. Lifetime savings were calculated for 24 windows over 20 years at a 3-percent discount rate. Total marginal cost was calculated using the marginal cost rate for 24 windows with a base price of \$250 per window. Total marginal cost is 3 percent of the window with a base price of \$250 for all zones except ES5a, where it is 10 percent. Product price excludes installation. The savings-to-cost ratio is based on 20 years of annual energy cost savings, with a discount rate of 3 percent, over total marginal cost. The simple payback period is based on marginal cost divided by annual energy cost savings, with no discounting.

Page 30

Original text: DOE expects current ENERGY STAR market share to decrease to 35 percent to 40 percent in Phase 1, with Phase 2 market share dropping further to 25 percent only in ES4 and ES5, where price premiums are highest.

Corrected text: DOE has assumed in its energy savings model that current ENERGY STAR market share will decrease to 45 percent in Phase 1, with Phase 2 market share dropping further to 25 percent only in ES4 and ES5, where price premiums are highest.

Errata as of August 11, 2008, continued

Page 45

Original text: Unless glass technology changes dramatically, most windows will use glass products with emissivities < 0.40. These emissivity levels will yield whole-window SHGCs < 0.40, the level set under the current ENERGY STAR criteria to ensure solar control in the southern United States.

Corrected text: Unless glass technology changes dramatically, most windows will use glass products with solar transmittance < 0.40. These solar transmittance levels will yield whole-window SHGCs < 0.40, the level set under the current ENERGY STAR criteria to ensure solar control in the southern United States.

Page 48

Original text: Nearly 70,000 doors listed in the NFRC database already qualify under the Phase 1 and Phase 2 criteria, and manufacturers report many of those that do not can be upgraded at little cost (Table 29).

Corrected text: Nearly 70,000 doors listed in the NFRC database already qualify under Phase 1 and nearly 35,000 doors qualify for Phase 2. Manufacturers report many additional doors can be upgraded at little cost to qualify for Phase 1 (Table 29).

Page 60 (Table 38)

Original:

	Phase 1	Phase 2
Spacer	33% use stainless steel 31% use aluminum 2% use non-metal/foam	67% use stainless steel 21% use aluminum
Source: D&R International, Ltd., 2008. Based on data from manufacturer interviews and the NFRC Certified Product Directory.		

Corrected:

	Phase 1	Phase 2
Spacer	49% stainless steel 34% aluminum 11% tin-plated	75% stainless steel 21% aluminum
Spacers with frequencies less than 4% not reported. Source: D&R International, Ltd., 2008. Based on data from manufacturer interviews and the NFRC Certified Product Directory.		