



## ENERGY STAR® for Windows, Doors, and Skylights Version 6.0 Product Specification Framework Document

October 2011

EPA recognizes and appreciates window, door, and skylight stakeholders' support of the ENERGY STAR program and the industry's interest in helping EPA shape requirements for this product category. As such, EPA is pleased to share the ENERGY STAR for Windows, Doors, and Skylights Version 6.0 Specification Framework Document with stakeholders. This framework outlines EPA's reassessment of the current ENERGY STAR Window, Door, and Skylight requirements and is intended to facilitate discussion of this assessment and possible resulting modifications to these ENERGY STAR requirements. Included in this document are EPA's initial findings on issues such as scope of possible revisions and eligibility criteria. The Agency welcomes stakeholder comments on all topics related to this specification revision, including topics not addressed in this document. Please send your comments via email to [windows@energystar.gov](mailto:windows@energystar.gov) no later than Friday, November 18, 2011.

### I. Introduction and Overview

The ENERGY STAR criteria for windows, doors, and skylights were last updated in April 2009. These criteria revisions took effect in January 2010. At that time, the U-Factor and solar heat gain coefficient (SHGC) criteria for these products were made more stringent, the ENERGY STAR climate zones were revised, and doors received their own set of criteria. In its announcement of this revision, DOE explained that the finalization of so called "Phase 2" criteria would be deferred to allow for the collection and analysis of additional data.

The U.S. Environmental Protection Agency (EPA), in consultation with DOE, has initiated additional research for the 2013 criteria (originally called "Phase 2"), to be called Version 6.0 going forward. This Framework Document outlines the preliminary findings of this research. To date, EPA has performed feasibility analyses using the National Fenestration Rating Council (NFRC) Certified Products Directory (CPD), market availability research for the top 20 window manufacturers, market availability research for nearly all skylight manufacturers, cost data analyses for a subset of manufacturer volunteers, and has held numerous discussions with industry stakeholders. Additionally, new data provided by Ducker Research demonstrated that the ENERGY STAR market share for windows, doors, and skylights is extremely high, at 81% for windows, 71% for swinging doors, and 99% for glass skylights.

Based on this feedback and analysis, EPA intends to share at least two draft specifications in addition to this framework document for stakeholder feedback. EPA envisions that the final specification will take effect no earlier than Fall 2013. For additional details, see 'Section VI: Next Steps/Tentative Timeline.'

This framework document is equivalent in nature to past letters sent to stakeholders by DOE outlining preliminary criteria ranges and proposing changes in scope to the ENERGY STAR for Windows, Doors, and Skylights specification. The research that underlies EPA's findings is preliminary; full results will be available in the Draft 1 Criteria and Analysis Report.

EPA has contracted with the Lawrence Berkeley National Laboratory (LBNL) to model residential energy savings using RESFEN 6. The RESFEN 6 model and assumptions are unchanged from those used in the Phase 1 (Version 5.0) criteria revision. EPA has provided LBNL with updated market share data for use with the model. Full results of the energy savings analysis will be included in the Draft 1 Criteria and Analysis Report.

EPA seeks comment on all of the proposals and assumptions in this document. EPA will consider all comments received carefully as it develops a Draft 1 Version 6.0 Specification for windows, doors, and skylights.

## **II. Program Elements Considered for Adoption**

During the Version 5.0 (formerly called Phase 1) criteria revision process, a number of issues were raised that could not be addressed at the time, but warranted further consideration and review. At this time, EPA believes that there is still insufficient data and/or justification for addressing the following items in the Version 6.0 criteria. EPA welcomes stakeholder comments and/or data that may highlight options for addressing the below items in this specification revision.

### **a. Structural Requirements**

Some manufacturers that currently test and certify to the North American Fenestrations Standard (NAFS) have requested that structural requirements be added as a to the ENERGY STAR specification. At this time, however, less than a quarter of ENERGY STAR's partnership base currently participates in NAFS certification through the American Architectural Manufacturers Association (AAMA) or the Window and Door Manufacturers Association (WDMA). This raises concerns that requiring NAFS certification at this time may result in a backlog at labs and inundation of AAMA and WDMA resources. Thus, EPA proposes that the Agency reconsider this suggestion during the next criteria revision.

### **b. Products Installed at High-Altitude**

Products installed at high altitudes have typically required the use of breather tubes, which precludes the use of argon gas and potentially reduces the efficiency that these products can achieve. Thus, stakeholders had requested allowances for products installed at high altitudes to account for these efficiency reductions. Recently, some manufacturers identified other ways to handle the problems brought on by the changes in pressure. Given that some in the industry have found a way around this problem and given the small number of products ultimately installed at high altitudes, EPA does not expect to propose special allowances for these products at this time.

### **c. Impact-Resistant Products**

There are some high-performance impact-resistant products available on the market today and the number of households required to buy impact-resistant products is relatively small (e.g., required only in Florida and within a few miles of certain eastern and gulf coastlines). Thus, EPA does not expect to propose a separate set of criteria for impact-resistant products.

#### **d. Daylighting**

EPA considers “daylighting” a property that can only be evaluated at a room or whole-building level. Individual fenestrations products cannot truly be evaluated for their daylighting properties, though EPA does recognize that the amount and quality of light admitted by a product can be an important product attribute. EPA considers the NFRC’s Visible Transmittance (VT) rating as a relatively simple and practical way to evaluate the lighting ability of individual products. At this time, EPA does not have sufficient evidence indicating the need for including a VT criterion in the ENERGY STAR window, door, and skylight specification.

#### **e. Lifecycle Analysis**

In order to guard against unintended consequences where ENERGY STAR is recommending a product with disproportionately high greenhouse gas (GHG) implications in another phase (such as during the manufacture of the product), the program has screened many ENERGY STAR product categories for non-use phase GHG emissions. Where non-use phase GHG impacts are significant relative to the use phase impact, EPA initiated more detailed research into options for ensuring the program is guarding against unintended consequences. With this aim in mind, EPA used Economic Input-Output Life Cycle Analysis (EIO-LCA) to characterize GHG emissions associated with many ES products, including windows. Preliminary results of this broad-brush analysis, completed in 2011, did not yield data usable for this criteria revision. The Center for Sustainable Building Research sought to initiate a more product-specific LCA for windows in 2011. Although EPA supported this effort, the study was canceled due to lack of industry support. EPA will reconsider incorporating LCA attributes into the specification during the next criteria revision if additional data becomes available.

#### Items for Comment & Discussion:

1. Is there compelling data demonstrating that any of these proposals should be reconsidered during this criteria revision?
2. Is there compelling data or research demonstrating that any of these proposals should not be considered (or, alternatively, should be given special attention) during the next criteria revision?

### **III. Program Elements Remaining Unchanged**

#### **a. ENERGY STAR Climate Zones**

During the Version 5.0 criteria revision process, ample discussion and research efforts led to a revision of the ENERGY STAR Climate Zones. EPA believes that these climate zones remain appropriate and has no intention of revising these further, unless stakeholders can supply compelling evidence that it is necessary and desirable to do so.

#### **b. Tubular Daylighting Devices (TDDs)**

Beginning in March 2012, NFRC is requiring physical testing for the certification of all TDDs. Simulations will no longer be accepted for TDD certification. TDD manufacturers have indicated to EPA that they are not concerned about meeting the new criteria levels set for skylights using the new physical test procedure for TDDs. Additionally, there are too few TDDs to warrant a separate set of criteria. Thus, EPA proposes continuation of the requirement that TDDs follow skylight criteria.

Items for Comment & Discussion:

1. Are there any compelling reasons to require TDDs to meet a distinct set of criteria from traditional skylights?
2. Do any manufacturers anticipate not being able to complete the physical test for their products before the NFRC-specified deadline in March 2012? If so, why?

**IV. New Additions to Program Requirements**

Though not addressed in this document, manufacturer partners are expected to abide by any changes made to NFRC testing (e.g. verification testing) at such time as they take effect.

**a. Air Leakage**

During the physical test to determine a fenestration product's thermal performance, proper procedure requires test labs to caulk windows completely shut to prevent any air infiltration in order to get a stable performance reading. This practice indicates how air leakage could affect the thermal performance of the product. In the real world, however, most fenestration products are not sealed shut. Currently, a consumer could buy an ENERGY STAR qualified fenestration product and be unsatisfied with the tightness of the seal. EPA believes an air leakage requirement would help ensure that consumers are purchasing quality fenestration. Additionally, the NFRC has revised its air leakage testing specification to allow for the use of other commonly used tests, an issue that had previously prevented the ENERGY STAR criteria from including an air leakage requirement. For the Version 6.0 criteria, EPA intends to propose the addition of the following air leakage requirements to align with the 2010 International Energy Conservation Code (IECC) and minimize the energy lost due to air leakage:

- Windows, sliding doors, and skylights must have an air leakage rating of  $\leq 0.3$  cfm/ft<sup>2</sup>
- Swinging doors must have an air leakage rating of  $\leq 0.5$  cfm/ft<sup>2</sup>

EPA will work closely with NFRC and stakeholders to determine the best way to label for and document compliance with the air leakage requirement. The following approaches are currently under consideration:

- Encouraging manufacturers to certify their products' air leakage using the NFRC 400.
- Working with NFRC to identify the best way to include air leakage rating on the NFRC temporary label (e.g. using " $\leq 0.3$ ")
- Allowing the AAMA Gold Label or the WDMA Hallmark label to be used instead of listing air leakage on the NFRC temporary label
- Requiring documentation of air leakage results in the CPD
- Having manufacturers relying on AAMA or WDMA labeling work with their Inspection Agencies to ensure test results are uploaded correctly to the CPD

Items for Comment & Discussion:

1. How many manufacturers are currently testing for air leakage? For those not already testing, what are the projected costs associated with adding air leakage

testing? Do manufacturers anticipate a product price increase to the consumer? If so, how much?

2. Approximately what percent of your company's products already meet and are labeled according to the above-specified air leakage criteria? What percent of your products are tested, but not labeled? What is the cost associated with beginning to label these products?
3. Are there any concerns about the ability of windows, doors, or skylights to meet the above-specified air leakage criteria?
4. Should air leakage results be available to the public via the CPD (or the forthcoming CPD-based ENERGY STAR search feature)?
5. What is a reasonable timeline for implementation of this requirement?

#### **b. Installation Instructions**

Poor installation is the most common cause of poor product performance for windows, doors, and skylights. Moreover, poor installation is the primary source of nearly all consumer complaints received by EPA's ENERGY STAR program. The consumers who contact EPA have report air infiltration, water leakage, reduced functionality of the unit, accelerated product decline, and even house-wide problems with mold. Callbacks and follow-up maintenance resulting from improper installation lead to added expenses for manufacturers and consumers and reflect poorly on manufacturers and the ENERGY STAR brand.

To improve access to proper installation information with ENERGY STAR qualified fenestration, EPA proposes requiring that manufacturers make detailed installation instructions available to consumers and installers online. Consistent access to this information can help ensure installers get the installation right. EPA recognizes and respects, however, that many manufacturers have created their own installation procedures. EPA anticipates offering manufacturers several ways to meet this requirement:

- Manufacturers may develop installation instructions in-house and provide them on consumer-facing web pages.
- Resellers, subsidiaries, private labelers, members of alliances, etc. would have the option of linking to installation instructions posted on the website of a parent company, original manufacturer, etc.
- Trade associations can develop installation instructions and provide them on consumer-facing web pages. Members of those organizations can then direct consumers to the trade organizations' websites.
- Manufacturers without company websites would have to develop marketing materials that include links to installation instructions as outlined above.

#### Items for Comment & Discussion:

1. What basic elements would be most valuable in installation instructions (e.g. diagrams, flashing instructions, attributes of insulation or air sealing materials, etc.)? What are potential obstacles to requiring these items?
2. What is the best way that partners have found to share installation info with customers? Should EPA consider any alternative or supplementary methods for educating consumers on proper installation of fenestration products?

## V. Proposed Revisions to Product Criteria

The preliminary criteria ranges below are based on feasibility analysis using the CPD, market availability research for the top 20 window manufacturers, market availability research for nearly all skylight manufacturers, cost data analysis for a subset of manufacturer volunteers, and numerous discussions with industry stakeholders. These ranges also take into consideration new data provided by Ducker Research and early results of LBNL's energy savings analysis.

The research that underlies EPA's findings is preliminary; full results will be available in the Draft 1 Criteria and Analysis Report. EPA welcomes feedback on these preliminary proposed levels as well as supporting data if alternate levels are suggested.

### a. Windows

Climate Zone	Maximum U-Factor to be set between	Maximum SHGC to be set between
Northern	0.25-0.27	Any
North-Central	0.28-0.30	0.35-0.40
South-Central	0.30-0.32	0.25
Southern	0.40	0.20-0.25

Air leakage must be  $\leq 0.3$  cfm/ft<sup>2</sup>

See Appendix A: Criteria for Reference (page 14) for current ENERGY STAR criteria and IECC 2012 criteria for windows.

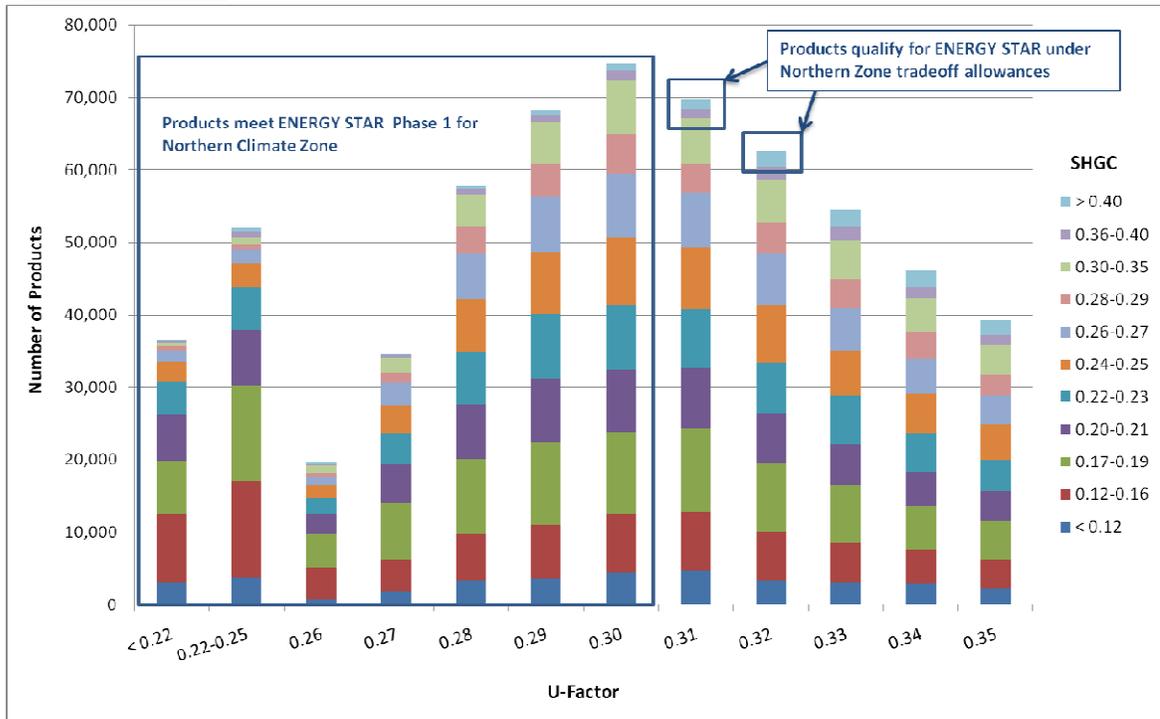
#### **Northern Climate Zone**

Due partly to the "30-30" tax credit, windows with a U-factor of 0.30 are more readily available than in years past. This is reflected by the current ENERGY STAR market share of 81% reported by Ducker. At the same time, triple pane products are still relatively uncommon and, based on our preliminary cost analysis, may not be cost-effective. EPA is looking to establish criteria that recognize the highest-performing doubles and bring a greater number of triple pane windows into the mainstream.

Heat gain in colder climates can reduce heating expenses, so there is value for many residents in these climate zones for allowing higher levels of SHGC. As such, EPA proposes to continue to allow products with any SHGC to qualify in the north.

The Version 5.0 criteria offered Equivalent Energy Performance criteria in the Northern Zone. An analysis of the CPD (illustrated in the following figure) found that extremely few windows are engineered to take advantage of this type of trade-off. Given the continued allowance for any SHGC in the North, the minimal number of products using these criteria, and the complexity that these criteria added to the program, EPA proposes to drop Equivalent Energy Performance criteria in the Version 6.0 specification.

## Double-hung Products in the CPD that Meet Current ENERGY STAR Criteria in the Northern Zone



### North-Central Climate Zone

Proposed revisions for the North-Central Zone are based on EPA's goal of moving U-Value and SHGC maxima to be equal to or more stringent than code. EPA's research has demonstrated that, based on currently available product, a significant reduction in U-Value is feasible. Due to high winter heating loads in the North-Central Zone, a higher solar heat gain can offset heating costs in the winter. Thus, a significant decrease in SHGC is not always ideal in this region, and EPA intends to set the SHGC criteria equal to or just below code.

### South-Central Climate Zone

IECC 2012 now meets the current ENERGY STAR requirement for U-factor in the South-Central Zone. The proposed U-factor ranges for the south-central allow ENERGY STAR to stay ahead of code and analyses indicate that product is available that can easily meet these U-factors.

IECC 2012 ratcheted down the SHGC in the South-Central Zone to 0.25, so EPA intends to propose that ENERGY STAR windows meet requirements that match the SHGC maximum. While preliminary analyses indicate that such a low SHGC may detract slightly from heating savings, the analysis also shows that any increase in heating consumption is relatively small and exactly matched by a decrease in cooling consumption.

### Southern Climate Zone

ENERGY STAR currently requires a U-Factor of less than or equal to 0.60 in the Southern Zone. IECC 2012 requires windows in the southern climate zone to meet an

SHGC of 0.40. Through an analysis of the CPD, EPA found that using many common, inexpensive technologies and materials windows are able to meet significantly lower U-Factors. EPA recognizes that a U-Factor of 0.40 is a significant tightening of the criteria, and does not intend to propose a more stringent level.

IECC 2012 has set SHGC in the Southern Zone to 0.25. Analysis of the CPD and products available for sale both show a mean and a median SHGC of 0.22 for windows with U-factors of 0.40 or less. For this reason, EPA is considering a requirement that exceeds the IECC criteria for SHGC in the south.

Items for Comment & Discussion:

1. What are the performance criteria for your company's most commonly sold ENERGY STAR qualified window?
2. What are the potential cost impacts of the proposed criteria ranges to the consumer and to your company?
3. Are there specific criteria you find particularly concerning? If so, why? (Please provide data substantiating your particular concerns.)
4. Are there concerns about removing the Equivalent Energy Performance criteria in the Northern Zone? If so, what are they? (Please provide data substantiating your particular concerns.)

**b. Doors**

Glazing Level	Maximum U-Factor to be set between	SHGC
<b>Opaque</b>	0.15-0.19	No Rating
<b>≤ 1/2-Lite</b>	0.22-0.25	≤ 0.25
<b>&gt; 1/2-Lite</b>	0.27-0.30	≤ 0.25

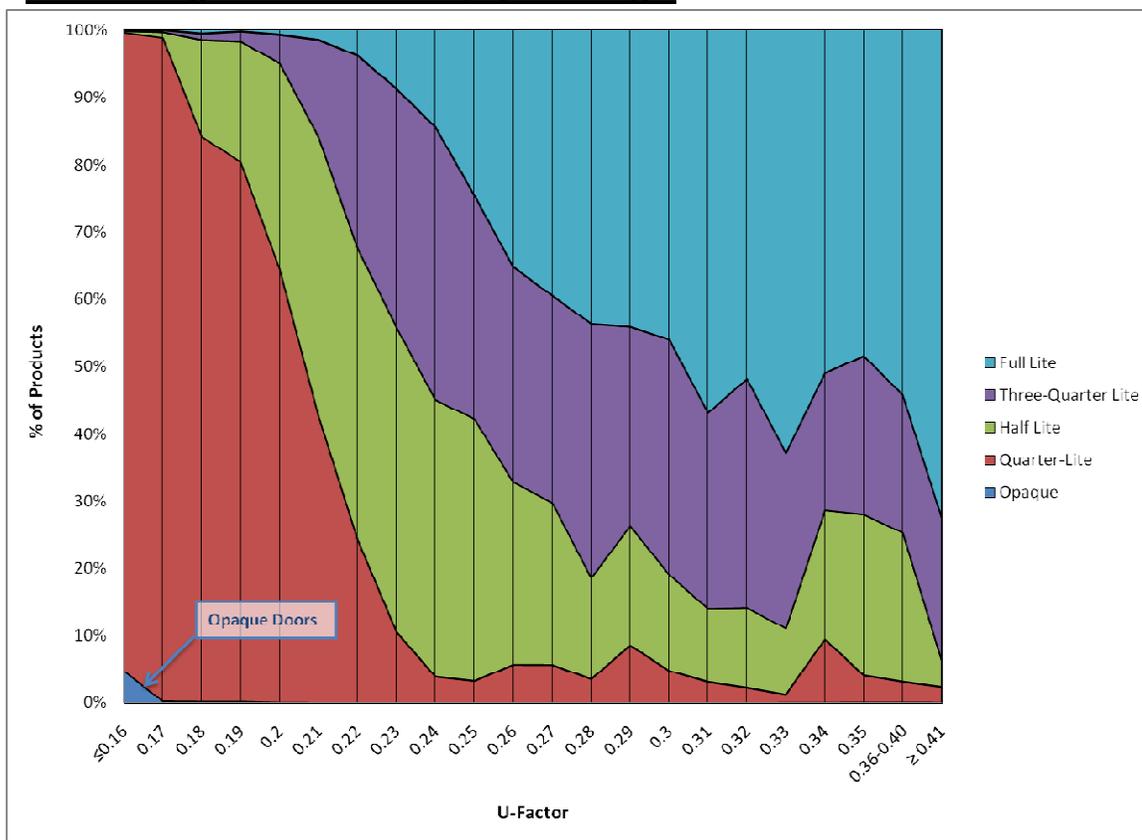
Air leakage for sliding doors must be ≤ 0.3 cfm/ft<sup>2</sup>

Air leakage for swinging doors must be ≤ 0.5 cfm/ft<sup>2</sup>

See Appendix A: Criteria for Reference (page 15) for current ENERGY STAR criteria and IECC 2012 criteria for doors.

As demonstrated by the following figure, energy performance varies significantly by door glazing level. Thus, EPA intends to continue classifying doors by glazing level.

### Door Glazing Level Distribution, by Glass Type



This chart also demonstrates that there is relatively little data for opaque doors as they only represent 0.2% of the CPD.

To determine the appropriate proposed levels for the Version 6.0 criteria, EPA analyzed the CPD and spoke with many stakeholders to validate that analysis. Based on this analysis and follow-up discussions, EPA proposes reductions in U-Factor and SHGC across all glazing levels.

EPA anticipates that the proposed levels will help ensure that the ENERGY STAR is a market differentiator for doors. In all cases, the proposed U-Factors are in line with the mean and median levels found in the CPD (see following table), leading EPA to believe that these ranges should not be overly burdensome for manufacturers, nor should they be too costly for consumers.

Glazing Level	Average U-Factor	Median U-Factor
<b>Opaque</b>	0.17	0.15
<b>≤ ½-Lite</b>	0.23	0.22
<b>&gt; ½-Lite</b>	0.30	0.28

\*Source: NFRC Certified Product Directory

IECC 2012 SHGC requirements are more stringent than the current ENERGY STAR specification. EPA has reviewed these levels and found that if the Agency were to lower

the SHGC maximum for doors with glazing from 0.30 to 0.25, approximately 10% of all doors in the CPD would be unable to meet the specification. Given this small drop, EPA proposes to match the lowest SHGC level specified under IECC 2012 (0.25) to allow the door specification to continue to apply to all climate zones.

Items for Comment & Discussion:

1. Do the proposed criteria levels present any challenges for sliding glass doors?
2. Does the proposed SHGC maximum raise any concerns?
3. Does the proposed SHGC maximum affect any doors disproportionately?
4. Given the relatively few data points in the CPD for opaque doors, does your company have additional information regarding opaque door performance that it would like to provide?
5. Would your company be willing to volunteer incremental cost data on its door products?

**c. Skylights**

Climate Zone	Maximum U-Factor to be set between	Maximum SHGC to be set between
<b>Northern</b>	0.43-0.45	0.25-0.35
<b>North-Central</b>	0.45-0.47	0.25-0.30
<b>South-Central</b>	0.48-0.50	0.25
<b>Southern</b>	0.55-0.60	0.25

Air leakage must be  $\leq 0.3$  cfm/ft<sup>2</sup>

See Appendix A: Criteria for Reference (page 16) for current ENERGY STAR criteria and IECC 2012 criteria for skylights.

According to Ducker Research, ENERGY STAR qualified skylights comprised 99% of the glass skylight market in 2009 and 2010. No plastic skylights qualify for ENERGY STAR under the current criteria, and they did not qualify under the 2005 criteria either. With this in mind, all skylight analysis and research has been limited to glass skylights. EPA analyzed the CPD data and reviewed skylights available for sale to determine what criteria levels would allow for a meaningful differentiation between ENERGY STAR qualified skylights and non-qualified skylights. EPA also spoke extensively with industry during all phases of analysis to ensure the accuracy of the data being evaluated.

In the past, little to no market data was available for skylights. As such, criteria levels were set with heavy reliance on industry for input. Now that the Ducker data has shed some light on the number of qualified skylights being sold, EPA expects to adjust the criteria accordingly. EPA believes—and the Ducker research shows—that there is significant room to improve the specification while allowing many, cost-effective choices for consumers.

Even under the more stringent criteria levels proposed, EPA’s analyses of the CPD and products available for sale both indicate that efficient skylights with double glazing would be able to earn the ENERGY STAR label. This is important, as prices tend to increase significantly when an additional layer of glazing is added.

Items for Comment & Discussion:

1. What are the performance criteria for your company's most commonly sold ENERGY STAR qualified skylight?
2. What are the potential cost impacts of the proposed criteria ranges to the consumer and to your company?
3. Are there specific criteria you find particularly concerning? If so, why? (Please provide data substantiating your particular concerns.)

**VI. Tentative Timeline**

The following is a tentative timeline outlining the projected dates of completion for the major milestones in the ENERGY STAR Windows, Doors, and Skylights Version 6.0 Specification Revision. EPA plans to provide the Draft 1 Criteria and Analysis Report approximately 18 months prior to final implementation of the criteria. EPA reserves the right to alter this timeline at any time.

Tentative Timeline	
Draft 1 Criteria and Analysis Report	March 2012
Stakeholder Meeting	April 2012
Comment Period	March 2012 – May 2012
Draft 2 Criteria and Analysis Report	July 2012
Comment Period	August 2012
Publish New Program Requirements	September 2012
Criteria Take Effect	Fall 2013

**VII. Stakeholder Feedback**

The Agency welcomes stakeholder comment on the concepts and criteria presented in ENERGY STAR for Windows, Doors, and Skylights Version 6.0 Specification Framework Document. Any and all suggestions for improvements to the scope, approach, and preliminary levels outlined in this document will be considered for inclusion in future specification drafts. EPA will consider all written comments received by Friday, November 18, 2011. Comments may be sent to [windows@energystar.gov](mailto:windows@energystar.gov) or faxed to (301) 588-0854. Please note that comments supported by data and/or analysis will receive more weight than those without substantiation of claims or positions. EPA will post all comments unless asked by a submitting stakeholder to refrain from doing so.

## Appendix A: Criteria for Reference

### Window Criteria for Comparison

#### Proposed Version 6.0 ENERGY STAR Criteria for Windows

Climate Zone	Maximum U-Factor to be set between	Maximum SHGC to be set between
Northern (IECC 5-8)	0.25-0.27	Any
North-Central (IECC 4)	0.28-0.30	0.35-0.40
South-Central (IECC 3)	0.30-0.32	0.25
Southern (IECC 1 & 2)	0.40	0.20-0.25

Air leakage must be  $\leq 0.3$  cfm/ft<sup>2</sup>

#### Current ENERGY STAR Criteria for Windows

Climate Zone	Maximum U-Factor to be set between	Maximum SHGC
Northern (IECC 5-8)	0.30	Any
North-Central (IECC 4)	0.32	0.40
South-Central (IECC 3)	0.35	0.30
Southern (IECC 1 & 2)	0.60	0.27

#### IECC 2012 Criteria for Windows

Climate Zone	Maximum U-Factor to be set between	Maximum SHGC
Northern (IECC 5-8)	0.32	No Rating
North-Central (IECC 4)	0.35	0.40
South-Central (IECC 3)	0.35	0.25
Southern (IECC 1 & 2)	0.40*	0.25

\*IECC Zone 1 has no rating for U-factor.

Air leakage must be  $\leq 0.3$  cfm/ft<sup>2</sup>

## Appendix A: Criteria for Reference, continued

### Door Criteria for Comparison

#### Proposed Version 6.0 ENERGY STAR Criteria for Doors

Glazing Level	Maximum U-Factor to be set between	Maximum SHGC
<b>Opaque</b>	0.15-0.19	No Rating
<b>≤ ½-Lite</b>	0.22-0.25	0.25
<b>&gt; ½-Lite</b>	0.27-0.30	0.25

Air leakage for sliding doors must be ≤ 0.3 cfm/ft<sup>2</sup>

Air leakage for swinging doors must be ≤ 0.5 cfm/ft<sup>2</sup>

#### Current ENERGY STAR Criteria for Doors

Glazing Level	Maximum U-Factor to be set between	Maximum SHGC
<b>Opaque</b>	0.21	No Rating
<b>≤ ½-Lite</b>	0.27	0.30
<b>&gt; ½-Lite</b>	0.32	0.30

#### IECC 2012 Criteria for Doors

See IECC 2012 Criteria for Windows for U-Factor and SHGC.

Air leakage for sliding doors must be ≤ 0.3 cfm/ft<sup>2</sup>.

Air leakage for swinging doors must be ≤ 0.5 cfm/ft<sup>2</sup>

## Appendix A: Criteria for Reference, continued

### Skylight Criteria for Comparison

#### Proposed Version 6.0 ENERGY STAR Criteria for Skylights

Climate Zone	Maximum U-Factor to be set between	Maximum SHGC to be set between
Northern (IECC 5-8)	0.43-0.45	0.25-0.35
North-Central (IECC 4)	0.45-0.47	0.25-0.30
South-Central (IECC 3)	0.48-0.50	0.25
Southern (IECC 1 & 2)	0.55-0.60	0.25

Air leakage must be  $\leq 0.3$  cfm/ft<sup>2</sup>

#### Current ENERGY STAR Criteria for Skylights

Climate Zone	Maximum U-Factor to be set between	Maximum SHGC
Northern (IECC 5-8)	0.55	Any
North-Central (IECC 4)	0.55	0.40
South-Central (IECC 3)	0.57	0.30
Southern (IECC 1 & 2)	0.70	0.30

#### IECC 2012 Criteria for Skylights

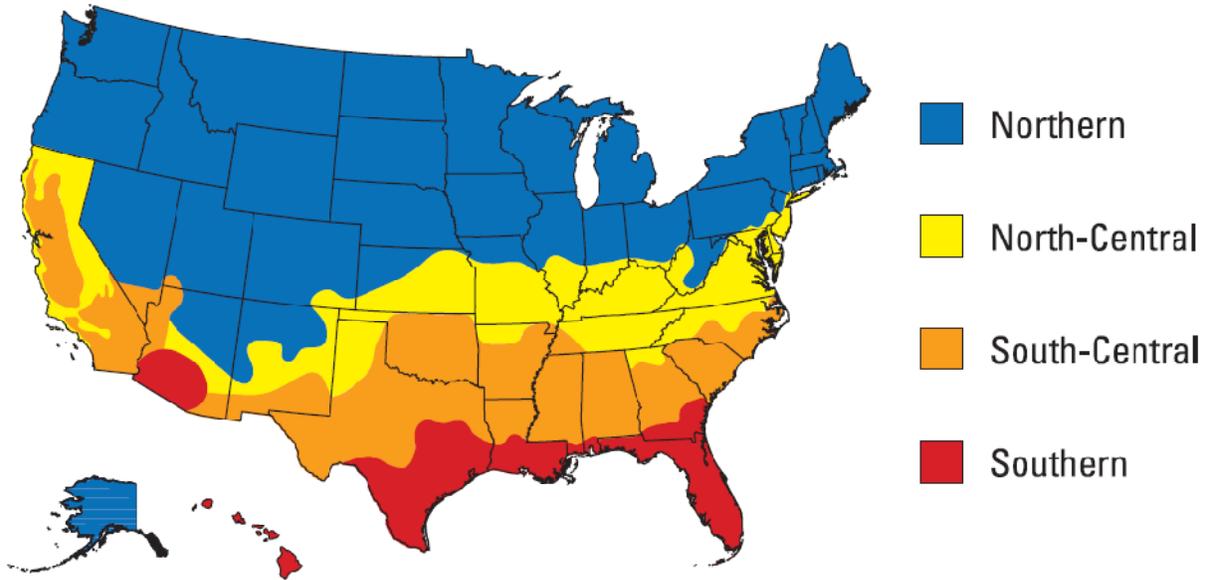
Climate Zone	Maximum U-Factor to be set between	Maximum SHGC
Northern (IECC 5-8)	0.55	No Rating
North-Central (IECC 4)	0.55	0.40
South-Central (IECC 3)	0.55	0.30
Southern (IECC 1 & 2)	0.65*	0.30

\*NOTE: IECC Zone 1 has a U-factor maximum of 0.75.

Air leakage must be  $\leq 0.3$  cfm/ft<sup>2</sup>

# Appendix B: Maps for Reference

## ENERGY STAR Climate Zone Map



## IECC Climate Zone Map

