

# Response to Door and Skylight Comments

ENERGY STAR® for Windows, Doors, and Skylights Version 6.0 Criteria Revision

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## Responses to Comments on Draft 2 Version 6.0 Criteria for Doors

### Comment 1 – Cost Effectiveness

One commenter's analysis shows that incremental cost for less than or equal to half-lite doors is more than double EPA's estimate. EPA estimated a 15-year payback in Boston, but the commenter found it to be 35 years.

#### EPA Response:

EPA's analysis is based on the data that manufacturers provided during the revision process. While the commenter has not provided EPA with the background necessary to evaluate this concern, EPA will review any additional data that manufacturers submit during the current comment period to evaluate the payback periods calculated by the manufacturer and/or reconsider the initial payback calculations presented in the *Draft 1 Criteria and Analysis Report*.

### Comment 2 – Criteria (General)

One commenter supports the improvements to the Draft 2 door criteria.

#### EPA Response:

EPA appreciates the support of the improvements to the proposed door criteria.

### Comment 3 – Criteria (SHGC)

One commenter supports the zonal Solar Heat Gain Coefficient (SHGC) requirements for greater than half-lite doors.

#### EPA Response:

EPA appreciates the support for the zonal SHGC requirements for greater than half-lite doors.

### Comment 4 – Criteria (SHGC)

One commenter prefers that the SHGC criteria for greater than half-lite doors remain the same as in Version 5.0 because the proposed changes will damage affordability and offer no payback.

#### EPA Response:

EPA notes that the ENERGY STAR mark must be associated with products that meet or exceed minimum requirements, such as national model codes. If the code approaches or exceeds the ENERGY STAR specification in some regions, as is the case with the current specification, EPA strives to exceed that code. EPA has proposed SHGC criteria for greater than half-lite doors that meet the 2012 International Energy Conservation Code (IECC) for glazed fenestration. Without this adjustment, ENERGY STAR greater than half-lite doors would not meet IECC 2012 code requirements. Additionally, the ENERGY STAR mark is intended to direct consumers to products with superior energy performance. Consumers have a range of product options at varying price points and efficiency levels. If a consumer elects to spend more to purchase an ENERGY STAR product, the incremental cost of that decision will be recouped within the lifetime of the product.

### Comment 5 – Criteria (SHGC for Greater than Half-Lite Doors)

Two commenters would like to see the SHGC for full-lite doors changed to "Any" in the Northern Zone because full-lite doors are essentially big windows and should have the same criteria. Alternatively, EPA could revert to covering full-lite doors under the windows criteria.

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### **EPA Response:**

EPA appreciates the commenters' suggestion on the SHGC for full-lite doors in the Northern Zone. EPA has proposed a two-zone (rather than three- or four-zone) approach for greater than half-lite doors to minimize the cost and logistical impact on manufacturers, while also allowing manufacturers to offer whole-home fenestration replacements utilizing the same glass package as requested during the previous comment period. EPA has received generally positive feedback for the current structure of the door criteria (based on glazing levels with all doors greater than half-lite grouped together). EPA may consider alternative approaches in the next criteria revision process.

### **Comment 6 – Criteria (Energy Savings for Two Zones for Greater than Half-Lite Doors)**

One commenter does not support the zonal SHGC criteria for greater than half-lite doors because it believes door SHGC has a minimal impact on energy savings and thus should not be adjusted.

### **EPA Response:**

EPA notes that the ENERGY STAR mark must be associated with products that meet or exceed minimum requirements, such as national model codes. If the code approaches or exceeds the ENERGY STAR specification in some regions, as is the case with the current specification, EPA strives to exceed that code. EPA has proposed SHGC criteria for greater than half-lite doors that meet the 2012 IECC for glazed fenestration. Without this adjustment, ENERGY STAR greater than half-lite doors would not meet IECC 2012 code requirements.

### **Comment 7 – Criteria (Labeling for Two Zones for Greater than Half-Lite Doors)**

Several commenters express concern about labeling greater than half-lite doors for two zones. One commenter believes that climate zone-based labels would confuse and frustrate consumers. Another commenter believes that the door pre-hanging industry is not prepared for the labeling complexity multiple climate zones would require. One commenter notes that feedback on creating whole-country criteria for doors has been mostly positive. One commenter expresses concern that millions of doors would require cost-prohibitive labeling revision because some manufacturers do not currently use climate zone-specific labeling.

### **EPA Response:**

EPA notes that prior to 2010, all doors were labeled based on qualification in four zones. The proposed criteria will affect only greater than half-lite doors that do not qualify everywhere. There will be only two additional labels for pre-hangers to use if they offer greater than half-lite doors that do not qualify in all zones. To reduce costs, manufacturers may use a single label for all doors if their greater than half-lite doors qualify across the country. The ENERGY STAR program is not aware of any consumer complaints regarding ENERGY STAR labeling received during the time that climate zone labels were required for doors. While EPA agrees that some commenters have supported national door criteria, several manufacturers have specifically requested the proposed two-zone SHGC criteria change for greater than half-lite doors. These manufacturers provided strong technical evidence to EPA (pictures, glass samples, and technical analysis) supporting their concerns.

### **Comment 8 – Criteria (Inventory for Greater than Half-Lite Doors)**

One commenter expresses concern that companies located in the center of the country will need to create dual inventories because Northern Zone customers will not pay the extra cost for the glass package required in the south.

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#### **EPA Response:**

EPA understands that the addition of a two-zone SHGC requirement for greater than half-lite doors may present logistical challenges for those manufacturers who wish to offer greater than half-lite doors that do not qualify in all climate zones. EPA notes that a manufacturer may choose whether to offer ENERGY STAR qualified options for both sets of climate zones depending on what it believes will best suit the company's customers. EPA believes the proposed criteria give each manufacturer the flexibility to choose an approach that best meets the company's needs.

#### **Comment 9 – Criteria (Trade-Offs for Greater than Half-Lite Doors)**

A commenter suggests that the additional trade-offs in the Northern Zone for windows increase the possibility for color mismatch between window and door glass packages. The commenter recommends prescriptive criteria maximums of 0.30 for U-factor and SHGC with one trade-off that allows a U-factor of 0.32 if SHGC is 0.40 or more

#### **EPA Response:**

EPA notes that the ENERGY STAR mark must be associated with products that meet or exceed minimum requirements, such as national model codes. If the code approaches or exceeds the ENERGY STAR specification in some regions, as is the case with the current specification, EPA strives to exceed that code. EPA has proposed SHGC criteria for greater than half-lite doors that meet the 2012 IECC for glazed fenestration. Without this adjustment, ENERGY STAR greater than half-lite doors would not meet IECC 2012 code requirements. IECC 2012 requires an SHGC of 0.25 or less in southern zones and an SHGC maximum of 0.40 in IECC Zone 4, which preclude the possibility of establishing a maximum SHGC of 0.30 or a minimum SHGC (respectively) as part of a trade-off.

#### **Comment 10 – Criteria (U-Factor)**

Two commenters support the increase of the U-factor for less than or equal to half-lite doors to 0.25. Two commenters would like to see the U-factor for opaque doors raised to 0.19. One believes that the opaque door criteria should not be changed because it will damage affordability and offer no payback.

#### **EPA Response:**

EPA appreciates the support for the change in the less than or equal to half-lite door U-factor criterion. While EPA appreciates the suggested criterion for opaque doors, EPA notes that the manufacturers who volunteered cost data indicated that their best-selling ENERGY STAR qualified opaque doors already achieve a U-factor of 0.17, which means no incremental cost increase to the consumer. If manufacturers submit additional cost data during the current comment period, EPA will review it to evaluate whether EPA should consider revising the proposed criteria.

## Responses to Comments on Draft 2 Version 6.0 Criteria for Skylights

NOTE: These are comments and responses regarding the Draft 2 Skylights specification (released on January 7, 2013), NOT the **Revised** Draft 2 Skylights specification (released on February 25, 2013). EPA has developed a separate set of comments and responses regarding the **Revised** Draft 2 Skylights specification, presented in the next section of this document. Some comments included below are addressed in more detail in the **Revised** Draft 2 Skylights comment responses.

### Proposed Draft 2 Version 6.0 Criteria for Skylights

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

### Comment 1 – Analysis (General Comments)

Two commenters believe that EPA incorrectly extrapolated skylight product availability by using the National Fenestration Rating Council (NFRC) Certified Products Directory (CPD). The commenters also believe the CPD should not be used in a feasibility analysis because of the high number of developmental products and believe that the CPD should not be used to inform criteria selection.

#### EPA Response:

EPA reviews the CPD because it represents the best available information on what could be available in the market in the future. This, when used in combination with the Products Available for Sale Database compiled and analyzed by EPA, helps in evaluating the potential availability when a specification takes effect. The CPD and the Products Available for Sale Database are just two of many elements EPA used in evaluating the potential criteria levels for skylights.

### Comment 2 – Analysis (General Comments)

Two commenters express concern that RESFEN 5 assumptions do not allow shading of skylights to be taken into consideration. The assumptions are inflexible when attempting to develop an accurate analysis of all energy impacts of skylights. The commenters also understand that no alternate tool exists.

#### EPA Response:

EPA understands the commenters' concerns regarding the RESFEN 5 assumptions and appreciates that the commenters recognize that no alternate tool exists. When RESFEN is modified or another tool is developed, EPA may consider reevaluating its analysis approach at that time.

### Comment 3 – Analysis (General Comments)

One commenter believes that EPA should determine annual energy savings for skylights rather than setting requirements based on arbitrary concerns such as "possible consumer discomfort" and clarifies that EPA should not consider heat gain only in the summer months when determining energy savings.

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#### **EPA Response:**

EPA appreciates the commenter's feedback regarding the impact of solar heat gain and the proposed SHGC levels. EPA has published revised SHGC criteria proposals for all climate zones based on technical discussions with manufacturers and re-evaluation of the available data. EPA notes that it calculates annual energy savings for all products. EPA also clarifies that its energy savings analysis accounts for heat gain throughout the year, not just in the summer months.

#### **Comment 4 – Analysis (General Comments)**

A commenter suggests that EPA perform a new skylight analysis that better adheres to the *ENERGY STAR® Products Program Strategic Vision and Guiding Principles* and provides fairer treatment in comparison to how EPA selected the windows criteria.

#### **EPA Response:**

EPA refers commenters to the *Introduction to Response to Comments*, which outlines EPA's approach in applying the *ENERGY STAR® Products Program Strategic Vision and Guiding Principles* to this criteria revision process. EPA notes that it evaluated skylights using the same approach as that applied to windows, performing many of the same analyses. As with windows, EPA has also proposed revised skylight criteria based on comments received and direct outreach to manufacturers.

#### **Comment 5 – Analysis (General Comments)**

A commenter believes that the analysis was not consistently applied across product categories. The commenter believes that skylights were treated much more harshly than windows without technical justification (e.g., EPA used a subset of window types, but evaluated all skylight types).

#### **EPA Response:**

EPA evaluated all skylight product types using the same approach as that applied to windows, performing many of the same analyses. EPA uses broad datasets to perform these analyses wherever possible. EPA had to limit the windows analysis because of the large quantity of data involved. EPA did apply the same analytic approach to the windows and the skylights datasets.

#### **Comment 6 – Analysis (General Comments)**

A commenter believes that EPA needs to consider the comments it has received, review its analyses, provide new analyses where the original analyses are lacking, and ensure the specification appropriately balances the program's guiding principles.

#### **EPA Response:**

EPA carefully considered all comments on the proposed skylight criteria and appreciates the additional data offered by manufacturers in support of specific criteria proposals. The proposed final draft specification includes revised U-factor and SHGC criteria across all zones based on the information commenters provided to EPA.

#### **Comment 7 – Analysis (General Comments)**

One commenter notes that not all skylight subtypes can be used in every application. The commenter believes the analysis should be revised accordingly.

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#### **EPA Response:**

EPA understands that not all skylight subtypes can be used in every application. As noted previously, EPA collectively reviewed and analyzed all skylight product types so it could use as broad a dataset as possible to perform the criteria revision analyses. EPA has worked closely with manufacturers since publishing the Draft 2 specification to determine what U-factor criteria to propose to account for the variance in performance across skylight subtypes.

#### **Comment 8 – Analysis (Northern Zone)**

One commenter believes that EPA cannot conclude that double-pane skylights meet the proposed criteria based on a review of the CPD because products in the CPD are not necessarily available for sale. If a product is not available for sale, it cannot meet the proposed criteria.

#### **EPA Response:**

EPA agrees that a review of the CPD alone cannot demonstrate product availability. The analysis of product feasibility based on the CPD and the analysis of the Products Available for Sale Database were two of many factors EPA considered when developing the proposed criteria levels. EPA concluded that double-pane skylights meet the proposed criteria based on an analysis of the Products Available for Sale Database and did not rely solely on the CPD.

#### **Comment 9 – Analysis (Northern Zone)**

One commenter believes that EPA's statement that the U-factors in the CPD and the products available for sale analysis are "roughly equivalent" is incorrect and misleading. The CPD has almost 50% more products available at 0.45 and 80%-90% more products at 0.47.

#### **EPA Response:**

EPA regrets if the commenter found this statement misleading. EPA notes that the *Draft 1 Criteria and Analysis Report* states that "the percentage of products at various U-factor levels is roughly equivalent." To clarify, the distribution of products, not the number of products, is similar at various U-factor levels.

#### **Comment 10 – Building Codes**

Two commenters see advancing beyond IECC 2012 as unnecessary because individual state adoptions will likely be deferred for several years. One commenter suggests there is a clear lag of at least four years between publication and adoption of code throughout the country. The commenter believes it will be at least 2016 before 50% of states adopt IECC 2012.

#### **EPA Response:**

EPA notes that the ENERGY STAR mark must be associated with products that meet or exceed minimum requirements, such as national model codes. While EPA understands that states may wait to adopt IECC 2012, it is important that the ENERGY STAR mark remain a symbol of superior efficiency. If the code approaches or exceeds the ENERGY STAR specification in some regions, as is the case with the current specification, EPA strives to exceed that code.

#### **Comment 11 – Cost Effectiveness (Cost Increases)**

One commenter believes that exceeding IECC 2012 results in prohibitive cost increases.

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### **EPA Response:**

EPA notes that the ENERGY STAR mark must be associated with products that meet or exceed minimum requirements, such as national model codes. While EPA understands that states may wait to adopt IECC 2012, it is important that the ENERGY STAR mark remain a symbol of superior efficiency. If the code approaches or exceeds the ENERGY STAR specification in some regions, as is the case with the current specification, EPA strives to exceed that code. EPA appreciates the commenter's feedback on potential cost increases and has worked with manufacturers to revise the proposed skylight criteria to levels EPA believes will offer improved cost effectiveness for consumers.

### **Comment 12 – Cost Effectiveness (General Comments)**

Two commenters would like to see EPA's cost effectiveness analysis expanded to account for regional differences and energy savings in each zone. Skylight distribution is often regional, and few companies market their products nationwide. Based on the limited size of the dataset used, valid conclusions cannot be drawn.

### **EPA Response:**

EPA understands the commenters' concerns regarding the lack of cost data voluntarily submitted by manufacturers. EPA extensively reviewed the available data supplied by manufacturers and will review any additional data that regional manufacturers submit during the current comment period to re-evaluate the cost effectiveness analysis initially published in the *Draft 1 Criteria and Analysis Report*.

### **Comment 13 – Cost Effectiveness (General Comments)**

Three commenters believe that EPA must include triple-pane skylights in its cost effectiveness analysis.

### **EPA Response:**

Including triple-pane products in the cost effectiveness analysis would be inconsistent with how cost effectiveness is determined for other ENERGY STAR product categories. Manufacturers may choose to offer ENERGY STAR products that are more expensive. However, not all of the costs associated with these products are necessarily related to achieving the ENERGY STAR criteria. Based on EPA's discussions with manufacturers and technical feedback from commenters, EPA believes manufacturers can meet the revised proposed specification using either double- or triple-pane skylights.

### **Comment 14 – Cost Effectiveness (General Comments)**

Two commenters believe that EPA has been provided with cost data by a number of manufacturers, but has not taken this data into account in its cost effectiveness analysis.

### **EPA Response:**

EPA reviewed all of the data submitted by manufacturers and took all data received into account in the cost effectiveness analysis. EPA will review any additional data that manufacturers submit during the current comment period to re-evaluate the cost effectiveness analysis initially published in the *Draft 1 Criteria and Analysis Report*.

### **Comment 15 – Cost Effectiveness (General Comments)**

Two commenters believe that EPA cannot justify lowering the SHGC from a cost effectiveness standpoint, especially if it considers the cost savings skylights provide by reducing consumers' need for artificial lighting.

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#### **EPA Response:**

As stated in the *Version 6.0 Product Specification Framework Document* and the *Draft 1 Criteria and Analysis Report* (Section 2.2.4), EPA considers daylighting a property that must be evaluated at a room or whole-building level. EPA does not believe that individual fenestration products can be evaluated for their daylighting properties.

#### **Comment 16 – Cost Effectiveness (General Comments)**

One commenter believes that EPA's analysis fails to address the fact that skylight subtypes exist for use in different applications and are not interchangeable. The cost of customizing a different type of product to meet the need of different applications will be far higher than the ranges EPA has assumed.

#### **EPA Response:**

EPA understands that not all skylight subtypes can be used in every application. As noted previously, EPA reviewed and analyzed all skylight product types so it could use as broad a dataset as possible to perform the criteria revision analyses. EPA has worked closely with manufacturers since publishing the Draft 2 specification to determine what U-factor criteria to propose to account for the variance in performance across skylight subtypes.

#### **Comment 17 – Cost Effectiveness (Payback Periods are too Long)**

Two commenters believe that the average homeowner is in a home for 7 years, so a payback of 30 years isn't reasonable. Two commenters believe that the payback periods need to maintain a range that will attract consumers. One commenter sees the payback periods in the Southern, South-Central, and North-Central Zones as too long. One commenter believes that the payback periods are unacceptable to consumers. Most payback periods were in the 20+ range, and paybacks as low as 7 years can exceed consumer tolerance. One commenter sees excessive payback periods as offering no incentive for purchasing an ENERGY STAR skylight and leading to the purchase of non-qualified products, which is counterproductive to saving energy.

#### **EPA Response:**

EPA has worked closely with manufacturers to identify revised criteria levels to propose that will address commenters concerns about cost effectiveness for consumers. Based on these conversations, EPA believes the proposed final draft criteria will offer shorter payback periods for consumers. EPA also notes that the guidance in the *ENERGY STAR® Products Program Strategic Vision and Guiding Principles* identifies payback within the lifetime of the product as the program's cost effectiveness goal.

#### **Comment 18 – Cost Effectiveness (Incremental Costs)**

Two commenters believe that the marginal cost of \$30 will reduce the number of homeowners who buy energy efficient skylights, which seems to defeat ENERGY STAR's purpose. Another commenter believes that marginal costs increases of \$20-\$40 will cause some homeowners to select less energy efficient products that cost less. A fourth commenter sees the price increase of \$25-\$40 as limiting the number of customers who will upgrade from plastic to energy-efficient glass skylights, which will erode the ENERGY STAR brand. Dealers indicate that consumers will not select ENERGY STAR if the incremental cost is even \$20. This will result in higher energy use and greenhouse gas emissions.

#### **EPA Response:**

EPA appreciates the commenters' concerns about the effect of marginal cost increases on the market desirability of skylights. The ENERGY STAR mark is intended to direct consumers to products with superior

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energy performance. Consumers have a range of product options at varying price points and efficiency levels. If a consumer elects to spend more to purchase an ENERGY STAR product, the incremental cost of that decision will be recouped within the lifetime of the product. EPA has worked closely with manufacturers to identify proposed final draft criteria that deliver on this tenet of the program.

#### **Comment 19 – Cost Effectiveness (Incremental Costs)**

One commenter believes that estimated incremental cost increases were oversimplified and understated. The commenter notes that moving from curb-mount to deck-mount has an incremental cost of \$92 for the proposed Northern Zone criteria. The commenter further notes that curb-mount can be improved for \$48 by adding a second low-e coating, but that is too detrimental to the main function of the skylight. The commenter believes EPA should use the best available information from partners and other trusted sources.

#### **EPA Response:**

EPA understands the commenter's concerns about the cost effectiveness analysis and assures commenters that EPA evaluated all available manufacturer cost data when assessing cost effectiveness. If additional manufacturers wish to provide detailed cost data during the current comment period, EPA will review the data to re-evaluate the cost effectiveness analysis provided in the *Draft 1 Criteria and Analysis Report*. EPA has revised the proposed U-factor and SHGC criteria for the Northern Zone to levels that, based on conversations with manufacturers, EPA believes will allow more curb-mount products to qualify.

#### **Comment 20 – Cost Effectiveness (Incremental Costs)**

One commenter believes the cost increase associated with the proposed specification risks putting these products out of reach of the vast majority of today's recession-impacted consumers. Another commenter notes that skylights are discretionary purchases for new residential buildings and that setting the criteria at the proposed levels reduces the pool of potential buyers due to excessively expensive enhancements.

#### **EPA Response:**

The ENERGY STAR mark is intended to direct consumers to products with superior energy performance. Consumers have a range of product options at varying price points and efficiency levels. If a consumer elects to spend more to purchase an ENERGY STAR product, the incremental cost of that decision will be recouped within the lifetime of the product. Based on discussions with manufacturers, EPA believes that the revised specification levels will shorten payback periods for consumers.

#### **Comment 21 – Cost Effectiveness (Request for Additional Data)**

One commenter believes that EPA has provided a vague and inadequate description of the process it used to generate the "average cost increase" for skylights, and believes the ranges EPA developed are too low. The commenter would like additional information to enable commenters to better understand both the nature of the data manufacturers provided to the Agency and how that data was used to develop the average values provided in Table 18.

#### **EPA Response:**

To protect the confidentiality of cost data provided by manufacturers, EPA cannot supply additional information beyond what was included in the *Draft 1 Criteria and Analysis Report*. EPA reviewed all of the data submitted by manufacturers and will review any additional detailed data that manufacturers submit during the current comment period to re-evaluate the cost effectiveness analysis initially published in the *Draft 1 Criteria and Analysis Report*.

### Comment 22 – Criteria (Availability)

One commenter found that product availability for skylights is below 20% in every climate zone except the Southern Zone, which demonstrates that the criteria are too stringent because these product availability levels indicate that the guiding principles may not be appropriately balanced.

#### EPA Response:

As stated in the *ENERGY STAR® Products Program Strategic Vision and Guiding Principles*, EPA has typically found that the best balance among the guiding principles may be achieved by setting specifications that recognize the top 25% of product models on the market at the time a specification takes effect, not when revised criteria are proposed. EPA emphasizes that this figure is provided for reference and is not a goal, a guiding principle, or a rule for criteria setting. EPA also notes that it has revised the proposed implementation date to January 1, 2015, and revised the proposed specification levels, both of which EPA expects to increase product availability at the time of implementation.

### Comment 23 – Criteria (Cost Effectiveness and Stringency)

One commenter sees the proposed criteria as not cost effective and overly stringent.

#### EPA Response:

EPA has reduced the stringency of proposed specifications in every climate zone and revised the proposed implementation date to January 1, 2015, to allow manufacturers more time to prepare for the Version 6.0 specification. Based on conversations with stakeholders, EPA believes these changes will also improve cost effectiveness for consumers.

### Comment 24 – Criteria (Incremental Improvements)

One commenter thinks that the skylight criteria are taking too large a step and incremental improvements can be made that offer better payback.

#### EPA Response:

EPA appreciates the commenter's concerns about the proposed specification levels and notes that the proposed criteria levels have been revised for every climate zone. Based on conversations with manufacturers, EPA believes the proposed revised levels will shorten payback periods for consumers.

### Comment 25 – Criteria (Skylight SHGCs)

One commenter notes that the only difference between skylights and windows with respect to SHGC is that the 20° slope of skylights results in an increase in SHGC of about 0.02 over the same product rated in a vertical position. The commenter further notes that the percentage of the frame that blocks the sun does not pertain to the strength of the frame, and there are no differences in SHGC among different glass types (i.e., annealed, heat-strengthened, or tempered).

#### EPA Response:

EPA appreciates the commenter's technical insight on skylight SHGCs. Based on feedback from commenters, EPA has reduced the stringency of the proposed SHGC criteria for skylights in every climate zone to allow more products to qualify.

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### **Comment 26 – Criteria (Effect on Curb-Mount Skylights)**

One commenter sees the proposed criteria as disenfranchising curb-mounted skylights, which is problematic because building code requires skylights to be installed a minimum of 4" above the roof when the pitch is 4/12 or less and notes that curb-mount manufacturers do not supply the curb and cannot dictate the type of curb used. The commenter notes that NFRC certification will only take the curb into account if the curb is an integral part of the skylight, which is not a product that builders would accept.

#### **EPA Response:**

EPA understands that not all skylight subtypes can be used in every application. EPA also appreciates the additional specifics with respect to curb-mount products that the commenter has provided. EPA has worked closely with manufacturers since publishing the Draft 2 specification to determine what U-factor criteria to propose to account for the variance in performance across skylight subtypes. These discussions indicate the proposed revised criteria and the revised implementation date will increase availability of ENERGY STAR qualified curb-mount skylights under the Version 6.0 specification.

### **Comment 27 – Criteria (Effect on Program Integrity)**

One commenter believes the proposed specification betrays consumers and manufacturers and irrevocably undermines the integrity of the ENERGY STAR program.

#### **EPA Response:**

EPA has revised the proposed specifications in every climate zone in response to commenter concerns.

### **Comment 28 – Northern Zone Criteria (General SHGC Comments)**

One commenter believes the proposed SHGC criterion in the Northern Zone is inconsistent with green building program requirements and ignores the passive solar heating benefits skylights provide.

#### **EPA Response:**

EPA has revised the proposed criteria to allow for any SHGC in the Northern Zone to allow those interested in high-gain products to pursue that option.

### **Comment 29 – Northern Zone Criteria (SHGC and Comfort)**

One commenter believes that setting an SHGC in the Northern Zone should not be based on the possibility of consumer discomfort. The commenter notes that skylight manufacturers are far more familiar with the demands for consumer comfort and ensure that their products address this in order to maintain sales. The commenter further offers that until EPA has conducted a thorough analysis and can provide substance to this assertion, it is imperative that the documented benefit of heat gain in northern climates be the determining factor for SHGC.

#### **EPA Response:**

EPA appreciates the commenter's input on the impact of solar heat gain on consumer comfort. Based on commenter input, EPA has revised the proposed Northern Zone criteria to allow for any SHGC to allow those interested in high-gain products to pursue that option.

### **Comment 30 – Northern Zone Criteria (Equivalent SHGC)**

One commenter believes that skylights and windows with the same glass package and framing materials should have the same SHGC requirement.

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#### **EPA Response:**

While EPA appreciates the commenter's suggestion, EPA considers skylights and windows two different product types with separate markets and uses. EPA sets specifications that are technology neutral so that manufacturers may choose whatever path they see fit to achieve improved energy efficiency.

#### **Comment 31 – Northern Zone Criteria (SHGC and IECC)**

One commenter notes that the proposed SHGC for windows does not exceed IECC, so the SHGC for skylights should not exceed IECC either.

#### **EPA Response:**

While EPA appreciates the commenter's suggestion, EPA considers skylights and windows two different product types with separate markets and uses. Based on feedback from commenters, EPA has revised the proposed Northern Zone criteria to allow for any SHGC.

#### **Comment 32 – Northern Zone Criteria (SHGC Additional Information Request)**

One commenter seeks a complete response from EPA on the background of the decision to set an SHGC in the Northern Zone.

#### **EPA Response:**

EPA's initial analysis showed that many skylights have low SHGCs, which prompted the originally proposed criteria. Based on commenter input, EPA has revised the proposed Northern Zone criteria to allow for any SHGC.

#### **Comment 33 – Northern Zone Criteria (SHGC and VT)**

One commenter believes the proposed SHGC criterion will reduce Visible Transmittance (VT) and thus violates the second guiding principle (product performance can be maintained or enhanced with increased energy efficiency).

#### **EPA Response:**

EPA notes that the analysis presented in the *Draft 1 Criteria and Analysis Report* EPA's indicates that low SHGC criteria are not as closely correlated with low VT as they were in the past. Based on commenter feedback, EPA has revised the proposed Northern Zone criteria to allow for any SHGC.

#### **Comment 34 – Northern Zone Criteria (Passive Heat Gain)**

One commenter believes that establishing an SHGC requirement in the Northern Zone is not technically justifiable. The commenter highlights that EPA values passive heat gain as demonstrated in the Northern Zone criteria for windows, and skylights can provide even more heat per area than windows.

#### **EPA Response:**

EPA has revised the proposed criteria to allow for any SHGC in the Northern Zone to allow those interested in high-gain products to pursue that option.

#### **Comment 35 – Northern Zone Criteria (General Comments)**

Several commenters request a U-factor maximum of 0.50 and no SHGC requirement in the Northern Zone.

### **EPA Response:**

EPA agrees with the suggestion to allow any SHGC in the Northern Zone and has revised the proposed criteria accordingly. While EPA has modified the Northern Zone U-factor based on conversations with manufacturers, EPA notes that the commenters did not provide sufficient information to explain their request for a U-factor of 0.50.

### **Comment 36 – North-Central Zone Criteria (General SHGC Comments)**

One commenter believes the proposed SHGC criterion is inconsistent with established energy codes and green building program requirements.

### **EPA Response:**

Based on commenter input, EPA has revised the North-Central Zone SHGC maximum to 0.35. EPA has not identified any energy codes or green building program requirements that conflict with the proposed criteria levels. EPA welcomes additional information from commenters on this topic.

### **Comment 37 – North-Central Zone Criteria (Passive Heating)**

One commenter believes that the proposed SHGC criterion ignores the passive solar heating benefits skylights provide.

### **EPA Response:**

Based on commenter input, EPA has revised the North-Central Zone SHGC maximum to 0.35. EPA notes that the ENERGY STAR mark must be associated with products that meet or exceed minimum requirements, such as national model codes. If the code approaches or exceeds the ENERGY STAR specification in some regions, EPA strives to exceed that code. IECC 2012 sets a maximum SHGC for skylights in the North-Central Zone, which limits the potential applications of high-gain products.

### **Comment 38 – North-Central Zone Criteria (SHGC and Payback Periods)**

One commenter notes that the proposed SHGC level results in payback periods that are too long.

### **EPA Response:**

Based on commenter input, EPA has revised the proposed North-Central Zone SHGC criteria to 0.35. Based on discussions with manufacturers, EPA believes this change will shorten payback periods for consumers.

### **Comment 39 – North-Central Zone Criteria (SHGC and VT)**

One commenter believes that the proposed SHGC criterion will reduce VT and thus violates the second guiding principle (product performance can be maintained or enhanced with increased energy efficiency).

### **EPA Response:**

EPA has revised the proposed North-Central Zone SHGC criteria to 0.35 based on commenter input. EPA notes that analysis presented in the *Draft 1 Criteria and Analysis Report* indicates that low SHGC criteria are not as directly correlated with low VT as they were in the past.

### **Comment 40 – North-Central Zone Criteria (Alternative Proposals)**

Two commenters request that the requirements be a U-factor maximum of 0.50 and an SHGC maximum of 0.40. One commenter requests a U-factor maximum of 0.53 and an SHGC maximum of 0.35.

### **EPA Response:**

EPA agrees with the suggestion to revise the proposed North-Central Zone SHGC criteria. While EPA has modified the North-Central Zone U-factor based on conversations with manufacturers, EPA notes that the commenters did not provide sufficient information to explain their request for a U-factor of 0.50 or 0.53.

### **Comment 41 – South-Central Zone Criteria (SHGC and Payback Periods)**

One commenter believes the proposed SHGC level results in payback periods that are too long.

### **EPA Response:**

EPA has revised the proposed South-Central Zone SHGC criteria to 0.28 based on commenter input and technical data provided by commenters. Based on discussions with manufacturers, EPA believes this proposal will reduce payback periods.

### **Comment 42 – South-Central Zone Criteria (SHGC and VT)**

One commenter is concerned that the proposed SHGC criterion will reduce VT and thus violates the second guiding principle (product performance can be maintained or enhanced with increased energy efficiency).

### **EPA Response:**

EPA has revised the proposed South-Central Zone SHGC criteria to 0.28 based on commenter input and technical data provided by commenters. EPA notes that analysis presented in the *Draft 1 Criteria and Analysis Report* indicates that low SHGC criteria are not as directly correlated with low VT as they were in the past.

### **Comment 43 – South-Central Zone Criteria (Alternative Proposal)**

Several commenters request that the U-factor maximum be 0.55 and that the SHGC maximum be 0.30.

### **EPA Response:**

EPA has revised the proposed South-Central Zone SHGC criteria to 0.28 based on commenter input and technical data provided by commenters. While EPA has modified the South-Central Zone U-factor based on conversations with manufacturers, EPA notes that the commenters did not provide sufficient information to explain their reasons for requesting a U-factor of 0.55. Based on discussions with manufacturers, EPA believes that the current proposal for the U-factor maximum is cost effective.

### **Comment 44 – Southern Zone Criteria (General SHGC Comments)**

One commenter notes that EPA did not seek to exceed the IECC SHGC criteria for windows and has not adequately justified the reasoning for the proposed SHGC for skylights. The commenter would like a response from EPA on the background of this decision.

### **EPA Response:**

While EPA appreciates the commenter's suggestion, EPA considers skylights and windows two different product types with separate markets and uses. Based on feedback and technical data from commenters, EPA has revised the proposed Southern Zone SHGC criteria to 0.28. EPA's initial analysis showed that many skylights have low SHGCs, which prompted the originally proposed criteria.

### **Comment 45 – Southern Zone Criteria (SHGC and Payback Periods)**

One commenter believes the proposed SHGC results in payback periods that are too long.

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#### **EPA Response:**

Based on feedback and technical data from commenters, EPA has revised the proposed Southern Zone SHGC criteria to 0.28. Based on discussions with manufacturers, the revised proposal will reduce payback periods for consumers.

#### **Comment 46 – Southern Zone Criteria (SHGC and VT)**

One commenter is concerned that the proposed SHGC criterion will reduce VT and thus violates the second guiding principle (product performance can be maintained or enhanced with increased energy efficiency).

#### **EPA Response:**

EPA notes that analysis presented in the *Draft 1 Criteria and Analysis Report* indicates that low SHGC criteria are not as directly correlated with low VT as they were in the past. Based on commenter input and technical data provided by commenters, EPA has revised the proposed Southern Zone SHGC criteria to 0.28.

#### **Comment 47 – Southern Zone Criteria (Alternative Proposals)**

Two commenters request a U-factor maximum of 0.65 and an SHGC maximum of 0.30. One commenter requested an SHGC maximum of 0.28.

#### **EPA Response:**

EPA agrees with the suggestion to revise the proposed Southern Zone SHGC criteria to 0.28 based on commenter input and technical data provided by commenters. While EPA has modified the Southern Zone U-factor based on conversations with manufacturers, EPA notes that the commenters did not provide sufficient information to explain their request for a U-factor of 0.65.

#### **Comment 48 – Daylighting**

Several commenters note that EPA has ignored the energy benefits that skylights provide in reducing the need for artificial light. EPA should review the studies that show the value of daylighting and use this information when selecting skylight criteria. Additionally, two commenters believe that RESFEN 5 assumptions do not address the daylighting benefits of skylights. The commenters see the assumptions as inflexible when attempting to develop an accurate analysis of all energy impacts of skylights, but the commenters also understand that no alternate tool exists.

#### **EPA Response:**

As stated in the *Version 6.0 Product Specification Framework Document* and the *Draft 1 Criteria and Analysis Report* (Section 2.2.4), EPA considers daylighting a property that must be evaluated at a room or whole-building level. EPA does not believe that individual fenestration products can be evaluated for their daylighting properties. EPA appreciates the commenters' acknowledgement of no alternative tool for evaluating skylight energy performance. When RESFEN is modified or another tool is developed, EPA may consider reevaluating its analysis approach at that time.

#### **Comment 49 – Product Availability (Current)**

One commenter believes that ENERGY STAR's goal of supporting energy efficient products that are readily available in the market will not be met by the proposed specification levels because many products that dealers are currently carrying will not meet the proposed levels.

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#### **EPA Response:**

EPA has revised the proposed skylight criteria in all climate zones and revised the proposed implementation date. The reduced stringency of the proposed criteria should improve product availability. The revised implementation date of January 1, 2015, will provide manufacturers and dealers more time to prepare for the revised specification, further improving product availability.

#### **Comment 50 – Product Availability (Northern and North-Central Zones)**

One commenter notes that EPA's analysis of products available for sale shows that 12% of products can meet the proposed Northern specification and 13% can meet the proposed North-Central specification. The commenter further notes that according to the *ENERGY STAR<sup>®</sup> Products Program Strategic Vision and Guiding Principles*, EPA has found that a product availability of 25% generally indicates an appropriate balance among the guiding principles.

#### **EPA Response:**

As stated in the *ENERGY STAR<sup>®</sup> Products Program Strategic Vision and Guiding Principles*, EPA has typically found that the best balance among the guiding principles may be achieved by setting specifications that recognize the top 25% of product models on the market at the time a specification takes effect, not when revised criteria are proposed. EPA emphasizes that this figure is provided for reference and is not a goal, a guiding principle, or a rule for criteria setting. EPA also notes that it has revised the proposed implementation date to January 1, 2015, and revised the proposed specification levels, both of which EPA expects to increase product availability at the time of implementation.

#### **Comment 51 – Product Availability (Effect of Cost)**

One commenter is concerned that the cost increase associated with the proposed specification may decrease the number of ENERGY STAR skylights offered in stores, which will erode the ENERGY STAR brand.

#### **EPA Response:**

EPA understands the commenter's concerns about the effect of potential cost increases on product availability. EPA has reduced the stringency of the proposed specification and revised the proposed implementation date to provide manufacturers more time to respond to the proposed criteria. These changes should improve product availability at the time of implementation and, based on conversations with manufacturers, EPA believes the revised proposed criteria will offer shorter payback periods for consumers.

#### **Comment 52 – Product Availability (Curb-Mount Skylights)**

One commenter notes that few existing curb-mount products can qualify in all zones under the proposed criteria and with curb-mount skylights used in many markets, more curb-mount products are needed in order to provide consumers with options. The commenter is particularly concerned with the lack of qualifying curb-mount skylights in the Pacific Northwest.

#### **EPA Response:**

EPA understands that not all skylight subtypes can be used in every application. EPA also appreciates the additional specifics with respect to curb-mount products that the commenter has provided. EPA has worked closely with manufacturers since publishing the Draft 2 specification to determine what U-factor criteria to propose to account for the variance in performance across skylight subtypes. These discussions indicate that the proposed revised criteria and the revised implementation date will increase availability of ENERGY STAR qualified curb-mount skylights under the Version 6.0 specification.

### **Comment 53 – Product Availability (Southern and Central Zones)**

One commenter believes dealers will stop stocking ENERGY STAR qualified skylights because of the costs associated with the specification changes in the Southern, South-Central, and North-Central Zones, which will reduce nationwide product availability in a major way.

#### **EPA Response:**

EPA has revised the proposed skylight criteria in all climate zones and revised the proposed implementation date. The reduced stringency of the criteria should improve product availability. The revised implementation date of January 1, 2015, will provide manufacturers and dealers more time to prepare for the revised specification, further improving product availability.

### **Comment 54 – Feasibility**

One commenter notes that triple-pane skylights will be required in the Northern Zone under the proposed criteria.

#### **EPA Response:**

Based on commenter feedback, EPA has revised the Northern Zone specification to allow a wider variety of double-pane products to qualify. The proposed revised implementation date of January 1, 2015, will also provide manufacturers additional time to transition to the proposed criteria.

### **Comment 55 – Draft 1 Version 6.0 Comment Responses (SHGC)**

One commenter noted that the rating system for SHGC measures only the percentage of potential heat gain through a fenestration product. The commenter notes that EPA used SHGC in its comment response when it appears EPA meant to reference the amount of solar gain only.

#### **EPA Response:**

EPA appreciates the commenter bringing this issue to EPA's attention.

### **Comment 56 – Draft 1 Version 6.0 Comment Responses (Payback Periods)**

One commenter clarified that it was not asking for EPA's opinion on why payback periods are long, rather, the commenter was noting that the long payback periods demonstrate that the proposed criteria are not cost effective.

#### **EPA Response:**

EPA appreciates the commenter's feedback on potential cost increases and has worked with manufacturers to revise the proposed skylight criteria to levels EPA believes will offer improved cost effectiveness for consumers.

### **Comment 57 – Draft 1 Version 6.0 Comment Responses (General Feedback)**

Several commenters believe that EPA did not respond completely or adequately to comments on the Draft 1 criteria. One commenter believes that EPA's responses to comments were confusing, inadequate, and lacking in explanatory details and rationale. One commenter is concerned that responses to technical issues, which may not be understood by EPA, were ignored and notes that commenters have consistently expressed their willingness to assist EPA with specific information on manufacturing that would assist EPA in reaching coherent determinations.

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#### **EPA Response:**

EPA has attempted to engage stakeholders throughout the specification revision process and has considered all comments. EPA has made and will continue to make every effort to respond to all the issues raised in the comments. EPA has proposed a number of modifications to the proposals in response to comments. The *Introduction to Response to Comments* released in conjunction with this document offers additional insight into EPA's decision-making process during this criteria revision.

#### **Comment 58 – Draft 1 Version 6.0 Comment Responses (Additional Information Request)**

One commenter would like EPA to be more transparent by sharing details of the calculation methods and assumptions used to derive the inputs to its models instead of providing general philosophical belief statements in responses to comments.

#### **EPA Response:**

EPA is unclear on what information the commenter is specifically requesting. EPA invites the commenter or others with specific technical questions to contact EPA directly to discuss specific requests such as this.

#### **Comment 59 – Program Goals and Guiding Principles (Market Share)**

One commenter believes that the ENERGY STAR program has been clear that market share should not be used as a benchmark when setting specification levels. Rather, product availability is the metric EPA should use to evaluate whether the specification appropriately balances the six guiding principles.

#### **EPA Response:**

EPA confirms that market share did not drive the selection of the proposed criteria levels. Code changes, energy savings, product availability, technological advancements, and other issues drove the decision to select the proposed criteria level. The *Introduction to Response to Comments* released in conjunction with this document offers additional insight into EPA's decision-making process during this criteria revision.

#### **Comment 60 – Program Goals and Guiding Principles (Affordability and Availability)**

The affordability and availability of currently marketed products must be maintained to support EPA's initiative to reduce energy consumption by replacing underperforming products. ENERGY STAR products must be affordable to ALL homeowners. This goal should not be compromised by self-imposed time constraints to update the program.

#### **EPA Response:**

EPA notes that ENERGY STAR is a designation meant to help consumers upgrade to the more energy efficient product when those consumers have already made a decision to purchase. The program does not seek to prompt consumers to purchase new products. The ENERGY STAR mark is intended to direct consumers to products with superior energy performance. Consumers have a range of product options at varying price points and efficiency levels. If a consumer elects to spend more to purchase an ENERGY STAR product, the incremental cost of that decision will be recouped within the lifetime of the product.

#### **Comment 61 – Program Goals and Guiding Principles (Technological Feasibility)**

The *ENERGY STAR® Products Program Strategic Vision and Guiding Principles* does not mention technological feasibility, so it cannot be used to evaluate potential criteria levels.

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#### **EPA Response:**

Technological feasibility analysis assists in evaluating technological advancements, which is a parameter identified in the *ENERGY STAR® Products Program Strategic Vision and Guiding Principles* as an element considered in specification revisions. Technological advancements can include new technologies already in the marketplace or changes that have not been widely adopted by manufacturers. By evaluating the CPD and the Products Available for Sale Database, EPA looks at both types of technological advancements.

#### **Comment 62 – Program Goals and Guiding Principles (Disconnect with Commenters)**

There is a fundamental disconnect between commenters and EPA on the program's ultimate goals.

#### **EPA Response:**

EPA agrees that there is a disconnect between some commenters and EPA regarding ENERGY STAR program goals. The *Introduction to Response to Comments* and the responses to comments seek to clarify the program fundamentals for these commenters.

#### **Comment 63 – Program Goals and Guiding Principles (Reducing Market Share)**

It is inappropriate for EPA to state that its goal is to reduce market share because nothing in the *ENERGY STAR® Products Program Strategic Vision and Guiding Principles* implies that EPA's goal during specification revisions is to reduce market share. The commenter believes EPA's goal is to balance the guiding principles and notes that market share is not a guiding principle.

#### **EPA Response:**

In the *Draft 1 Criteria and Analysis Report* EPA notes that it “would like to see a market share of less than 50% after the Version 6.0 specification takes effect.” EPA would like to clarify that while lower market share will improve differentiation in the marketplace, EPA did not set the specification with a goal of reducing market share.

#### **Comment 64 – Program Goals and Guiding Principles (Differentiation)**

While the sixth guiding principle is product differentiation, it does not mention market share and there is no Agency document that indicates that market share should serve as a proxy for differentiation. EPA states that high market share alone does not diminish the value of the program. There is no basis for using market share to evaluate differentiation.

#### **EPA Response:**

Current ENERGY STAR market share for skylights is more than 70%, and with the majority of products performing at the same level, there is little to no differentiation among products, which is required under the sixth guiding principle.

## Responses to Comments on Revised Draft 2 Version 6.0 Criteria for Skylights

NOTE: These are comments and responses regarding the **Revised** Draft 2 Skylights specification (released on February 25, 2013), NOT the Draft 2 Skylights specification (released on January 7, 2013). EPA has developed a separate set of comments and responses regarding the Draft 2 Skylights specification, presented in the preceding section of this document. Some comments included below are addressed in more detail in the Draft 2 Skylights comment responses.

### Proposed Revised Draft 2 Version 6.0 Criteria for Skylights

Zone	U-factor	SHGC
Northern	<del>≤ 0.45</del> ≤ 0.47	<del>≤ 0.35</del> Any
North-Central	≤ 0.47	≤ <del>0.30</del> ≤ 0.35
South-Central	≤ 0.50	≤ <del>0.25</del> ≤ 0.28
Southern	≤ 0.60	≤ <del>0.25</del> ≤ 0.28

### Comment 1 – Analysis (TDDs)

One commenter requests that the revised analysis based on the newly available National Fenestration Rating Council (NFRC) Certified Products Directory (CPD) data be made available and the comment period extended. One commenter notes that no Tubular Daylighting Devices (TDDs) qualify under the revised Draft 2 specification. Additionally, the U.S. Environmental Protection Agency (EPA) has not indicated how much U-factor levels increased in its re-analysis.

#### EPA Response:

EPA understands the requests from commenters regarding the additional analysis performed to evaluate TDD performance. EPA downloaded all TDD data from the CPD, verified this data directly with manufacturers, and then calculated the percentage of products that would qualify at varying specification levels. By increasing the proposed U-factor in the Northern Zone, all products that qualified in the North-Central Zone under Draft 2 now also qualify in the Northern Zone. EPA notes that it did not do a comparative analysis of TDD U-factor levels before and after the change in the NFRC test procedure.

Percent of TDDs in the CPD Qualifying			
Zone	Draft 2 Version 6.0	Revised Draft 2	Final Draft
Northern	0%	20%	20%
North-Central	20%		
South-Central	7%	7%	7%
Southern	20%	20%	20%
<b>Total</b>	<b>47%</b>	<b>47%</b>	<b>47%</b>

Note: EPA removed two products with very low U-factors from the dataset before performing the analysis to be conservative. Manufacturers indicated that these products may have erroneous test results.

### Comment 2 – Analysis (General Comments)

One commenter believes that it is not clear how EPA selected the revised specifications.

#### EPA Response:

EPA spoke with a number of TDD and skylight manufacturers, some of which provided technical information that helped inform the revised specification levels. EPA also based the proposed revision on the feedback received during the comment period.

### Comment 3 – Analysis (Use of CPD)

One commenter reaffirms that the products available for sale analysis—not the CPD—should be used as the key factor for determining feasibility and availability of products. The commenter adds that the CPD analysis appears to be the primary determinant for the revised criteria and that there is no evidence EPA considered balance among the ENERGY STAR guiding principles. A re-analysis of the revised specification in accordance with ENERGY STAR guiding principles is requested.

#### EPA Response:

EPA confirms that the CPD alone was not used to determine the criteria. EPA spoke with several manufacturers to confirm that skylight and TDD products would be available at the proposed specification levels and that those products would not be prohibitively costly. EPA also confirms that the original and most recent analyses were done in accordance with the guiding principles. EPA refers commenters to the *Introduction to Response to Comments*, which outlines EPA’s approach in applying the *ENERGY STAR® Products Program Strategic Vision and Guiding Principles* to this criteria revision process.

### Comment 4 – Building Codes

One commenter notes that recessed ceiling lighting fixtures are permitted by code to leak more air than NAFS compliant TDD products. The air exchanged with the attic by a light fixture has the same thermal effect as air exchanged with the atmosphere through a TDD dome, when using NFRC standard conditions. EPA should strive to avoid the likely situation that certain ENERGY STAR qualified lighting fixtures use more energy than non-ENERGY STAR TDDs do.

#### EPA Response:

EPA notes that the commenter’s concern seems to be with the ENERGY STAR lighting program and with building codes. EPA encourages the commenter to become involved in the ENERGY STAR lighting criteria revision process and/or with the code revision process.

### Comment 5 – Cost Effectiveness (General Comments)

One commenter believes that there is no evidence that recent revisions will result in any improvement to cost effectiveness.

#### EPA Response:

To protect the confidentiality of data provided by manufacturers, EPA cannot supply additional information on how the revisions will improve cost effectiveness. EPA has, however, proposed additional changes to the specification to help improve cost effectiveness. If manufacturers submit additional data during the current comment period, EPA will review it to further evaluate the cost effectiveness of the proposed revised criteria.

### **Comment 6 – Cost Effectiveness (Alternative Proposal)**

Two commenters state that the values proposed by the American Architectural Manufacturers Association (AAMA) save more energy and will provide consumers with cost effective products as essential replacements for outdated products.

#### **EPA Response:**

EPA appreciates the commenters' opinions regarding the numbers proposed by AAMA, but notes that no data or analysis was provided to substantiate the assertion that the criteria will save more energy or be more cost effective.

### **Comment 7 – Cost Effectiveness (Cost to Manufacturers)**

Three commenters believe that production costs will negatively affect cost effectiveness by lengthening payback periods. The commenters believe that EPA must provide justification for the increases in cost.

#### **EPA Response:**

Based on discussions with manufacturers and extensive analysis of the cost data provided by stakeholders, EPA believes the proposed revised criteria levels will result in shorter payback periods for consumers.

### **Comment 8 – Cost Effectiveness (Cost to Consumers)**

One commenter notes that retailers and suppliers have expressed concern that ENERGY STAR skylights will not be cost effective and that increased costs will not be acceptable to most builders and homeowners.

#### **EPA Response:**

EPA notes that it did not receive any comments on the revised draft criteria from retailers or dealers regarding concerns about increased costs. With the proposed revisions, EPA believes product costs will be lower and therefore more cost effective for consumers.

### **Comment 9 – Cost Effectiveness (Availability and Affordability)**

Two commenters are concerned that mandating substantial production cost increases to achieve incremental energy savings will drive consumers away from ENERGY STAR qualified fenestration products. The commenters further state that availability and affordability of currently marketed products need to be maintained to continue the nation's and EPA's initiative to reduce energy consumption by replacing underperforming products.

#### **EPA Response:**

EPA emphasizes that ENERGY STAR is a voluntary program, not a mandatory standard. The ENERGY STAR mark is intended to direct consumers to products with superior energy performance. Consumers have a range of product options at varying price points and efficiency levels. If a consumer elects to spend more to purchase an ENERGY STAR product, the incremental cost of that decision will be recouped within the lifetime of the product. Conversations with manufacturers indicate that the number of products available will increase by the revised implementation date of January 1, 2015.

### **Comment 10 – Cost Effectiveness (Triple-Pane Skylights)**

Two commenters note that available information suggests that the revised criteria will force the market to triple-pane skylights, resulting in a significant average cost increase.

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#### **EPA Response:**

EPA refers commenters to Figure 28 of the *Draft 1 Criteria and Analysis Report*, which indicates that double-pane skylights were available on the market in 2010 that reach U-factors levels as low as 0.42, which is significantly more efficient than EPA's current proposal. EPA also notes that double-pane skylights meeting the proposed final draft specification are currently available for sale on at least one major retailer's website.

#### **Comment 11 – Criteria (General Comments)**

One commenter hopes that this revision does not represent the Agency's final proposal on the Version 6.0 criteria for windows, doors, and skylights.

#### **EPA Response:**

EPA has revised the proposed criteria based on discussions with manufacturers and offers this final draft specification for comment prior to finalization.

#### **Comment 12 – Criteria (TDD U-Factor Ratings, Part 1)**

One commenter notes that TDD products only obtain NFRC ratings through physical testing, not through simulation software as for windows, doors, and skylights. Furthermore, only one U-factor test facility exists and only one SHGC test facility is available, which makes repeatability and consistent accuracy difficult, as evidenced by the recent 60%-90% shift in U-factor test results using the same apparatus on identical specimens.

#### **EPA Response:**

EPA is aware of the constraints presented by the availability of current testing options and encourages commenters to actively participate in NFRC to work toward resolving these issues.

#### **Comment 13 – Criteria (TDD U-Factor Ratings, Part 2)**

One commenter states that NFRC drew an arbitrary line when defining those TDD listings that would need to be retested in order to continue to be considered certified products. Setting the cut-off date at January 1, 2011, resulted in products tested early in 2011 that meet the proposed U-factor criteria level, but actually are much less efficient than most products tested in 2012 that do not qualify at 0.47.

#### **EPA Response:**

EPA understands that commenters may have concerns about the cut-off date for the TDD results. EPA encourages these commenters to work with NFRC to resolve these concerns.

#### **Comment 14 – Criteria (TDDs and U-Factor)**

A commenter believes that EPA must avoid setting U-factor criteria so low that some might resort to using insulation around the outside of the tube, as recommended by ENERGY STAR Homes on single diffuser TDDs. This can result in condensation inside the tube, and all the potential problems associated with uncontrolled water penetration of the building envelope.

#### **EPA Response:**

EPA appreciates the feedback regarding potential issues with the use of insulation on TDD tubes. However, EPA is not aware of any reported occurrences of this condensation issue at this time. EPA sets specifications that are technology neutral so that manufacturers may choose whatever path they see fit to achieve improved

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energy efficiency. EPA welcomes any detailed analysis and/or specific examples of condensation occurring in this type of scenario.

#### **Comment 15 – Criteria (SHGC Support)**

A commenter believes that EPA has failed to technically and economically justify exceeding the 2012 International Energy Conservation Code residential skylight prescriptive SHGC, while just meeting the residential window prescriptive SHGC, everywhere except the Northern Zone. The commenter indicated that it can support the modified skylight SHGC criteria in the interest of moving forward and because of the relatively low impact on broadly available products. Going forward, the commenter believes EPA has reached an SHGC “floor” when combining currently affordable proven technologies with the goal of maintaining essential product functionality for skylights.

#### **EPA Response:**

EPA appreciates the support for the revised specification and assures the commenter that EPA plans to do additional analysis on these and other issues in future specification revisions.

#### **Comment 16 – Criteria (SHGC and VT)**

A commenter notes that SHGC limits will remain difficult for products to achieve without major reductions in transmitted light, which defeats the purpose of delivering daylighting to consumers.

#### **EPA Response:**

Based on Figure 16 of the *Draft 1 Criteria and Analysis Report*, EPA believes that there is compelling evidence to indicate that glass technology has improved such that high visible transmittance is still possible even at very low SHGCs.

#### **Comment 17 – Criteria (TDDs versus Skylights)**

Several commenters state that due to distinctions in application, design, and function, applying the same performance criteria to TDDs and skylights results in inaccurate comparisons. This ultimately distorts and provides inaccurate ratings for builders and homeowners.

#### **EPA Response:**

EPA understands that skylights and TDDs have different designs, applications, and functions and appreciates the commenters’ comment. EPA may consider separate criteria for TDDs and skylights in the Version 7.0 criteria revision.

#### **Comment 18 – Criteria (TDDs and SHGC)**

Some commenters note that the proposed changes to SHGC will not expand the number of ENERGY STAR qualified TDDs. All of the TDDs that qualify under the revised U-factors will continue to qualify under the revised SHGC.

#### **EPA Response:**

EPA concurs that the change in SHGC does not expand the number of qualified TDDs. The change in SHGC was intended to allow more skylights to qualify. The change in U-factor was made, in part, to allow more TDDs to qualify.

### Comment 19 – Criteria (Curb-Mount Products)

Some commenters believe that until NFRC develops procedures to account for the number of curbs being mounted outside of the skylight manufacturing facility, high-quality, high-performing skylights will remain unable to achieve ENERGY STAR qualification. One commenter notes that it is working with NFRC to update its guidelines to allow for these energy-saving innovations.

#### EPA Response:

EPA appreciates the challenge in having new technologies recognized under test procedures and encourages commenters to continue working with NFRC to update testing guidelines.

### Comment 20 – Criteria (TDD U-Factors)

Some commenters note that TDD U-factor criteria could be handled as an exception within the skylight criteria table to avoid requiring a completely new table.

#### EPA Response:

EPA appreciates this suggestion and may consider a separate U-factor for TDDs for the Version 7.0 specification.

### Comment 21 – Criteria (General Comments)

Criteria should be set so that any double-pane skylight will still qualify in the northern two zones.

#### EPA Response:

EPA sets performance-based (not technology-based) specifications to allow industry flexibility in choosing how it will meet the proposed specification. EPA is proposing criteria in the Northern and North-Central Zones that balances cost effectiveness and performance.

### Comment 22 – Criteria (TDDs)

One commenter suggests that EPA consider as qualified all TDD products utilizing at least three glazing layers, with two of those layers at ceiling level, regardless of U-factor. Many TDDs with three glazing layers do not qualify at U-factor levels below 0.50, which seems unreasonable when they are essentially lighting devices that draw no energy to create light. An alternative is for EPA to set a U-factor maximum at 0.60 for TDD products, which accomplishes approximately the same balanced adherence to all six ENERGY STAR Guiding Principles, but which incurs a delay associated with a new cost effectiveness review.

#### EPA Response:

EPA sets performance-based (not technology-based) specifications to allow industry flexibility in choosing how they will meet the proposed specification. EPA further notes that as stated in the *Version 6.0 Product Specification Framework Document* and reiterated in the *Draft 1 Criteria and Analysis Report*, EPA considers “daylighting” a property that can only be evaluated at a room or whole-building level. Individual fenestration products cannot truly be evaluated for their daylighting properties. EPA believes the proposed specification offers balance among the guiding principles.

### Comment 23 – Northern Zone Criteria (Stringency)

Several commenters believe that a U-factor of 0.47 for skylights in the Northern Zone is still too low based on previous Draft 2 comments. Two commenters note that additional relief is needed in the northern market for U-factor. If the proposed U-factor revisions have been made to increase the number of qualifying TDDs, it appears

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that only four of the product listings currently available in the NFRC CPD will qualify across all zones. The AAMA proposed U-factor values provide a more balanced set of criteria that will maximize energy performance better than the proposed EPA values and will allow curb-mount skylights and TDDs to maintain a more robust market share.

#### **EPA Response:**

EPA has revised the proposed U-factor in the Northern Zone based on discussions with manufacturers. EPA notes that there were 17 TDD products in the CPD when it performed its revised analysis. Therefore, four TDDs represent over 23% of products in the CPD. Additionally, overall performance of TDDs may improve by the implementation date of January 1, 2015. EPA appreciates the alternative criteria suggestions, but no analysis was provided that indicated how these proposed criteria will outperform the proposed values.

#### **Comment 24 – Northern Zone Criteria (Alternative Proposal)**

Three commenters suggest a U-factor of 0.50 and any SHGC for the Northern Zone.

#### **EPA Response:**

EPA appreciates the support for the removal of an SHGC requirement in the Northern Zone. Based on discussions with manufacturers, EPA believes that the revised proposed U-factor in the Northern Zone will allow TDDs and double-pane deck- and curb-mount skylights to qualify while reducing the payback period for these products.

#### **Comment 25 – North-Central Zone Criteria (Stringency)**

Several commenters note that a U-factor of 0.47 for skylights in the North-Central Zone is still too low based on previous Draft 2 comments.

#### **EPA Response:**

EPA raised the U-factor maximum to 0.48 in the North-Central Zone to allow more products to qualify. EPA continues to work with industry to identify the best criteria for this zone and has made several revisions based on continued discussions with manufacturers.

#### **Comment 26 – North-Central Zone Criteria (Availability)**

Several commenters offer that Figure 30 of the *Draft 1 Criteria and Analysis Report* shows that there are no skylights available for sale with a U-factor of 0.46 or 0.47, which means there will be no improvement in product availability at a U-factor of 0.47.

#### **EPA Response:**

EPA appreciates this comment and has revised the U-factor maximum to 0.48.

#### **Comment 27 – North-Central Zone Criteria (Alternative Proposal)**

Three commenters request a U-factor maximum of 0.50 and an SHGC maximum of 0.40.

#### **EPA Response:**

Based on discussions with manufacturers, EPA has revised the proposed North-Central Zone U-factor criteria to 0.48. EPA has not revised the SHGC criteria because manufacturers have indicated to EPA that the proposed SHGC level is acceptable.

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#### **Comment 28 – South-Central Zone Criteria**

Several commenters suggested the criteria be set at 0.55 maximum U-factor and 0.30 maximum SHGC. One commenter notes that while the increase in SHGC is welcome, EPA's proposal does not address ongoing concerns about cost effectiveness. Another commenter adds that both the U-factor and SHGC proposed in the South-Central Zone are low.

#### **EPA Response:**

Manufacturers have indicated that the incremental cost to achieve the proposed U-factor is low. The SHGC was also based on technical discussions with manufacturers that indicated the specification is at a cost effective level.

#### **Comment 29 – Southern Zone Criteria**

Two commenters suggest the criteria should be set at 0.65 maximum U-factor and 0.30 maximum SHGC.

#### **EPA Response:**

EPA has received technical information from manufacturers that indicates that the proposed levels are acceptable and cost effective.

#### **Comment 30 – Daylighting**

Several commenters believe that EPA has ignored the energy benefits that skylights provide in reducing the need for artificial light. EPA should review the studies that show the value of daylighting and use this information when selecting skylight criteria.

#### **EPA Response:**

As stated in the *Version 6.0 Product Specification Framework Document* and the *Draft 1 Criteria and Analysis Report* (Section 2.2.4), EPA considers daylighting a property that must be evaluated at a room or whole-building level. EPA does not believe that individual fenestration products can be evaluated for their daylighting properties.

#### **Comment 31 – Draft 2 Version 6.0 Comment Responses**

One commenter believes that EPA did not adequately respond to or explain rejections of Draft 2 comments in the letter announcing the revised Draft 2 specification for skylights.

#### **EPA Response:**

EPA regrets any confusion on this issue. As noted in the announcement letter, EPA was still reviewing the Draft 2 comments and preparing the comment responses, which are provided in the previous section of this document.

#### **Comment 32 – Implementation Date**

Several commenters believe that more time is required before ENERGY STAR 6.0 commences and reiterate that the criteria proceed only with an open-ended implementation date of 2015. Two commenters also believe that forcing the implementation of more rigorous criteria during the ongoing economic crisis should not jeopardize the ENERGY STAR program or the capacity for manufacturers' and homeowners' to absorb the additional costs of program enhancements. One commenter adds that it appears that EPA remains committed to an implementation date that will not provide sufficient time for commenters to prepare.

### **EPA Response:**

Based on commenter feedback, EPA has proposed an implementation date of January 1, 2015. EPA believes that this change will allow manufacturers sufficient additional time to transition to the proposed Version 6.0 specification.

### **Comment 33 – Product Availability (Use of CPD)**

Several commenters note that CPD listings are a poor surrogate for product availability. The commenter strongly discourages EPA from using triple pane listings to indicate that qualifying products are available without conducting a review of the average cost increment.

### **EPA Response:**

EPA confirms that it did not use the CPD as a surrogate for product availability. During the initial analysis, EPA also performed an analysis of the Products Available for Sale Database. During its later analysis, EPA further confirmed availability with manufacturers. In each instance, the analysis showed that the proposed criteria can be met with double-pane skylights.

### **Comment 34 – Product Availability (Use of Market Penetration)**

Several commenters believe that EPA attempted to apply the 25% market penetration objective to the TDD product CPD listings. This approach ignores the large number of uncertified and poorly designed options available to consumers in this low price point segment of the top lighting market. Further, the few resulting qualified products will not meet the “broad availability” objective based on current market distribution of the few qualifying products.

### **EPA Response:**

EPA clarifies there is no market penetration objective for the program, and EPA did not set a market share goal for this criteria revision. EPA proposed specification levels that struck a balance between availability, technological advancements, performance, and cost effectiveness for TDDs and skylights. EPA notes that TDDs meeting the proposed final draft specification are currently available for purchase online through at least one major retailer. Additionally, overall performance of TDDs may improve by the implementation date of January 1, 2015.

### **Comment 35 – Product Availability (Triple-Pane Skylights)**

Several commenters believe that Figure 28 of the *Draft 1 Criteria and Analysis Report* reveals that there is currently almost no overlap in the performance of double- and triple-pane skylights, with a breakpoint at a U-factor of 0.42 or 0.43. This indicates that most of these products will likely be triple pane, making them significantly more expensive than double-pane skylights. It is likely that there will be no double-pane options for many sub-types.

### **EPA Response:**

EPA notes that the revised Draft 2 proposed specification level is much higher than 0.42 or 0.43 and clarifies that Figure 28 provides no indication of how many double- versus triple-pane products are sold at any given specification level. Discussions with manufacturers indicate that there are double-pane options for skylight subtypes, such as curb-mount, at the proposed final draft criteria levels.

### **Comment 36 – Program Goals and Guiding Principles**

Two commenters believe EPA did not balance the six guiding principles when selecting the proposed criteria.

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### **EPA Response:**

EPA discusses this topic in the *Introduction to Response to Comments*, which outlines EPA's approach in applying the *ENERGY STAR® Products Program Strategic Vision and Guiding Principles* to this criteria revision process.