VELUX America Inc.

Comments Regarding:

ENERGY STAR® for Windows, Doors, and Skylights
Industry Stakeholders Meeting
Held December 12, 2014

Submitted March 13, 2015

The following comments are offered to the U.S. Environmental Protection Agency (EPA) ENERGY STAR program in response to their request for industry stakeholder input regarding issues raised and questions posed at the above meeting. VELUX America Inc. appreciates EPA's desire to improve the collaborative process traditionally employed for previous program revisions, and are poised to offer any needed expertise and information to strengthen the ENERGY STAR brand far into the future.

As the global leader and innovator of high-volume roof windows, unit skylights and tubular daylighting devices, and energy-saving accessories for those products, VELUX brings a uniquely comprehensive outlook to the effort. ENERGY STAR has served VELUX well in the US and Canada, and we are motivated to do all we can to ***shed light*** onto, and ***breathe fresh air*** into, the program. We let that spirit guide the following comments.

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General Comments

The prime importance of the ENERGY STAR brand for the markets we serve is illustrated by these observations:

- For new construction, product specifiers, green building standards, utility program operators, production builders, and high-end custom builders base many of their product selections on ENERGY STAR performance as a benchmark.
- For replacement and alteration, the decision makers (consumers, remodelers, utility program operators, etc.) have more flexibility, but less expertise, as they choose products for their projects. When they do not have a trusted and easily recognizable marker to look for in a product category, they tend to opt for the least expensive, and usually much less efficient choices. ENERGY STAR provides that marker, which makes higher quality products like ours justifiable to them in most cases.
- As a product group, skylights and TDDs are universally appreciated and enjoyed by those who live or work under them. However, there are many who do not have that pleasant experience and are not likely

to choose them as just one of many discretionary ways to select the amenities for their home.

So, our business has traditionally focused on ENERGY STAR as our minimum performance standard, whenever possible, for the product designs the market demands. Therefore we are committed to preserving a stronger and continually relevant ENERGY STAR brand, as the regulatory ground continues to shift under our feet.

Working against roof-mounted fenestration products being included in a given project are unique headwinds that seem to be strengthening. Below are three major hurdles to these products being accurately evaluated for all energy savings potential. Thus these products are not being recognized for the true benefits they bring to a building and its occupants, under traditional ENERGY STAR evaluation schemas:

- Sole focus on U-Factor and Solar Heat Gain criteria to represent the full energy impact of fenestration products
- The existence of a market that does not exhibit the same relatively homogenous structure of the window and door market, and is therefore not adequately characterized by the same analysis process
- An aggregate market size that is currently less than 5% of the window and door market, which automatically pushes the "skylight" category to the back of the bus when "aggregate potential savings" drives the decision to allocate analysis resources

To counteract this situational bias, EPA is hereby asked to make a concerted effort to let us help structure a data gathering and analysis plan, early on in the stakeholder input process design, that is appropriately sensitive to the unique market characteristics of the skylight category. A review of VELUX comments submitted for the final Version 6.0 amended draft will identify several of those characteristics.

Comments Specifically Addressing Certain Questions Posed

Specification Revision Process - "Should EPA consider sunsetting the ENERGY STAR specifications…"

From our standpoint, partial sunsetting **must** be ruled out, if a sunset action is ever deemed warranted. Either the entire Windows, Doors and Skylights program is shut down, or all of the product types stay in. A better approach for preserving the energy-savings objective would say:

1. We will no longer use prescriptive code limits as "de facto" ceilings. (It is not one of the Guiding Principles anyway.)
2. We will develop a "performance method" to evaluate products based on their full building energy impact. There are many ways to do this

already – there just needs to be a rule set developed that is adapted to the ENERGY STAR objectives.

3. We will support all product types that still offer cost-effective savings opportunities, no matter how large (or small) the aggregate savings.
4. We will foster efficient deployment of fenestration products for any building project, through education and workable tools that enable that objective.

Related to the first point, most building codes and regulations will inevitably "catch up" with ENERGY STAR with their prescriptive requirements for traditional fenestration product ratings. In some jurisdictions, this has already happened. Does that mean products which fall short of those prescriptive requirements are no longer legal or desirable? Certainly not, due to the many other ways building designers can comply with code, through performance or outcome-based compliance paths.

As long as low performing choices remain legal and readily available, ENERGY STAR will have a valuable function to perform. This is true even if it never finds a way to incentivize replacement of <u>installed</u> products that waste significant energy. We know there are over 10 million plastic domes on homes – ENERGY STAR can help the nation realize the huge energy savings replacing them would bring. The sooner the better!

<u>National Energy Savings</u> – "What changes should EPA consider … to realize significant national energy savings?"

Through a pure "skylight prism", incremental reduction in U-Factor and SHGC will never "measure out" as yielding significant savings using traditional one-for-one comparisons. This is because the strong points of overhead fenestration are not captured, due to the over-emphasis on the energy loss caused by heat-only flows through the roof. Future analysis methods can remedy this serious gap and capture the "forest" of potential savings expanded use of skylights can offer. We encourage EPA to look past the "trees" blocking real progress.

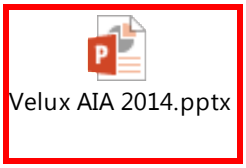
VELUX has commissioned studies that offer much promise for "significant nationwide energy savings" that will not be realized unless more unit skylights and TDDs are deployed relative to current market levels. These whole house energy studies for all climates evaluate the true value of optimizing fenestration for daylight and natural cooling potential, and EPA should examine closely the new methods we would propose for evaluating desirable future criteria for this category.

<u>Discovery 1</u>: **Daylighting primarily through skylights is an HVAC energy saving strategy.** We furnished an early edition of the study that proves this point with Version 6.0 comments, and we have expanded its scope and meaning in the latest version.

Discovery 2: **Using venting skylights is a cooling energy saver, even better than whole house fans.** This measure also is a more efficient stale air remover.

Discovery 3: **Using venting skylights helps preserve indoor air quality.**

Below is a PDF of a new AIA course sponsored by VELUX, Benefits of Daylight and Fresh Air in Residential Design, which will illustrate these discoveries. We will also make available the detailed study reports on request.



The main message to the ENERGY STAR skylight market for new construction and additions should become: "include controllable skylights in the initial plan if you intend to maximize building HVAC efficiency and save energy with your fenestration" – as opposed to thinking of them as an optional amenity. It is now very apparent that paying attention to How and Where fenestration products are deployed in a building is much more critical to defining their average energy benefit per unit area than just comparing U-Factors and SHGC ratings.

Maintaining Product Performance – "What non-energy attributes are important to consumers?"

All glazed fenestration products are desired because of the access to **daylight** and the **views** they provide to connect occupants with their external environment. Many also are operable, mainly for natural **ventilation**, but some are sized to provide for emergency escape and rescue when necessary. Less obvious to consumers are the known health and safety benefits that derive from full spectrum light in sufficient quantity and fresh air availability.

Any criteria changes that reduce the natural lighting and ventilation potential of a building are detrimental to the well-being of the living things in that building.

"Are any of these attributes compromised [as traditional energy efficiency ratings goals are made more demanding]?" (question was restated to more accurately reflect the skylight perspective)

SHGC has a significant proportional relationship with light transmittance and reflectance, so any reduction in SHGC levels necessarily degrades the interior environment. U-Factor of an operable skylight is always higher than a comparable fixed product, so reduction in U-Factor levels beyond the point where the ventilating version no longer qualifies also removes the valuable stack effect of a venting unit to provide free and fast natural cooling when conditions warrant.

A further point on the daylighting value of skylights: even though a sloped product and a vertical product get visible transmittance ratings that might seem equal, the actual amount of daylight per unit area of glazing passing through a skylight is much higher than for a window with the same glass package on the same side of a building. VT is only a percentage measure, not a quantity measure. Continuing to overlook the enhanced incident light **availability** in calculating all energy impacts will do a great disservice to sloped products.

"How should EPA measure and evaluate the non-energy performance of products?"

In summary, while these attributes are real and meaningful they are not product specific. That means they cannot be directly assessed for a given rated product. EPA can still attach due importance to these performance essentials and consider applying some kind of "correction factor" that reflects their true energy value and preserves the resulting non-energy value for consumers.

"Are there any subcategories of [sloped] fenestration products that have special features or functionalities that make it more difficult to meet higher efficiency levels?"

As stated in our prior comments to EPA mentioned above, we believe curb-mounted skylights that completely straddle the rough opening of the envelope need to be evaluated separately. Their unique utility as direct replacements for very inefficient older plastic curb-mounted skylights and their regionally specific popularity call for criteria that do not hamper this subcategory's ability to economically meet future criteria. They are uniquely challenged to meet the U-Factor and SHGC values deck-mounted products with less vision area but the same glass package can more easily attain. Furthermore, typical curb-mounted venting versions sit much higher on the roof, which further inhibits potential U-Factor performance by at least ten percent.

<u>Product Availability</u> – "How can EPA develop a reasonable proxy of products available for sale?"

For the skylight market, there are far more "theoretical" products in the Certified Products Directory than "broadly available" or regularly-produced listings. There is also a manageable number of manufacturers that maintain those listings. We would think that requiring manufacturers to provide a confidential report on the products that sell in some minimum quantity, and where they ship them, would not be unreasonable or difficult to analyze.

For a study of which products appear in a particular retail setting, the method employed late in the Version 6.0 development process would be informative, as long as the search covered each major market area individually.

Measurement and Verification – "How should the performance of dynamic products be measured and verified?"

VELUX has several CPD listings for skylights that are shipped with precision-fitted interior blinds pre-mounted. We would encourage EPA to place a priority on recognizing the enhanced energy performance of all such dynamic products by evaluating the significant energy savings even minimal use of these additional "glazing layers" will produce. One idea we might suggest is devising a modified "effective U-Factor" and "effective SHGC" rating scheme when the product has a range of performance. We will offer to develop this idea further if it sounds attractive. Such ratings could be verified through energy modeling combined with verification measurement.

Market Differentiation – "Does ENERGY STAR effectively differentiate the top performers in the market?"

As we alluded above, until there is a "performance method" that calculates both the positive and negative terms of the full "energy equation", any attribute-based differentiation method is bound to be incorrect in attempting to represent the good / better / best skylight models available. That prescriptive method might work well for doors, a little less well for windows, but is certainly not appropriate for our markets without "correction factors".

The "holy grail" we see for this ENERGY STAR program down the road is to develop a way to evaluate energy efficiency POTENTIAL of a unit area of given rated glazed product, no matter what surface of the building it is eventually placed into or onto. Let's work together to see what is already happening that might start us on this path.

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