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**Re: Criteria Revision - Public**

Dear Doug and Emily:

Attached are Pilkington North America, Inc.'s comments to the new Energy Star Windows criteria.

Sincerely,

Alan R. Graham

**Comments of Pilkington North America, Inc.  
To Energy Star Version 6.0 Product Specification  
Framework Document For Windows, Doors and Skylights dated October 2011**

Pilkington North America, Inc. (“PNA”) is one of five (5) manufacturers that operate float glass facilities in the United States. PNA is also a long time Energy Star stakeholder.

**Summary of PNA’s Comments.**

Pilkington North America would like to express its appreciation and support for the involvement the Environmental Protection Agency (“EPA”) is offering stakeholders in the development of the Version 6.0 (“V.6”) Framework Document (“Framework Document”) for the product specifications (“Criteria”) applicable to Energy Star Windows, Doors and Skylights (“Energy Star”) dated October, 2011.

PNA’s comments in response to the V.6 Criteria urge EPA to establish the following U-factors and SHGCs in the northern and north-central zones:

Comment 1A. A *northern* U-factor Criteria  $\leq$  0.25.

Comment 1B. A *northern* SHGC Criteria  $\geq$  0.40.

Comment 2 A. A *north-central* U-factor Criteria  $\leq$  0.28.

Comment 2 B. A *north-central* SHGC Criteria “Any”.

Energy Star’s proposed prescription to use “any” SHGC in the northern zone makes it possible for the largest national window manufacturers to market a single, ultra-low SHGC product from Miami, Florida in the south, to the Canadian border in the north. The hidden and unintended consequences of this include: (i) a failure of Energy Star to deploy an effective strategy for using the sustainable energy of the sun to heat homes in northern climates, resulting in (ii) a loss of aggregate annual energy efficiencies due to (iii) the consumption of more fossil

fuels than would otherwise be necessary if the Energy Star label was awarded only to higher SHGC products in the north.

The unintended consequences of this nationwide marketing strategy will be explored throughout the remainder of the following comments.

**Comment 1 A:**  
**Establishing a maximum 0.25 U-factor in the northern zone.**

The U-factor range set out in the Framework Document for the northern climate zone is from 0.25 to 0.27. The Framework Document states that *“EPA is looking to establish criteria that recognize the highest-performing doubles and bring a greater number of triple pane windows into the mainstream.”*

Setting the U-factor at 0.25 in the northern zone is the best way to require the highest-performing doubles pane windows (“DGUs”) while bringing a greater number of triple pane windows (“TGU”) into the mainstream, thus achieving EPA’s goal. Setting the northern zone U-factor at 0.27 will not result in Energy Star labeling the highest performing double pane windows in the northern zone and will further discourage moving the market toward the use of more TGU.

A 0.25 U-factor Criteria can be achieved in two ways. The first is to use a DGU with two low-e coatings, namely, either a single, a double or a triple sputter low-e coating on the #2 surface paired with a pyrolytic low-e coating on the #4 surface (“Double Low-e Product”). The second is to use a TGU. Because a TGU has twice the number of insulating air gaps as a DGU, it only requires a single low-e coating on the # 4 surface to achieve a 0.25 U-factor or lower. The low-e coating used on the TGU may be pyrolytic; or a single; a double; or a triple sputter coating.

The lowest U-factor that can be achieved with a DGU with a single low-e coating is a proprietary, triple silver sputter coated DGU Product (“Triple Silver DGU”).<sup>1</sup> Because the Triple Silver DGU can achieve a 0.27 U-factor, if Energy Star sets the northern zone U-factor at 0.27, the Triple Silver DGU will proliferate and dominate the market in the northern zone because a Triple Silver DGU costs significantly less than a TGU with a single low-e coating<sup>2</sup> and because the same product is now being mandated, prescriptively, in the southern zone.

A Triple Silver DGU can achieve an SHGC of 0.25 or less. The 2012 International Residential Code (“IRC”) now mandates a 0.25 SHGC in climate zones 1, 2 and 3 for both new home construction and retrofit windows.<sup>3</sup> If a 0.27 U-factor is selected as the Energy Star U-factor Criteria in the northern zone, Energy Star will match its Criteria to the U-factor performance of the Triple Silver DGU. Since the IRC has now established an SHGC criteria in climate zones 1, 2 and 3, which also matches the ultra-low SHGC performance of the Triple Silver DGU, the largest national window manufacturers will quickly merge the northern zone Energy Star U-factor Criteria with the prescriptive SHGC criteria established by the IRC in the southern zones to secure the economies of achieving a nationwide market for a single product, namely, a Triple Silver DGU, from Miami, Florida in the south to the Canadian border in the north.

This strategy of being able to market a Triple Silver DGU nationwide will be further encouraged by Energy Star’s proposed use of “Any” SHGC Criteria in the northern zone. This is

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<sup>1</sup> Cardinal, PPG and Guardian offer proprietary Triple Silver DGU Products capable of achieving a 0.27 U-factor.

<sup>2</sup> According to the 2013 CASE Report dated September, 2011 and prepared for non-residential fenestration in California, a Triple Silver DGU Product in the hands of the consumer has a price premium of \$6.78/per sq.ft. for the low-e coating compared to uncoated glass plus a \$3.83/sq.ft. premium for a DGU over a single pane product. A TGU with a single pyrolytic coating has a price premium of \$4.24/sq.ft. for the low-e coating compared to uncoated glass plus an \$11.18/sq.ft. premium for a TGU over a single pane product. As a result, it is reasonable to expect a single low-e coated TGU to cost approximately \$9.32/sq.ft. more than a TGU.

<sup>3</sup> The climate zones found in the IRC are the same as those found in the International Energy Conservation Code. All residential provisions have been deleted from the 2012 edition of the IECC, and are now found exclusively in Chapter 11 of the IRC.

true because the Triple Silver DGU's ultra-low 0.25 SHGC will not only be mandated for use in the southern region by the IRC, it will also enjoy the benefits of an Energy Star label in both the northern and north-central climate zones by virtue of its ability to comply with the "Any" SHGC Criteria being proposed in Energy Star's northern zone and the maximum SHGC Criteria of 0.35 to 0.40 being proposed in its north-central zone.

If the objective is to use the Energy Star label as a nationwide marketing vehicle for a single product, namely, the Triple Silver DGU, then selecting a 0.27 U-factor and "Any" SHGC as the northern zone Criteria will certainly move that objective a long way toward becoming a reality. However, doing so will not achieve the best possible performance that DGUs are capable of providing in the northern zone, nor will it drive the market in the direction of using more TGUs. At the same time, allowing the ultra-low SHGC performance of the Triple Silver DGU to be Energy Star labeled in the northern zone will result in a significant loss of aggregate energy efficiencies and the burning of more fossil fuels than would be necessary if only high SHGC products were awarded the Energy Star label in the northern zone.

**Comment 1 B:**  
**Establishing a Northern SHGC Criteria  $\geq$  0.40**

As described above, the triple silver low-e sputter coating used to make the Triple Silver DGU not only yields a 0.27 U-factor, but also yields an ultra-low SHGC of 0.25 or less.<sup>4</sup> While a 0.25 SHGC is now the standard that has recently been adopted by the IRC for southern climate zones 1, 2 and 3, the further north from these southern zones you move prescriptive SHGC values in the IRC increase. This is intentional as higher prescriptive SHGCs are intended to provide northern homeowners with windows that permit more solar energy to enter their homes

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<sup>4</sup> The actual SHGC value will vary depending on the amount of framing in the window. More framing material typically reduces SHGC while less framing material typically increases SHGC.

through the windows, thereby using the renewable energy of the sun to reduce the amount of fossil fuels that would otherwise have to be burned in order to meet winter heating loads.

However, the use of “Any” SHGC Criteria as proposed by V.6 in the northern climate zone will not result in the use of higher SHGC windows in the north. Instead, allowing “Any” SHGC Criteria in the northern zone will actually allow both high SHGC and ultra-low SHGC windows to be used in the north, even though there is no energy justification for the use of ultra-low SHGC windows in the northern zone. Since ultra-low, 0.25 SHGC windows are now mandated for use in IRC climate zones 1, 2 and 3, window manufacturers have no choice but to use them there. Since those same ultra-low SHGC Windows would be allowed to bear an Energy Star label in the northern zone by reason of the “Any” SHGC Criteria proposed by V.6 , this will naturally lead the largest, national window manufacturers to use the Energy Star label as a basis to market as “energy efficient” the same windows in the northern zone that they are obligated by the IRC to use in the south because of the amount of solar energy they block from entering the home. The resulting problem is that, while Triple Silver DGUs are clearly energy efficient in the cooling dominated south, in northern heating dominated climates, these same ultra-low SHGC windows block 75% or more of the sun’s energy, causing homeowners to use more energy to compensate for the loss of the sun’s renewable energy that would otherwise enter through the windows and heat their homes.

While this loss of energy savings in the north may be unintended from allowing “Any” SHGC in the north, it is inevitable. In a free market, window manufacturers are constantly looking for ways to simplify their manufacturing, inventory and delivery costs for the windows they market. The best way to reduce these costs is to use the Energy Star label to market a single

product that can be used in Miami, the southern-most climate zone, all the way to states in the northern-most climate zone bordering Canada.

The “Any” Criteria proposed in V.6 makes this “one size fits all” manufacturing, marketing and delivery strategy possible. The only way to avoid it is to require a minimum SHGC in northern climate zones.

A minimum 0.40 SHGC in the north is scientifically justified by the energy savings analysis that Lawrence Berkeley National Laboratory (“LBNL”) prepared for DOE’s proposed climate zones ES4 and ES5 in Phase 2 of its Draft Criteria and Analysis for Energy Star Windows, Doors and Skylights, dated August 6, 2008 (“LBNL Report”). In the LBNL Report, climate zone ES4 is the same as IRC climate zone 5 and ES5 is the same as IRC climate zones 6 and 7. The energy savings analyses set out in graphic form in Figs. 7 and 8 on pages 15 and 16 of the LBNL Report clearly show that a 0.25 U-factor paired with SHGCs  $\geq 0.40$  would qualify for DOE’s proposed Energy Star criteria in IRC climate zones 5, 6 and 7.<sup>5</sup> Tables 15 and 16 at page 32 of the LBNL Report estimates that the paired U-factor of 0.25 with SHGCs  $\geq 0.40$  in the northern zone (ES4 and ES5 or IRC zones 5, 6 and 7) would yield a savings of 4.19 trillion BTUs.<sup>6</sup>

While some may argue that summer cooling loads in the north will increase with the use of higher SHGC windows, as the LBNL Report documents, the savings resulting from reduced heating loads far outweighs any anticipated increase in summer cooling loads. Moreover, the Energy Star label is primarily used to guide consumers who are retrofitting existing homes with

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<sup>5</sup> Together, ES4 and ES5 in the DOE Report make up the northern climate zone in the Framework Document.

<sup>6</sup> This estimated energy savings would likely remain the same even though the criteria in the DOE Report for climate zone ES5 included a larger number of U-factor and SHGC combinations since all of the U-factor/SHGC combinations proposed in the DOE Report yield equivalent energy performance.

new windows.<sup>7</sup> As a result, many, if not all, of the windows replaced by Energy Star windows will be single pane, clear glass windows. Such windows are likely to have a 0.65 SHGC or higher and an insignificantly high U-factor. Replacing those windows with Energy Star labeled windows that have a  $\leq 0.25$  U-factor and an  $\geq 0.40$  SHGC will not only save an enormous amount of energy, but at the same time, significantly reduce peak electric loads.

**Comment 2 A.**  
**Establishing a Maximum 0.28 U-factor in the North-Central Zone.**

In 2010, the northern zone Energy Star U-factor Criteria was reduced to 0.30 in response to the 0.30/0.30 tax credit (“Tax Credit”). In turn, that caused the final 2010 north-central zone U-factor to be set at 0.32.

The Framework Document proposes a U-factor range for the north-central zone between 0.28 and 0.30. While a 0.30 U-factor is the U-factor of the current Energy Star northern zone, moving the north-central zone to  $\leq 0.28$  U-factor will not only represent a significant increase in U-factor stringency, but is entirely feasible, especially if the Criteria in the northern zone is established at  $\leq 0.25$ . In that regard, many of the products that will be used to secure Energy Star labeling in the northern zone will also qualify for Energy Star labeling at the 0.28 U-factor level in the north-central zone. Exercising this option will, in effect, ensure the energy savings realized from the northern zone are solidified in the north-central zone.

**Comment 2 A.**  
**Establishing “Any” SHGC in the North-Central Zone.**

The following chart displays the results of applying the regression coefficients developed by LBNL in connection with the DOE Report to a fixed U-factor and multiple SHGCs in the north-central zone for both new construction and retrofits of the existing building stock:

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<sup>7</sup> Minimum energy codes mandate the performance of windows in new homes whereas Energy Star attempts to exceed those minimum standards. Accordingly, Energy Star is not typically used in new home construction, but is, instead, primarily used by consumers selecting retrofit windows in the existing residential building stock.

Energy STAR® USA  
Windows

LBNL Regression Coefficients

Floor Area **2,000** sq. foot Natural Gas Heating (combustion furnace)

<u>Comparison</u>	<u>U-factor</u>	<u>SHGC</u>	Heating Energy (kBtu/sf)	Cooling Energy (Wh/sf)	Total Energy Site (kBtu/sf)	Total Energy Source (kBtu/sf)	Heating Cost (\$)	Cooling Cost (\$)	Total Cost (\$)
Window 1	<b>0.28</b>	<b>0.40</b>	31.9	947.7	35.1	<b>42.3</b>	\$ 638	\$ 227	\$ 865
Window 2	<b>0.28</b>	<b>0.60</b>	29.3	1176.0	33.4	<b>42.3</b>	\$ 587	\$ 282	\$ 869
Existing, Furnace, Single story			Energy Star Zone = North-Central (Average for 21 cities within this zone)						
Existing, Furnace, Two story									

<u>Comparison</u>	<u>U-factor</u>	<u>SHGC</u>	Heating Energy (kBtu/sf)	Cooling Energy (Wh/sf)	Total Energy Site (kBtu/sf)	Total Energy Source (kBtu/sf)	Heating Cost (\$)	Cooling Cost (\$)	Total Cost (\$)
Window 1	<b>0.28</b>	<b>0.40</b>	15.0	595.1	17.0	<b>21.5</b>	\$ 300	\$ 143	\$ 442
Window 2	<b>0.28</b>	<b>0.60</b>	13.0	756.9	15.6	<b>21.3</b>	\$ 260	\$ 182	\$ 441
New, Furnance, Single story			Energy Star Zone = North-Central (Average for 21 cities within this zone)						
New, Furnace, Two story									

For Energy Star - North-Central Zone - U-factor = 0.28 Btu/hr-sf-F (max) and SHGC = Any

This zone is SHGC 'neutral' - heating energy consumption will balance cooling energy consumption – range of SHGC values

Relationship holds true for both Existing House and New Construction

The chart clearly displays that there is no energy justification whatsoever for capping SHGC in this climate zone at 0.40, since products with SHGCs higher than 0.40 perform the same. The only thing a 0.40 SHGC cap does is eliminate products with higher SHGCs that should qualify

for the Energy Star label since they are equivalent performing products to those with lower SHGCs and do qualify for the Energy Star label.

The north-central zone is ***not*** sensitive to increased SHGC over 0.40. Although the 2012 IRC mandates a maximum 0.40 SHGC in zone 4, it is simply wrong.<sup>8</sup> There is no technical basis upon which to exclude products with an SHGC higher than 0.40 in the north-central zone from an Energy Star label. “Any” SHGC should be permitted in the north-central zone.

### **Conclusion**

The northern zone is very sensitive to SHGC. Allowing “Any” SHGC coupled with a 0.27 U-factor in the northern zone will inevitably result in the nationwide Energy Star labeling of the Triple Silver DGU because:

- In the ***northern*** zone, the Triple Silver DGU, will achieve an Energy Star label at the 0.27 U-factor and “Any” SHGC as proposed in the Framework Document;
- In the ***north-central*** zone, the Triple Silver DGU will achieve an Energy Star label at any of the U-factor’s or SHGCs in the range proposed in the Framework Documents –or- the 0.28 U-factor and “Any” SHGC proposed by PNA;
- In the ***south-central*** and the ***southern*** zones, the IRC mandates use of the Triple Silver DGU on account of its ultra-low SHGC of 0.25 or below.

While Energy Star labeling of the ultra-low SHGC performance characteristics of the Triple Silver DGU will save energy in the southern and south-central zones, it will have no significant energy consequences in the north-central zone and its use in the northern zone will squander significant amounts of energy in comparison to the use of higher SHGC.

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<sup>8</sup> The maximum 0.40 SHGC was included in zone 4 as a result of the ICC’s Final Action Hearing for the 2012 edition of the IRC held in Charlotte, NC (“Final Action Hearings”). Those Final Action Hearings resulted in the filing of multiple appeals by a wide variety of stakeholders on the basis of improprieties relating to alleged relationships that existed between the financial interests of various industries affected by the Final Action Hearings and the governmental members of ICC that voted at the Final Action Hearings. Details of these appeals can be provided to EPA on request. The appeals resulted in numerous recommendations by the Appeals Panel to institute significant changes to the way Final Action hearings are conducted.

***PNA strongly urges EPA to adopt the following V.6 Energy Star Criteria:***

- A ***northern*** U-factor Criteria  $\leq$  **0.25**.
- A ***northern*** SHGC Criteria  $\geq$  **0.40**.
- A ***north-central*** U-factor Criteria  $\leq$  **0.28**.
- A ***north-central*** SHGC Criteria “Any”.