

Submitted electronically

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ENERGY STAR for Exterior and Interior Storm Windows
United States Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Re: Comments on *ENERGY STAR[®] Program Requirements for Exterior and Interior Storm Windows Draft 1 Version 1.0* and Related Documents

Dear Doug:

We appreciate your invitation to comment on EPA's draft documents released on July 21, 2017 related to the proposed ENERGY STAR storm windows program. As you know, we have actively participated in the ENERGY STAR[®] Windows, Doors and Skylights program from its inception. Andersen is a strong supporter of energy efficiency and the mission of the ENERGY STAR program to promote efficient products. As such, we would like to offer our comments and recommendations, based in large part on our technical and marketing experience related to energy efficiency in the window industry, to assist EPA in making fundamental decisions about the proposed program. Our comments address all three draft documents: *Draft 1 Version 1.0 Partner Commitments and Eligibility Criteria*, *Version 1.0 Criteria Analysis Report* and *Consumer Checklist for ENERGY STAR Storm Windows*.

First and foremost, as we stated in our preliminary comments last year, we continue to believe that the EPA should be very cautious in extending the ENERGY STAR brand from complete finished goods (i.e., a window or door, appliance, etc.) to a "component," such as a storm window, where the overall performance (energy efficiency, condensation, water drainage, etc.) is in large part reliant upon and will vary enormously based on an unknown existing product, in this case the existing window and how the existing window has been installed. A low-e storm panel installed over an aged low-performing existing window and its associated installation will likely not deliver the energy efficient and comfortable result expected by the homeowner of an ENERGY STAR branded product.

We remain concerned that a storm windows program could significantly undercut EPA's current, highly successful, windows program, particularly as to window replacement. We have no doubt that some of those who sell storm windows will make the unjustified claim that ENERGY STAR windows and storm windows are equivalent (after all, both would carry the same ENERGY STAR brand – and under the current proposal, a nearly identical label). EPA should do all it can to "first do no harm" to the ENERGY

STAR Windows brand and program and guard against this eventuality and the potential for confusing and misleading consumers.

The criteria proposed to determine whether a low-e storm window would qualify as ENERGY STAR is a single emissivity limit, a single solar transmission limit that varies depending on climate zone, and an air leakage limit. These proposed criteria do not appear to provide any real or valuable differentiation among low-e storm windows (since virtually all would comply in either the northern or southern climate zones and none would comply in both). While low-e storms are likely to perform better than clear storm windows, this is not a sufficient basis alone to establish a new ENERGY STAR program. In short, given the risk of the harmful unintended consequences noted above, the proposed criteria do not seem to warrant a full ENERGY STAR category and program, much less one with four climate zones seemingly modeled on the current windows program for storm panels. If the goal is simply to promote low-e, that could be accomplished far more easily for all concerned. EPA could simply create an educational effort to promote low-e storms and/or post recommended criteria and related information on the EPA ENERGY STAR website as a consumer education service on selecting a better performing low-e storm window.

At this point in time, focusing on improving EPA's existing programs, such as increasing the replacement of old windows with efficient ENERGY STAR windows, would seem a better, less risky use of EPA's limited resources. We hope that EPA will give careful consideration to an education alternative. At a minimum, EPA should carefully and explicitly differentiate the two programs (windows and storms), particularly in labeling and education efforts, to reduce consumer confusion and make it clear that both the performance and the products are not equivalent simply because both are labeled ENERGY STAR.

Second, we want to underscore the importance of a comprehensive, rigorous and effective third-party on-going testing, certification and labeling process. Without such a process, the program would erode confidence in the EPA ENERGY STAR brand with far-reaching consequences. In a review of storm window manufacturer and big box retail websites, it does not appear that emissivity and solar transmittance data is readily available, much less certified or labeled. The ENERGY STAR Windows Program requires windows, doors and skylights to be NFRC tested, certified and labeled with the ratings prior to being certified by ENERGY STAR. A similar type of testing, certification and labeling process should apply for storms that would qualify under this proposed program. The eligibility criteria should clearly mandate that initial independent testing and certification (and periodic recertification) be based on testing by an independent lab of each product line to determine that each product line meets all three criteria, are labeled with these criteria, and include on-going plant inspections and other efforts to ensure that the products produced meet the proposed criteria. Similarly, as mentioned on the August 3, 2017 webinar, the final EPA eligibility criteria should require that the program will be subject to an independent verification program (IVP) and with a specific percentage (we recall 10% being mentioned on the webinar) of products randomly selected and tested on an annual basis. The details of both of these programs should be spelled out in the final program requirements (subject to advance public review and comment) and the details of any individual certification program should also be subject to public review and comment prior to EPA approval.

Third, we believe that each of the specific potential criteria for the program (emissivity, solar transmission and air leakage) should be fully evaluated and justified by sufficient analysis to demonstrate energy savings, cost-effectiveness (reasonable payback), and practical feasibility before the criteria are adopted by EPA. As discussed further herein, there remain substantial issues and unanswered questions related to the analysis intended to support the program. In addition, based on the information presented so far, it appears that more rigorous criteria should be considered by EPA.

In summary, Andersen does not believe there is sufficient justification at this time to create an ENERGY STAR program for low-e storm windows. A much more reasonable approach would be to provide online educational information and guidelines regarding the use of low-e storm panels, discussing both the benefits as well as the disadvantages of use rather than creating an ENERGY STAR labeled product. However, if EPA proceeds with developing an ENERGY STAR storms program, then we urge that EPA carefully consider the issues identified and outlined in our comments.

We offer additional more detailed and specific comments and questions below. For ease of consideration, we have divided our additional comments that follow among the three documents released by EPA; however, we request that EPA consider our comments in every instance where they apply. For example, we will discuss the criteria selection process and analysis in more detail in the context of the Analysis Report, but the discussion also applies to the Program Requirements.

We thank you for the opportunity to provide our comments. We reserve the right to change and/or amplify our comments and position as we further consider and better understand the implications of the EPA proposed Storm Windows program. Please let me know if you have any questions or comments.

Sincerely,

A handwritten signature in black ink, appearing to read "Mark T. Mikkelson". The signature is fluid and cursive, with a large, stylized initial "M".

Mark T. Mikkelson

Director, Corporate Regulatory Affairs

ANDERSEN ADDITIONAL MORE DETAILED COMMENTS ON PROPOSED ENERGY STAR STORM WINDOW PROGRAM

Draft 1 Version 1.0 Program Requirements

Differentiation from ENERGY STAR Windows Program

ENERGY STAR should avoid any suggestion that low-e storm windows are a reasonable alternative to the benefits, performance and durability of full replacement or insert ENERGY STAR windows and should take steps to ensure that an ENERGY STAR low-e storm window program is clearly differentiated from and not treated as equivalent to the ENERGY STAR Windows, Doors and Skylight Program.

Some steps in accomplishing this objective that EPA should consider include:

- Name the program ENERGY STAR “Storm Panels” as originally proposed by EPA rather than ENERGY STAR “Storm Windows”. The term “storm windows” implies that storm windows are a window (like other ENERGY STAR windows), instead of an attachment over a window.
- Create a uniquely different label that cannot and will not be confused with the label currently used for windows, doors and skylights. The storm label should carry a clear statement that it only applies to storms and that the performance of ENERGY STAR storms will not be equivalent to ENERGY STAR windows and the program should not be confused with the entirely different ENERGY STAR windows program.
- Eliminate climate zones from the storm window label. Given that the same emissivity and air leakage criteria are recommended regardless of US climate zone and based on our comments that follow on solar transmission, climate zones may be unnecessary. Even if climate zones are used, the label should at least be substantially modified.

In addition to the Consumer Checklist, EPA should develop other educational materials that clearly differentiate the two programs. EPA should spell out that while ENERGY STAR storm windows are better than other storm windows, the preferred alternative from an energy efficiency perspective is an ENERGY STAR window.

Eligibility Criteria

Given the data presented in the Analysis Report (discussed later), it does not appear that the proposed criteria effectively differentiate between more and less efficient low-e storm windows. If the program is to do more than simply promote low-e, then EPA should consider more rigorous criteria. For example, why not use a 0.15 emissivity or at least closer to it? (As discussed in more detail later, 0.15 is the value actually evaluated by the PNNL studies relied upon by EPA.) Similarly, why not use a more aggressive air leakage requirement?

We are also not convinced of the practicality, need for, and value of the solar transmission criterion in the case of storm windows. We simply do not see control of solar transmission as a primary attribute

of storm windows. Further, if solar transmission is included, we question the choices made for the northern zones:

- The current criteria only permit solar transmission greater than 0.55 for the Northern zone, which assumes that high solar gain meets the needs of every purchaser of a low-e storm panel. We challenge this assumption. By contrast, the criteria for ENERGY STAR Windows has no SHGC requirement for the Northern zone, although it permits an alternative U-Factor/high SHGC passive solar option. Likewise, there should be no solar transmission requirement for low-e storms in the Northern zone.
- The listed solar transmission for the North-Central zone for exterior storms appears to allow any solar transmission. This also seems inconsistent with the ENERGY STAR Windows program, which requires low solar gain in the North-Central.

For interior low-e storms, ENERGY STAR certification is not proposed for the South-Central and Southern zones. This approach again supports the proposition that the proposed criteria does not provide for enough of a unique difference in performance to justify a US climate zone map and label. For that matter, as we have stated elsewhere in these comments, EPA could simply recommend on their website to look for low-e storm panels (possibly with a specified emissivity) and then educate on solar transmission, including whether or not heat gain is desired, and how solar transmission values relate to the heat gain or reduction desired.

Testing and Certification Requirements

Products under the ENERGY STAR Windows program must be NFRC tested, certified and labeled for U-Factor and SHGC before certifying to ENERGY STAR. This poses questions for storm window certification:

- How will EPA ensure independent testing, certification and labeling for emissivity, solar transmission and air leakage for low-e storms? Will storms be required to carry a label showing actual performance related to all of the criteria?
- If such testing, certification and labeling will not be required, how will EPA verify low-e storms meet the program requirements?
- How would a consumer compare the emissivity and solar transmittance of various storm products in the marketplace if that information is not independently tested, certified and labeled by a credible third party certification program?
- Will plant inspections be required for low-e storms?
- Will there be independent verification, with testing, for actual products in the market and how would it work?

EPA states that it will use its standard process to solicit eligible organizations to test and certify ENERGY STAR storm windows. Will EPA offer a process for stakeholders to comment on these eligible organizations and their procedures? EPA has also stated that it is open to using the AERC program as an alternative path. Unless there is a change, AERC at this stage does not appear to require physical

testing or plant audits as part of their certification. This is very concerning as testing and plant audits are a critical component in verifying product performance and validating that a manufacturer is making the product in their production facilities consistent with the product that was sent for testing and certification. This should be a major concern to EPA as to the credibility of the AERC certification.

Version 1.0 Criteria Analysis Report

We are concerned about the technical validity of and support for the three proposed eligibility criteria. The Analysis Report appears to attempt to justify the program (and associated criteria) based on an energy savings analysis and payback analysis for products with more stringent features than those products that EPA now proposes to specify. For example, it appears that the products used in the PNNL energy savings analyses relied upon by EPA have a 0.15 emissivity and either 0.50 (southern) or 0.69 (northern) solar transmission. However, the proposed ENERGY STAR specifications are weaker: 0.22 emissivity and 0.55 solar transmission. It is fundamental that an energy savings and cost benefit (payback) analysis intended to justify the program should reflect products meeting the criteria EPA intends to adopt, not a more energy efficient low-e that is not required for the program. In our view, either the analysis should be redone for the products specified, or the program requirements should specify the products that were analyzed.

The proposed emissivity and solar transmission performance values do not appear to be sufficiently rigorous based on the data, particularly considering the level of stringency for windows. There are many significant unanswered questions and issues:

- How much performance is being lost by using the less stringent values? How should EPA assess this potential loss in energy efficiency? Should EPA determine if there would be additional cost from using more stringent criteria and assess whether the more stringent criteria have a reasonable payback? (Note that the cost-benefit analysis did not analyze the cost of meeting various criteria, but appears to simply use a generic low-e cost.)
- The Analysis Report claims that the proposed criteria were selected to match criteria used by the Regional Technical Forum (RTF), a Pacific Northwest group. Simply adopting criteria currently used by one entity in one small region of the country without further analysis is not the best practice for a national program with the scope of ENERGY STAR. While it may “reinforce existing market signals” in that small part of the country, it does not promote more efficient products that seem to be readily available (given their use by PNNL in their study). By contrast, the Report rejected numerous other important RTF requirements such as permanent installation, the storm window not being in direct contact with the primary window, etc.
- We do not think Appendix A of the Report supports the proposed criteria. The Appendix appears to list the combination U-factor, SHGC and VT determined by a lab for one particular storm panel (0.15 emittance and 0.69 solar transmission) combined with certain different generic primary window types. We have identified the following issues:
 - The composite U-factor performance of the low-e storm as depicted in the Appendix varies hugely, reflecting the different types of primary windows – from a high of 0.57 to a low of 0.26.

- Similarly, the overall SHGC performance also varies significantly - from a high of 0.56 to a low of 0.42.
- The above factors illustrate how customer performance may vary substantially with a proposed ENERGY STAR storm window. By contrast, all ENERGY STAR windows are required to meet the same rigorous U-factor and SHGC criteria and perform at the same minimum level.
- The program runs the risk of promoting much less efficient results in the real world. For example, a low-e storm combined with an existing single pane window results in much weaker energy performance than replacement of the existing window with an ENERGY STAR window. According to the data in the Appendix, the aluminum-frame window double hung, with a 0.15 emissivity low-e storm window, would have a 0.57 U-factor (0.44 with thermally broken mounting), worst case; the wood-frame double hung would have a 0.36 U-factor. Both compare very unfavorably to the 0.27 U-factor for all ENERGY STAR windows. Moreover, these values do not even consider installation and retention issues associated with potential non-professional and not-permanent installation.
- Appendix A does not differentiate SHGC values between low and high solar – although the Report’s energy savings analyses appear to assume 0.69 solar transmission in northern zones and 0.50 in southern zones. The corresponding values for the 0.50 window are not provided (it is not clear what SHGCs were used to correspond with a 0.50 solar transmission and/or how they were determined). Appendix A apparently represents a specific high solar product and does not reflect other potential product variations. Also, no analyses are provided of alternative values for either emittance or solar transmission for any of the climate zones.
- Appendix B of the Report also fails its apparent purpose – providing a list of numerous glass options that would realistically meet the proposed criteria – and instead raises numerous additional unanswered questions:
 - Many of the Appendix B options, particularly for the Southern zones, do not appear to be realistic choices. They combine low-e with tinting, laminating and other techniques that can be expected to significantly increase the cost of the low-e glass product. Have the incremental costs of these specific glass products in retail storm windows been identified and considered? How many of these options are actually being used significantly in storm windows? It seems to us that just a few of these products are likely contenders.
 - Should EPA assess the potential U-factors and SHGCs resulting from each of these various options (or at least representative examples) combined with generic primary windows in order to determine the appropriate combination of criteria? There is no analysis of these various emissivity and solar performance levels.
 - The zonal designations (north and south) appear to eliminate numerous options in each zone based on the solar transmission criteria. How is this reasoning consistent with the conclusion that a tighter, more efficient emissivity specification would be inappropriate because it “would eliminate otherwise viable low-e options that are currently available

in the market.” (Report p. 10). It seems to us that more stringent emissivity criteria is more important for a storm product than the solar transmittance criteria.

- Appendix B lists 29 glass options that are claimed to meet the proposed criteria –12 northern and 17 southern. Dropping emittance to 0.15 drops these options to 5 and 11 respectively. (See Table 6). It seems to us that an emittance equal to or at least closer to 0.15 would be a more reasonable emittance, particularly given the use of this value in the underlying analyses. By using less stringent emittance and solar transmission values, the proposal includes virtually all normal low-e glass options as either northern or southern, rather than differentiating between better and worse low-e products. This approach misses the opportunity to fully capture potential energy efficiency.
- Considering the proposed criteria for southern climate zones, the Analysis should address the following issues:
 - Does the criteria produce reasonable savings over a typical northern storm window? Are there realistic products to meet the criteria – what are they and are they cost-effective? What equivalent SHGC will be produced by the proposed criteria?
 - It seems arbitrary to designate a storm with a 0.56 solar transmission as “high solar” for the northern zones, and a storm with 0.55 solar transmission as “low solar” for the southern zones.
- Should the program simply establish a single specification? For example, EPA could consider basing their storm panel glass requirement on emissivity only and not address solar transmission (i.e., the 0.15 emissivity that was modeled, along with an air leakage requirement). That way, a qualifying storm panel could simply be labeled with the ENERGY STAR logo, and EPA would avoid a confusing window-like label with maps and climate-specific performance values.
- Does the proposed program fail to encourage or even recognize product improvements in other ways? For example, what about other efficiency improvements such as insulating glass units? Should ENERGY STAR recognize their potential and promote them as an option? What about promoting improved frames? Does the use of only glass properties and air leakage sufficiently capture energy efficiency of the product?

Air Leakage

Establishing an air leakage requirement is a good idea. However, the proposed requirements raise a number of questions and call for further evaluation:

- Why use AERC 1.2 as the standard to measure air leakage? Why is it reasonable? Why is it reasonable to use a 2.0 cfm/ft² baseline window air leakage?
- Why are the specified air leakages (1.5 for exterior and 0.5 for interior storms) reasonable?
 - Window air leakage requirements are much lower (0.3). Can/should the storm window, combined with an existing window, achieve performance as good as (or at least closer to) a stand-alone window?

- The Analysis Report says that AERC found that storm windows achieved air leakage rates of 1.3 for exterior operable products and 0.4 for interior operable products. Why not at least use these values? Has AERC conducted sufficient analysis to justify their conclusions? Do we need better data before a specification is decided?
- PNNL Report #24444– T. Culp, S. Widder and K. Cort, *Thermal and Optical Properties of Low-E Storm Windows and Panels* (July 2015), table 4, page 7, lists approximate air leakage values that appear much lower (called “reasonable but conservative”) of 0.3 for exterior storms and 0.1 for interior storms. How does EPA reconcile the PNNL, AERC and proposed ENERGY STAR air leakage values?
- Is it reasonable to set different air leakage values for interior and exterior storms or should there be one value?

Consumer Checklist

As noted earlier, it is important that consumers receive sufficient guidance and information from EPA regarding the new program so that consumers are fully educated regarding their options and can make informed decisions regarding ENERGY STAR storm windows. The Consumer Checklist can be an important tool in this regard.

Under the heading “Are ENERGY STAR Certified Storm Windows right for you?”, information and a weblink should be added to provide consumers with information on the advantages of full or insert ENERGY STAR window replacement as an alternative to storms. Included in this information should be the benefits of each option, including overall energy performance, appearance, increase in the value of the home, permanence, durability and maintenance. The Checklist should encourage consumers to look at ENERGY STAR window replacement as an option to storm windows and make it clear that if the consumer has decided upon storms, they should buy ENERGY STAR storms.

Other improvements that should be considered for the Checklist include:

- In explaining “What is a low-e storm window?”, EPA could first explain what a storm panel is and how it differs from a regular window.
- In asking “Why are ENERGY STAR certified storm windows better?”, EPA could add “than other storm windows.” This would clarify that the choice is between ENERGY STAR storms as opposed to other storms.
- Under the topic, “What else should I consider in my purchase decision?”, EPA should:
 - Recommend that the consumer strongly consider professional installation to ensure that the consumer obtains the expected benefits of storms and note the risks from non-professional installation;
 - Develop a stronger statement on the need to assess escape and rescue issues during a fire or other emergency and not recommend storm windows for bedrooms and other places where an emergency egress is required; and
 - Delete the reference to historic homes (unless EPA is certain that adding storm windows will comply with all historic preservation requirements).