

ENERGY STAR® Version 7.0 Specification – Stakeholder Feedback - ODL

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23. What is the market penetration of products with dynamic glazing or integrated shading systems for residential applications? Do stakeholders expect the market for such products to expand in the next few years?

ODL launched integrated shading, in the form of blinds between insulated glass (BBGs) for hinged entry doors, in 1997. BBGs now comprise a meaningful segment of hinged entry door and sliding glass door units. The share of BBGs in windows is smaller but is growing due to improvements in BBG size offerings, lead times and quality. The number of window manufacturers offering BBGs is expanding. Due to the size of the window market, low share can still represent a significant number of units. Blinds and shades behind unsealed glass in a window, not in the insulated glass panel, have been in the market for many years but have only been available through a small number of window manufacturers. Shades between insulated glass are currently a very small segment of integrated shade units.

The market for dynamic glazing (e.g. electrochromic) and shading is expected to grow for several reasons.

- Consumer research indicates that dynamic glazing has strong appeal. The appearance of dynamic glazing is highly rated. Consumers indicate they are willing to pay a premium for dynamic glazing but high cost has limited market penetration to date.
- Consumer awareness of integrated shading has historically been relatively low. Expanded availability through more window and sliding door manufacturers is increasing consumer awareness. Key reasons consumers give for the appeal of integrated shading are:
 - o Blinds remain clean, there is no dusting.
 - o Safer for young children and pets.
 - o Eliminates the risk of tangled cords and damage from children or pets.
 - o Maintains a clean attractive appearance over time.
- The growth of smart homes is identified as a key driver in the growth of “smart” windows. Future Market Insights¹ estimates the 2018 residential market for smart windows and doors at \$470 MM.
- Automated control of dynamic glazing and integrated shading offers users added convenience while optimizing considerations for comfort, energy efficiency, and personal preferences.
- Automated control can yield significant energy savings vs. typical window covering use patterns.

Dynamic glazing is referenced in Section R402.3.2 in the 2018 IECC as a means to satisfy the SHGC requirements of the residential energy code. This is an example of dynamic glazing achieving greater visibility within the building industry.

24. How should the process for certifying and listing dynamic and/or integrated products be revised to better evaluate the performance and availability of such products?

A NFRC task group was assembled Sept. 2019 to determine an appropriate method of simulating and labeling manually controlled blinds between glass. An ideal outcome is that the methodology could be applied to other types of dynamic glazing and shading. The task group will likely rely upon physical test results and the Therm 7.7 simulation program. Therm 7.7, which will issue in January 2020, can simulate performance with blind slats in the up, down, horizontal, or vertical position.

Current Rating Approach

NFRC 700 Section 6.5.4, which covers the rating and labeling for “Dynamic Glazing Products & Dynamic Attachments for Swinging Doors”, specifies that ratings shall reflect fully CLOSED and fully OPEN positions. It also specifies that an arrow and the word “variable” should be used if the product has the ability to operate in intermediate states. Most dynamic glazing and shading have intermediate states (e.g. half open). However, blinds can be CLOSED (slats down) with slats tilted vertically or horizontally. This may explain why a higher % of blinds in a 2013 DOE¹ study of window covering operation were observed to be left in the CLOSED position. This study provides insights on how manually controlled window coverings are typically used in homes.

Operation Insights

Windows coverings and windows with dynamic glazing and shading are similar in that their energy savings potential is dependent on how the occupant operates them. The 2013 study of window covering operation can be used to infer how dynamic glazing and shading are operated. Top line insights are:

- Between 75% and 84% of coverings remain in the same position throughout the day, depending on the season and time of week.
- Between 56% and 71% of households do not adjust any of the windows coverings in their house on a daily basis, depending on the season and time of week.
- Window coverings’ average position range as follows:
 - o Open 18% - 26% of the time
 - o Half Open 26% - 32% of the time
 - o Closed 44% - 55% of the time
- There are differences in position by window covering type. Horizontal blinds comprise a majority of coverings and a higher % of them are CLOSED (down) throughout the day than other types of window coverings.

A 2018 study² of window covering performance and dynamic control, using the PNNL lab home, showed that “typical” use of operable window coverings yields lower savings than a range of optimized operation schemes. Optimal automated or manual control strategies can be similar between window coverings and dynamic glazing and shading.

The 2018 study suggests, whether through automation or through manual control operation, that there is a need to help educate consumers on energy-efficient operation of window coverings to help them fully realize energy savings. The study found that even simple operating schedules were able to achieve consistent and significant savings. An example winter schedule is to open blinds/shades during the day and close them at night.

Connected Functionality

Simulation tools could be used to estimate relative energy savings for windows with dynamic glazing and integrated shading using a given control strategy. Automated control can reduce reliance on users to follow a control strategy. The ENERGY STAR smart home energy management system (SHEMS) specification recognizes automated windows coverings as an encouraged optional device, without specifying a control strategy. **If ENERGY STAR windows with automated dynamic glazing and shading are to be included in the SHEMS spec. should ENERGY STAR Version 7.0 include a section to define connected criteria for windows with connected functionality?** This could be handled similarly to the ENERGY STAR lighting spec.³, which includes a section for products with connected functionality.

References:

1. Residential Windows and Windows Coverings: A Detailed View of the Installed Base and User Behavior, DOE EERE, 9/13
2. Testing the Performance and Dynamic Control of Energy-Efficient Cellular Shades in the PNNL Lab Homes, PNNL, 8/18
3. ENERGY STAR Program Requirements for Luminaires – Eligibility Criteria Version 2.2