

Pane and Simple: Breaking the 20-Year Window Performance Plateau with a Golden Carrot

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ABSTRACT

Triple-pane R-5 windows represent the next performance threshold for the window industry but have been viewed as a luxury product. Although windows are a neglected upgrade for many homes compared to other insulation measures, feature bundling and a lack of cost-optimized options have prevented wider adoption, particularly for affordable, multi-family, and volume builders who ask specifically for advanced performance in entry-level product lines.

To systematically address market barriers to adoption, a multi-state market transformation (MT) effort launched a manufacturer RFP in Jul 2025 to incentivize development of cost-optimized, entry-level products that posed the question to window manufacturers: What are the minimum features needed to reach a 0.22 or better U-Factor at a price point accessible to the wider market? This effort directly addresses the affordability barrier by urging manufacturers to decouple performance glazing from premium product feature sets.

Multiple MT programs and utility sponsors selected three manufacturers to deliver cost-optimized, entry-level triple-pane products, which represent a dramatic shift to the glazing standards that have remained largely static for 20 years. This intervention is especially important given the long service life of windows — products installed today are likely to still be in service in 2060.

This paper documents the Golden Carrot RFP as one facet of a coordinated MT suite, exploring the energy and non-energy benefits unlocked by broader product availability. This paper demonstrates how strategic upstream market interventions can create lasting change at a cost that builders will utilize and enable necessary advancements to building stock performance.

Introduction

Whatever home you live in, windows are probably the least insulating part of your home's building envelope. Buildings are responsible for 40% of national energy use and emissions. As grid congestion and load growth chart a challenging course for utilities in the coming decades, upgrading window performance at the time of replacement provides a powerful peak load reduction tool and reduces a customer's overall electric and natural gas consumption throughout the year. Further, as residential building stock ages, triple-pane windows are one of the lowest-hanging fruit for thermal improvements as an air-sealing and insulation intervention. Improved windows could save American homeowners \$600 per year on utility bills, or \$17.5 billion nationwide (EIA RECS 2020).

Center for Energy and Environment (CEE) with sponsors Nicor Gas, Xcel Colorado, and partner Resource Innovations (RI) are targeting this thermal weak point through a "golden carrot" manufacturer RFP incentive as part of a wider MT suite. This manufacturer incentive is

designed to entice manufacturers to develop cost-optimized windows with a maximum U-Factor of 0.22 by decoupling performance features from window design elements that do not impact efficiency. Features such as many sash and frame colors, opening styles, and varieties of grille options, etc. increase product cost without improving product performance. By focusing principally on the features that improve product performance in order to expand cost-optimized product offerings, R-5 triple-pane windows can be made available to more of the U.S. housing stock, including affordable home builders, volume builders, and performance builders. Through this and other MT interventions, this collaborative effort aims to accelerate the rate of adoption of this much-needed envelope measure.

The multistate partnership came about from existing and ongoing collaboration between state MT efforts funded by multiple utilities. The Northwest Energy Efficiency Alliance (NEEA), CEE, RI, Nicor Gas, and Xcel Colorado have worked closely for several years on inter-state window MT efforts, resulting in interventions like this one. Through these regional efforts, partners created a coordinated demand signal for cost-optimized, high-performance windows. In market transformation efforts, this coordination aligns market actors around shared product needs and encourages manufacturers and supply chain actors to invest in efficient product availability.

Market Research

Understanding the current state of the market is critical to market transformation success, as it informs the choice of market support strategies and interventions that best address the largest market barriers. CEE and Nicor Gas completed market research as part of their state-level MT efforts, outlined in the following section.

Market Overview

To measure the impact of state-level MT programs, market baselines were collected for both MN and IL. In Minnesota, windows with less than 0.22 U-Factor (generally triple-pane) are estimated to have a low market adoption, at approximately 4% (Bender, Syed, and Delonis, 2024). The market is diffuse with dozens of manufacturers, hundreds to thousands of home builders, retrofit contractors, and architects. Although consumer awareness is growing, market penetration remains low due to incremental prices ranging from tens of dollars up to thousands of dollars, concerns about payback, and market availability, resulting in adoption rates notably lagging awareness rates. In a 2026 homeowner survey, 63% of homeowners reported awareness of triple-pane windows (even higher at 78% for those that replaced in the last two years), but only 24% indicated being offered triple-pane windows during the bidding process (ETA 2026).

Nationally, 57.4 million residential windows were sold into the U.S. in 2022 (Bender, Syed, and Delonis 2024), with approximately half being sold into new home builds and half into window replacements (ETA 2023). Sample data for MN and the Northwest region are shown in Table 1.

Table 1. Regional window sales (Cadeo, 2022)

Region	New Construction	Percentage	Existing Homes	Percentage	Total
MN	508,000	50%	513,000	50%	1,021,000

Northwest – OR, WA, MT, ID	1,590,000	45%	1,975,000	55%	3,565,000
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CEE’s market characterization study, completed by the Cadeo Group in 2022, found that the market dynamics within the replacement and new construction markets are complex and different from each other. The new construction market is highly driven by first costs and will typically specify a code-minimum window unless the home builder is participating in an above-code program (e.g., passive house construction). The cost-sensitivity in this market informed the program design for the manufacturer incentive outlined in this paper. The replacement market is complex for homeowners to navigate, as they face several choices related to brand, product line, and contractor. They also need to decide on many factors outside of efficiency (e.g., type, aesthetic, color, etc.), all of which have historically impacted cost. Homeowners are more likely to request or prioritize ENERGY STAR® products compared to builders, but they rely heavily on contractor opinions, making contractors a key influencer in the window replacement market (Cadeo 2022).

In Illinois, the residential window market is largely driven by retrofit activity due to the age of the housing stock. Survey data collected by Nicor Gas from more than 5,800 Illinois homeowners found that most respondents live in homes built between 1940 and 1979, indicating a substantial population of homes in which original or aging windows may still be present. Because Illinois issues fewer housing permits than most states, new construction represents a smaller share of window demand than in faster-growing markets, making retrofits the dominant pathway for window replacement.

Nicor Gas market characterization research also found that most (71%) Illinois homes currently have double-pane windows, while approximately 26% still have single-pane windows. High-performance windows remain a small share of the installed stock, and overall familiarity with triple-pane technologies remains limited among homeowners. Survey results indicated that more than half of respondents had not heard of triple-pane windows, highlighting an ongoing awareness gap in the market.

Supply-chain outreach in 2025 similarly identified cost and a lack of consumer demand as primary barriers to the adoption of higher-efficiency windows. Builders and manufacturers generally recognize the ENERGY STAR label, but report that most projects continue to prioritize cost, aesthetics, and availability over certification status. Together, these findings suggest that while the Illinois market has substantial retrofit potential, broader adoption of high-performance windows will likely depend on improved market awareness, cost reductions, and stronger demand signals through utility energy efficiency rebate programs and supply-chain engagement.

Double-pane windows range in price from \$200 up to \$1,500 or more (EPA 2021). Triple-pane windows may range in cost from \$300 up to several thousand dollars or more, depending on the features selected. Therefore, the incremental cost that the consumer sees may range from \$50-100 up to \$2,000 or more. Although installation costs vary, builder pilots have shown that no labor changes are typically needed to install most triple-pane products, except for those that are especially large (NEEA 2023, 2024).

CEE recently completed a Minnesota homeowner survey pertaining to high-performance windows (ReconMR 2026). In a willingness-to-pay assessment, it was found that 45% of homeowners would upgrade to triple-pane windows for an additional \$200, and 25% would

upgrade if the added cost was \$300 (when anchored to a \$1,000 installed cost standard double-pane window). However, 42% indicated they would not be willing to pay any additional cost to upgrade to triple-pane windows. The percentage of participants that are unwilling to pay more is typical for this early phase of MT efforts, where early adopters and early majority populations are targeted with interventions, thereby enabling the scale and price improvements needed to drive the product to a wider population.

The homeowner research also found that a \$100 rebate per window would make 66% of homeowners more likely to purchase triple-pane windows, financing availability would make 45% more likely, and a \$50 rebate per window would make 41% more likely. This cost research highlights the importance of driving down incremental costs through interventions like decoupling performance features and offering performance glass packs in entry-level and builder-grade product lines that are supported by utility new construction and retrofit measures.

In an assessment within the survey to understand the relative importance of window purchasing factors, the offered purchasing factors that mattered most were improved comfort (i.e. temperature and drafts) at 17.2 points, lowered energy bills at 16.1 points, and total upfront cost at 15.3 points. These factors were two to three times more important than factors like increased resale value or sustainability. Factors were split into several segments as outlined in Figure 1.

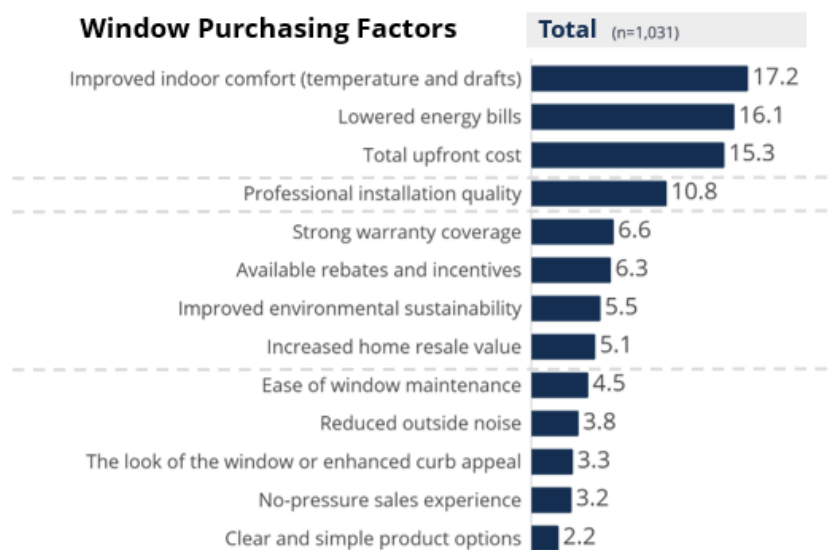


Figure 1. Homeowner window purchasing factors. Cost, comfort, and savings matter most to homeowners buying windows.

Of those surveyed that had replaced their windows in the past two years (“recent replacers”), most replaced because windows were drafty/letting cold air in (63%) and to reduce energy bills (53%). Functional issues like difficulty opening/closing (44%) or moisture in or on the panes (38%) also mattered, as outlined in Figure 2.

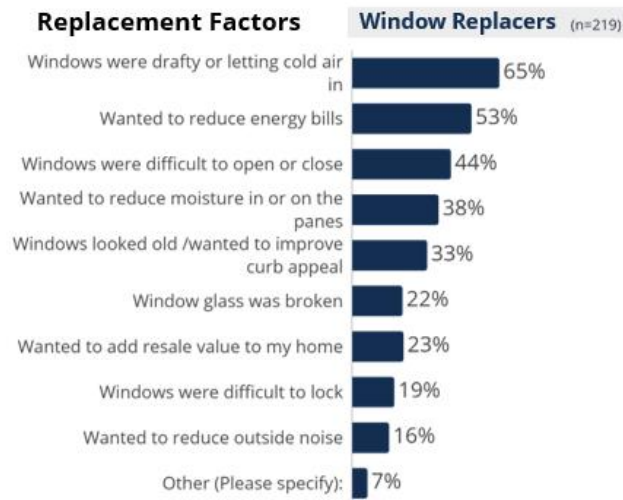


Figure 2. Homeowner factors for deciding to replace windows. Given the long service life of windows of multiple decades, homeowners often replace windows when a practical need presents itself.

It was also found that high-performance windows (HPW) were offered to just 24% of window replacers, although 63% reported familiarity with the product category. Of those 24% who were offered HPW, two out of every three homeowners selected them, a notable 64% conversion rate. The National Association of Home Builders (NAHB) performs a regular “What Home Buyers Really Want” consumer survey (NAHB 2024). Homeowners want good windows: in this NAHB survey, windows routinely show up as a top desired home improvement and the top desired energy efficiency improvement, as shown in Figure 3 from their 2024 report.

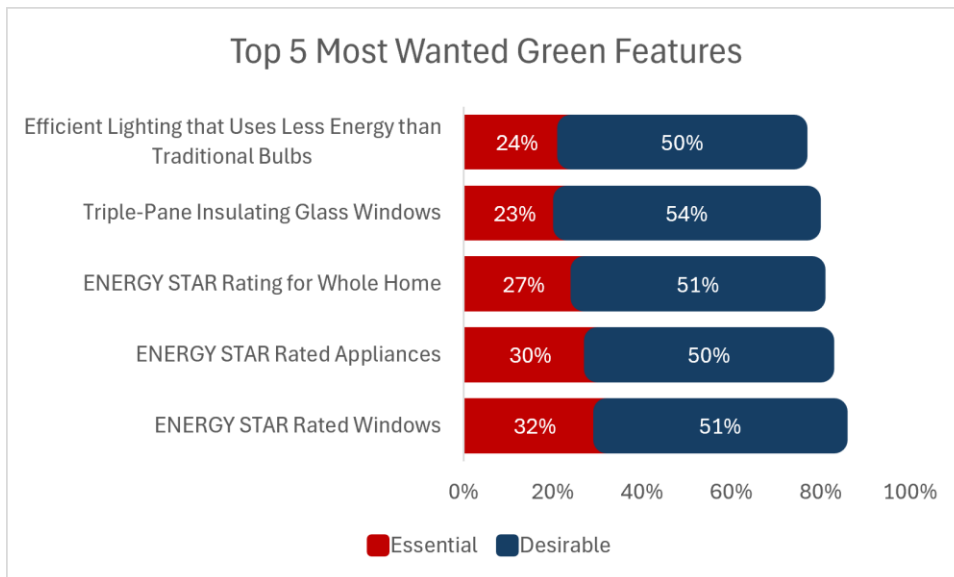


Figure 3. NAHB survey of the most desired green features. Windows regularly show up in top desired efficiency upgrades in annual NAHB surveys.

Homeowners value the comfort, energy savings, and non-energy benefits that high-performance windows can provide. However, broader adoption has been constrained by real and perceived cost barriers, limited availability of cost-optimized efficient product lines, and market perceptions that triple-pane windows are difficult to justify based on energy savings alone.

For an increasing number of homes, triple-pane windows can be offered at a price that makes them competitive as an air sealing and insulation measure for many homes, especially in colder climates. For example, in a pilot project in Grand Ronde, OR, builders lowered cost by \$4300 per unit by utilizing triple-pane windows to meet building envelope targets instead of using R-5 continuous exterior insulation (CEI), and produced modeled efficiency slightly higher than with the CEI (NEEA 2023). In a 100-home pilot with a high-volume national home builder, triple-pane windows were used to cost-competitively meet building code requirements without making changes to their building practices (NEEA 2024). Since this pilot, three other large builders in the area have begun using triple-pane windows as a tool to meet rising codes.

A contractor market research survey found that most retrofit contractors have some experience with HPW (82%) and had a favorable opinion of triple-pane windows (62%). Despite this familiarity, 90% of contractors surveyed believed that double-pane windows were sufficient to meet consumers' needs. Fifty-four percent of contractors viewed the upfront cost of high-efficiency windows to be too high and not worth the benefit (ETA 2025). Contractors in this survey estimated these high-efficiency windows to be on average \$170 more expensive than standard windows. However, in an ENERGY STAR price analysis, an incremental cost for an ENERGY STAR window compared to a code window was \$54 if additional features were not bundled with the triple glazing (PAWS 2023).

This homeowner research identified a pivotal price tipping point. If manufacturers could reduce the cost to upgrade below \$200 for a \$1,000 window, 45% of homeowners indicated they would be willing to upgrade to triple pane (only 25% would upgrade at \$300 in added costs). This highlights the importance of decoupling performance features to keep incremental prices below this tipping point.

Product Cost

Cost remains a central barrier to broader adoption of high-performance windows, but the barrier is not simply the material cost of adding a third pane of glass. ENERGY STAR's Version 7 analysis found that the added cost to upgrade from double-pane to triple-pane glazing can be modest for many manufacturers, particularly when an existing product can accommodate the wider glass pack without frame redesign and when the performance upgrade is not bundled with other premium features (EPA 2021). This suggests that high-performance glazing does not inherently require an expensive finished product.

However, consumer-facing pricing often tells a different story. CEE's market characterization research found substantial variation in quoted window prices, as shown in Figure 4. Mystery shopping results reveal low-end prices ranging from approximately \$1,000 to nearly \$3,000 per window and high-end prices ranging from approximately \$1,500 to \$4,500 per window, often including installation. These substantial ranges illustrate the complexity and information asymmetry that consumers face when shopping for windows. It also shows why the incremental cost of high-performance windows can be difficult for consumers, contractors, and

builders to evaluate — performance upgrades are often presented within broader product packages that also include differences in brand, frame material, aesthetics, hardware, warranty, installation approach, and sales channel.

This distinction is important for market transformation. If the underlying cost of improved glazing is relatively modest, but the consumer-facing price premium is high or difficult to isolate, then cost-optimized product design can help close the gap between technical cost and market price. Recent homeowner research reinforces the importance of this price point: 45% of surveyed homeowners indicated they would upgrade to triple-pane windows for an additional \$200, while 25% would upgrade at an added cost of \$300 when anchored to a \$1,000 installed double-pane window (ETA 2026). These willingness-to-pay findings suggest that reducing the visible incremental cost of high-performance windows could make them more appealing to a meaningful share of potential buyers, particularly when paired with utility incentives, contractor education, and clearer product positioning.

For this reason, the Golden Carrot RFP focused not only on achieving a target U-factor, but also on encouraging manufacturers to develop cost-optimized products that separate performance glazing from premium non-performance features. By making high-performance glass available in entry-level or builder-oriented product lines, manufacturers can reduce first-cost barriers, simplify product selection, and expand the market for R-5 windows beyond luxury or highly customized applications.

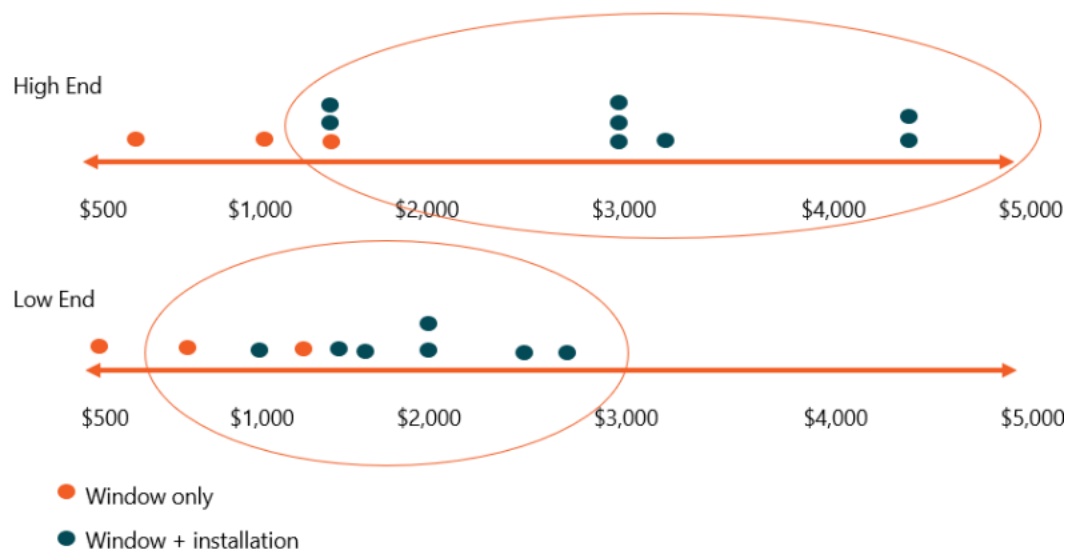


Figure 4. Results from mystery shopping for CEE's Market Characterization report (ETA 2023). Costs vary widely in both low-end and high-end products.

Market Barriers and Opportunities

Barrier: Lack of Awareness and Familiarity

According to the ENERGY STAR Product Finder for windows (EPA 2025), there are 994 certified product families that are ENERGY STAR Most Efficient (i.e. U-Factor of 0.22 or

less), where each product family is a specific manufacturer product line and opening style. Each of these product families consists of several hundred combinations listed on the National Fenestration Rating Council (NFRC) window database (e.g. Low-E coatings, gas fill, frame color, muntin bars, etc.). Due to this variety of options, homeowners rely on the expertise of industry professionals such as window manufacturers, retailers, and contractors to narrow down product selection as shown in Figure 5 (ETA 2026).

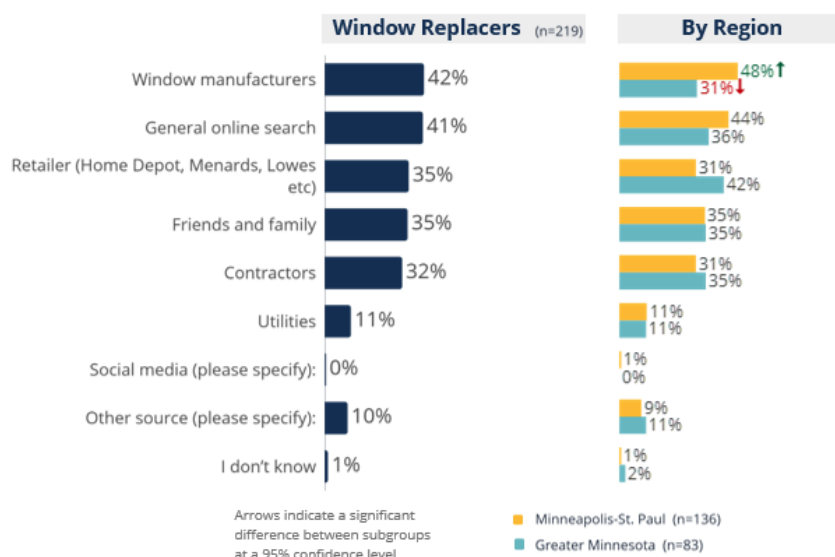


Figure 5. Where Homeowners go for purchasing information. Industry professionals, online searching, and personal recommendations are the most used options (ETA 2026).

Barrier: Product Selection is complex, with many factors and features to navigate

Window purchasing decisions require homeowners, builders, and contractors to navigate many product attributes at once, including brand, frame material, opening style, glazing package, coatings, gas fill, color, hardware, muntin bars, warranty, installation approach, etc. In this environment, energy performance is often only one factor among many, and the incremental cost of higher-performance glazing can be difficult to distinguish from the cost of non-performance features when bundled together. This complexity can make it harder for buyers to compare products on a cost-per-performance basis and can reinforce the perception that high-performance windows are only available as premium products.

Opportunity: Windows Provide Substantial Non-Energy Benefits

HPWs provide several unique non-energy benefits. As outlined in Figure 3, homeowners want quality windows. HPWs provide substantial comfort to occupants, including thermal comfort, seen in Figure 6. The health and psychological benefits of outdoor light from windows are further enabled by using HPW: builders are able to either maintain performance with increased glazed area, improve comfort with the same glazed area. HPWs also provide a two-times reduction in perceived outdoor sound as compared to a business-as-usual new double-pane window, resulting in a quieter living space. Thermal comfort can be used to visualize similarities

between sound control levels — both are an outcome of the relative insulating power of the windows.

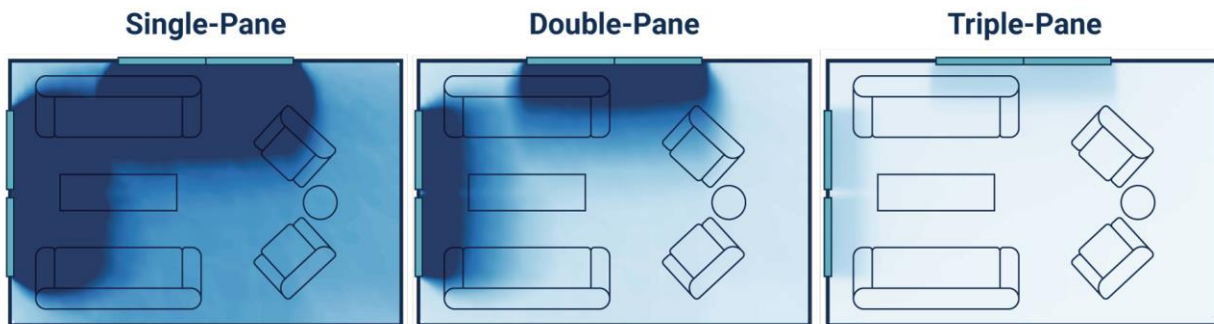


Figure 6. Modeled thermal comfort in a room based on glazing type. Thermal comfort improves dramatically as insulating power increases.

Room-side condensation is also a concern for many northern climate homeowners. Even with a new double-pane window, condensation and even ice buildup is possible on the window glass and frame due to the high temperature differentials that are possible in heating-dominated climates. For example, in -30°F weather (not uncommon in places like Minneapolis, MN or Helena, MT), there is a 100°F temperature differential between indoor and outdoor temperatures. This causes the indoor surface of the glass to regularly drop below the dew-point temperature, yielding room-side condensation and ice. HPWs, however, provide dramatically higher Condensation Resistance (CR) than double- or single-pane windows, virtually eliminating room-side condensation and the associated risks of rot, mold, and mildew, which can dramatically impact indoor air quality.

Opportunity: National Collaboration via The Partnership for Advanced Window Solutions (PAWS)

The Partnership for Advanced Window Solutions (PAWS) is a national public-private collaborative focused on accelerating adoption of cost-effective, high-performance window and window attachment solutions for new and existing buildings. PAWS includes government agencies, national laboratories, regional energy efficiency organizations, utilities, builders, market transformation organizations, and window-solutions manufacturers. PAWS focuses on coordinating market transformation efforts, sharing research and resources, identifying market gaps, and aggregating demand for affordable advanced window technologies, including triple-pane and thin-triple-pane windows, secondary glazing, storm windows, insulating shades, and exterior shades.

National collaboration through PAWS creates an opportunity to extend the impact of individual state and utility market transformation efforts. By bringing together organizations that work on similar window market barriers, PAWS aligns research, messaging, program strategies, and supply-chain engagement across regions. This coordination allows local and regional efforts to build from shared market intelligence rather than operate independently, while creating a stronger signal to manufacturers, builders, distributors, and contractors that multiple markets are

moving in the same direction. The Golden Carrot RFP discussed in this paper was supported by this broader collaborative environment, with PAWS serving as a key forum.

Builder Feedback: An Appetite for Optimized Cost on Performance

In 2024, PAWS convened over 60 industry professionals and window manufacturers at the EEBA High-Performance Home Summit to address affordability issues with triple-pane windows. Builders called for transparent pricing and performance data, mid-priced frames, and reliable delivery times for large orders. Manufacturers were able to gather feedback in small groups and shared available options.

Specifically, builders expressed a need for high-performance glazing not only in top-end product lines but also in lower-cost products. However, builders stated that the products must be available in standard installation systems, rather than mix-and-match ordering with longer lead times.

Builders noted that costs extend beyond materials and can include hidden expenses associated with ordering and acquiring windows that substantially increase project costs and pose barriers to integrating high-performance products into their home builds. Additionally, they expressed that product performance specs must be easily identifiable in order to assess cost-on-performance as a part of their value engineering work and include whole-windows' U-Factor values instead of center of glass values.

Builders were primarily concerned with cost, time, and quality concerns. Direct engagement with builders through events like the High-Performance Home Summit informed the selection of a manufacturer golden carrot as an effective intervention strategy.

Manufacturer Golden Carrot RFP Incentive

Golden Carrot Concept and Design

There have been several “golden carrot” incentives used in the energy efficiency industry to partner with manufacturers to drive product offerings toward efficient designs. For example, in the early 1990s, a group of utilities collaborated with refrigerator manufacturers to develop a much more efficient product (Feist 1994).

CEE, in collaboration with Nicor Gas and Xcel Colorado, launched a \$300,000 golden carrot for Midwest window manufacturers to produce cost-optimized, entry-level, triple-pane windows, aiming to deliberately decouple performance features from non-performance features. Five Midwest window manufacturers responded to the RFP in Jun-Jul 2025, with three selected as winners in Sep 2025. Partnership agreements were in place in Q1 of 2026, with market implementation planned throughout 2026 and adoption and impact monitoring continuing into 2027. Approaches to achieve cost-optimization were deliberately left open-ended such that manufacturers were able to plan according to their strengths and creatively approach the challenge. The methods of each of the three manufacturers are briefly laid out in the following sections.

Manufacturer Approaches: Manufacturer 1

Manufacturer 1 is adding triple-pane glazing to an existing and popular product line. By updating the product line to accommodate a triple-pane glass pack, they will be able to offer a higher level of performance, which has previously only been available in higher-tier and higher-

cost product families. By adding high-performance glazing to their entry-level product family, they will be able to leverage the broad existing reach and vertical integration of the current product family at a value and performance level desired by homeowners and requested by builders.

Manufacturer 1 will recruit key opinion leaders (KOLs) like builders and contractors for demonstrations that will provide content for and exposure to the new cost-optimized offering. Through new build and retrofit projects and trade show engagements, marketing collateral such as photos, video, and testimonials will serve as an early catalyst to enable KOL sales.

Shared market plan development with MT partners is targeting engagement with professionals and homeowners to launch dual-audience campaigns focused on building product awareness. By leveraging existing ad templates and internal content and creative services, Manufacturer 1 will align on and amplify the messaging guides developed by MT partners through a thorough understanding of the target markets from previous and ongoing market research in the target states of MN, IL, and CO.

Channel partners are a primary audience for sales enablement efforts, with the goal of educating these partners on the best practices and value proposition of triple-pane products, with which they may not be familiar. Channel enablement interventions include targeted email communications, collecting builder and dealer testimonials, collaboration with internal sustainability team, and creation and dissemination of a training video focused on their cost-optimized triple-pane offering and the benefits of the product.

The manufacturer had this to say about these updates to their entry level product:

“The new triple-pane glazing on our entry-level product line brings high-performance at an accessible price to our most price-sensitive consumers. This product line plays a critical role in ensuring more customers can choose Andersen products by elevating affordability and accessibility.”

Manufacturer Approaches: Manufacturer 2

Manufacturer 2 is optimizing an existing product family by limiting the number of features that the product comes with. By narrowing to a select number of opening styles and trim colors, they will be able to bring per-unit costs down due to the economies of scale associated with higher repetitions of a more limited feature set. By using fiber-reinforced composite frames, with thin triple glazing that uses a very thin middle lite of glass, their product reaches a U-Factor of 0.15 to 0.17 (R-5.9 – 6.7).

By partnering with an exclusive distributor in MN, along with key partners in IL and CO, Manufacturer 2 will highlight the offer with those distributor’s builder partners, including a heavy focus on in-person events. Through these sales enablement trainings with their distributor’s key partners, builders will be selected to pilot the new product family, resulting in case studies and installer comfort with the product. They have developed a dedicated landing page for the product with lead capture integrated to simplify the ordering process for builders.

Manufacturer 2 has streamlined the offering by limiting colors only to white frames and keeping opening styles limited to picture windows, awnings, casements, and mulled picture-casement styles, exclusion of bars, etc. These interventions are expected to reduce product costs by approximately 15% from previous offerings of comparable performance.

Manufacturer Approaches: Manufacturer 3

Manufacturer 3 is using the funds to upgrade their in-house manufacturing equipment to produce high-performing triple-pane windows in house rather than buying them from external suppliers. Through this equipment upgrade and related workforce upskilling, the manufacturer will be able to offer a product family at a new tier of cost per performance compared to their other product offerings. By in-sourcing their production of triple-pane windows, they will also have a higher level of control over lead times, delivery times, and rework times, which are targeted value proposition metrics for this manufacturer.

Cost improvements are expected based on bringing production for this product's insulating glass units in-house. By way of example, in a stakeholder meeting ENERGY STAR indicated that material costs are \$54 to upgrade from a baseline 0.32 U-Factor window to a 0.22 U-Factor window. Cost to customers for internally produced triple-pane windows is expected to reduce as the production line is vetted and production volumes increase, but exact price improvements will require time studies to understand how cycle times are affected since this is a new product for their production teams. Prior to this intervention, one comparative quote for an existing slider product from Manufacturer 3 showed an incremental cost of \$268 (\$603 triple vs. \$335 double) for an externally produced triple-pane IGU. Price estimates are pending but expected to bring the incremental cost down notably.

For all three manufacturers, these efforts to reduce first costs for a cost-optimized, entry-level product align favorably with MN homeowner pricing research, which showed 45% of homeowners would be willing to pay \$200 or more to upgrade to triple-pane windows, and 25% would upgrade if be willing to pay \$300 or more to upgrade (ETA 2026). In-sourced production is expected to bring added costs into this range, making product available to a wide tranche of the market that would not be willing to upgrade at a higher price.

Complementary work is being carried out by implementers CEE and RI to maximize the impact of these product launches, such as braiding additional funding sources to enable demonstrations with the new products, collaborations with distributors and builder partners of the manufacturers, and midstream SPIFF sales incentives to build supply chain familiarity and expertise. The in-kind efforts from each manufacturer deliver additional leverage on program funds. By securing the funding to entice manufacturer partners to advance the cost-optimized product category, the manufacturers are bringing private funding that is several times larger than the public capital that kicked off the program. Through these private-public partnerships, funds and resultant impact are multiplied.

Further Market Transformation Interventions

The golden carrot for cost-optimized HPW highlighted in this paper is one of a suite of MT interventions implemented in Minnesota, Illinois, and the broader Midwest to achieve an accelerated market adoption rate for triple-pane windows. Many other MT market support strategies and interventions synergize with the golden carrot effort.

In both MN and IL, case studies and demonstrations are planned through implementers and utilities to showcase the value proposition of HPW to builders, homeowners, and other

market actors. Through these case studies, installers develop comfort and familiarity with HPW, including the incremental costs and assuaging concerns about added labor resulting from the extra weight of HPW. In practice, builders and contractors have found that extra labor is not needed for all but the largest windows. In a volume builder demonstration, they found that no extra labor was needed (two workers for either a double- or triple-pane installation) for all but the largest products (NEEA 2024).

Across MT initiatives, a staple of stakeholder engagement and education includes creating (or co-creating) marketing and educational collateral. These can be used to train, educate, and empower builders, installers, and suppliers in the new construction and retrofit markets.

By engaging with utilities, local entities, and national coalitions, HPW are increasingly integrated into program offerings, incentives, and policies. A national assessment found that more than 65 utility incentives for primary windows are offered across 29 U.S. states (PAWS 2025). Through national and regional collaboration, MT initiatives aggregate market demand signals and regional expertise to build scale, share costs, and influence national code and above-code discussions.

In Illinois, MT efforts are complemented by utility-administered energy efficiency programs that provide traditional resource acquisition incentives for HPW. The Nicor Gas Energy Efficiency Program offers incentives to customers for ENERGY STAR qualified windows through its Residential New Construction program and its retrofit offerings delivered through the Air Sealing and Insulation (ASI) program.

The Residential New Construction program provides incentives of \$50 per HPW installation. The ASI program offers incentives of \$100 or \$125 per HPW depending on the type of window being replaced. These programs provide builders, contractors, and homeowners with direct financial incentives to adopt higher-performing windows.

Cost-optimized triple-pane products emerging from the golden carrot initiative can qualify for these incentives, allowing manufacturers' new offerings to compete within established utility program frameworks.

In addition to these downstream incentives, Illinois utilities are collaborating on a statewide midstream pilot that engages distributors and supply chain partners to increase the availability and promotion of high-performance windows in the state. The pilot, a partnership between Nicor Gas, Peoples Gas, North Shore Gas, ComEd, and Ameren Illinois, will provide a \$50 per window incentive for ENERGYSTAR qualified products sold through participating distributors.

Together, these complementary program structures create multiple pathways for cost-optimized, triple-pane products to reach the Illinois market. By combining upstream market engagement with existing downstream incentives, Illinois utilities are positioned to support adoption of these products.

Conclusion

High-performance windows are increasingly available, but adoption has been minimal, in part due to the historical bundling of performance and non-performance features. Manufacturers

opted into a golden carrot program because of the MT efforts of this multi-state coalition and forward market vision. This partnership positions the windows supply chain to break through a 20-year performance plateau and meet the market demand for high-performance windows at an incremental cost that many consumers and builders will accept. As national building codes tighten, builders must choose between higher-performing windows, fewer windows, or smaller windows, and it's clear which of these choices homeowners want. These products can be used for new construction and retrofit applications alike, serving both markets as this product segment scales.

By decoupling performance features or bringing HPW production in-house, manufacturers will address the large and growing demand for entry-level triple-pane products that are widely available to multifamily, affordable, and volume builders. These builder types represent a dramatic portion of U.S. building stock, laying a clear pathway to scale cost-optimized products rapidly. As advantageous cost-on-performance products emerge, market supply plus consumer demand for HPW non-energy benefits may align to overcome outdated market inertia that views double-pane windows as sufficient. However, contractor recommendations may ultimately decide whether homeowners see these products at the point of sale.

The window decisions that home builders make today will impact a generation or more of grid management, as well as home energy use, affordability, and U.S. homeowner energy burdens. Bringing incremental costs to price break points for consumers makes building stock upgrades more widely accessible, with performance improvements likely lasting through 2060. Now is the time to lock in better building envelopes by addressing their weakest thermal link through cost-optimized R-5 triple-pane windows.

If price is no longer the pane point (sic), what market barriers remain to R-5 window adoption as a default building choice? MT efforts zero in on this pressing building science question.

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