Millwork 101: Transforming the Market for Energy-Efficient Windows

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ABSTRACT

This paper describes several innovative approaches to transforming markets for energy-efficient windows, primarily in the replacement market, but also affecting new construction practice. The paper is based on actual program and field experience for a major California program, with lessons learned as to what works and what does not.

Residential windows account for 25% of a typical home's heating costs, and up to 60% of cooling costs. The windows market is highly fragmented with more than 4000 companies producing window products and an intertwined network of market actors, including architects, builders, contractors, retailers, and homeowners.

Core approaches to promote efficient window replacements revolve around promotion of the ENERGY STAR® brand and mid- and upstream approaches working closely with manufacturers and major retail outlets. Retailer and contractor training is combined with in-store consumer promotions, and a full-time circuit rider.

The authors also report on several potential innovative approaches, including a realtor/mortgage lender initiative and appraiser/home inspector initiative, since these groups have considerable influence on home sales. A landlord initiative is also examined focusing on the value of enhanced windows in rental housing.

Data are also reported from sales staff interviews regarding the best approaches to marketing energy-efficient windows, including the best influencer channels.

Introduction

Inefficient windows in residential buildings can be a major source of energy waste. In colder climates, they often increase heat loss and infiltration. In warmer climates, they can increase solar heat gain thus significantly increasing cooling energy consumption. In the southern regions of the United States, it has been estimated that energy-efficient windows, which meet ENERGY STAR® standards, can save homeowners 15% or more on heating and cooling costs.

Recognizing the importance of windows in reducing residential cooling consumption in particular, Southern California Edison (SCE) launched a program in 1998 focused on promoting energy-efficient ENERGY STAR® windows among manufacturers, distributors and retailers in Southern California. The initial program design featured an "upstream" approach, which incentivized manufacturers to promote and ship ENERGY STAR® compliant lines in the SCE service territory. This was coupled with working with major retail chains to distribute point of purchase materials. The program also coordinated with the training program offered

through the California Window Initiative (CWI).[1] The program was extended in 1999 and 2000 to add several features and to incorporate a market transformation strategy, which would facilitate the transformation of the replacement windows market in Southern California to the ENERGY STAR® brand. ENERGY STAR® labeling offers the opportunity to take residential windows out of the mode of a "search" good, which is largely price driven, and into the mode of a "credibility" good, with value established by the national ENERGY STAR® brand, and marketing strategies which seek to bring the value experience to consumers.

The Residential Windows Market

Market Characteristics

Residential windows are manufactured on a national, regional, and local level. The manufacturing pipeline feeds both new construction and replacement markets. Nationally, sales of residential window units have grown by approximately 5% annually between 1992 and 1997, with 48.9 million units sold in 1997 (DOE 1998). Residential window sales are approximately equally divided between new construction and remodeling/replacement applications. On a national level, vinyl frames have continued to gain market share, mainly at the expense of aluminum, holding a 40% share in 1997. Wood (including vinyl and aluminum clad wood) held a 44% market share in 1997. While clear insulated glass units (IGUs) continue to dominate nationally, the share of low emissivity (low-e) windows has risen to 34% in 1997 and is continuing to gain ground.

According to a recent Fact Sheet/Press Release on CWI, residential windows account for 25% of a typical home's heating energy costs, and up to 60% of a home's cooling costs. The majority (as much as 90%) of existing installed stock is single-pane clear glass. New construction and replacements use conventional double glazed windows. However, new glazing technologies can reduce peak air conditioning demand by up to 29%, and reduce peak cooling energy use up to 1,193 kWh per home. These figures are for Pacific Gas & Electric, and may be even higher in the SCE service territory because of its warmer climate zones.

Conventional double clear pane windows represent the technology of the past. In recent years, new window technologies that dramatically increase the energy efficiency of windows have been introduced to the marketplace. This technology includes solar control low-e glass coatings, low-conductivity frame enhancements, and low-conductivity inert gas fills. These features provide significantly greater heating and cooling energy savings at a low incremental cost. The enhancements, individually or in combination, improve the annual energy performance of the window. Solar control low-e glass coatings offer solar heat gain control with little loss of visible light transmittance.

In order to design an effective market transformation strategy for residential windows, it is critical to understand the window distribution structure. Figure 1, on the following page, illustrates how windows are distributed, and the approximate national percentages flowing through each channel (Ducker Research Company 1997). Of particular

[1] The 1998 SCE program was supported by D&R International. CWI was developed and implemented by Richard Heath and Associates under contract to three California utilities. In 1999, support of the SCE windows program was assumed by ICF Consulting with Richard Heath and Associates as its subcontractor.

concern in the replacement market are: the remodeling contractor and homeowner consumers, and the primary sources from which these consumers purchase windows (i.e., manufacturer direct and home center). Lumberyards, specialty retailers, and distributors play a smaller role in the replacement window market. According to the U.S. Department of Energy (DOE) analysis, "home centers are well on their way to cornering the residential remodeling market. They target contractors and do-it-yourselfers and do not emphasize performance. Home centers are rapidly replacing specialty retailers" (DOE 1998).

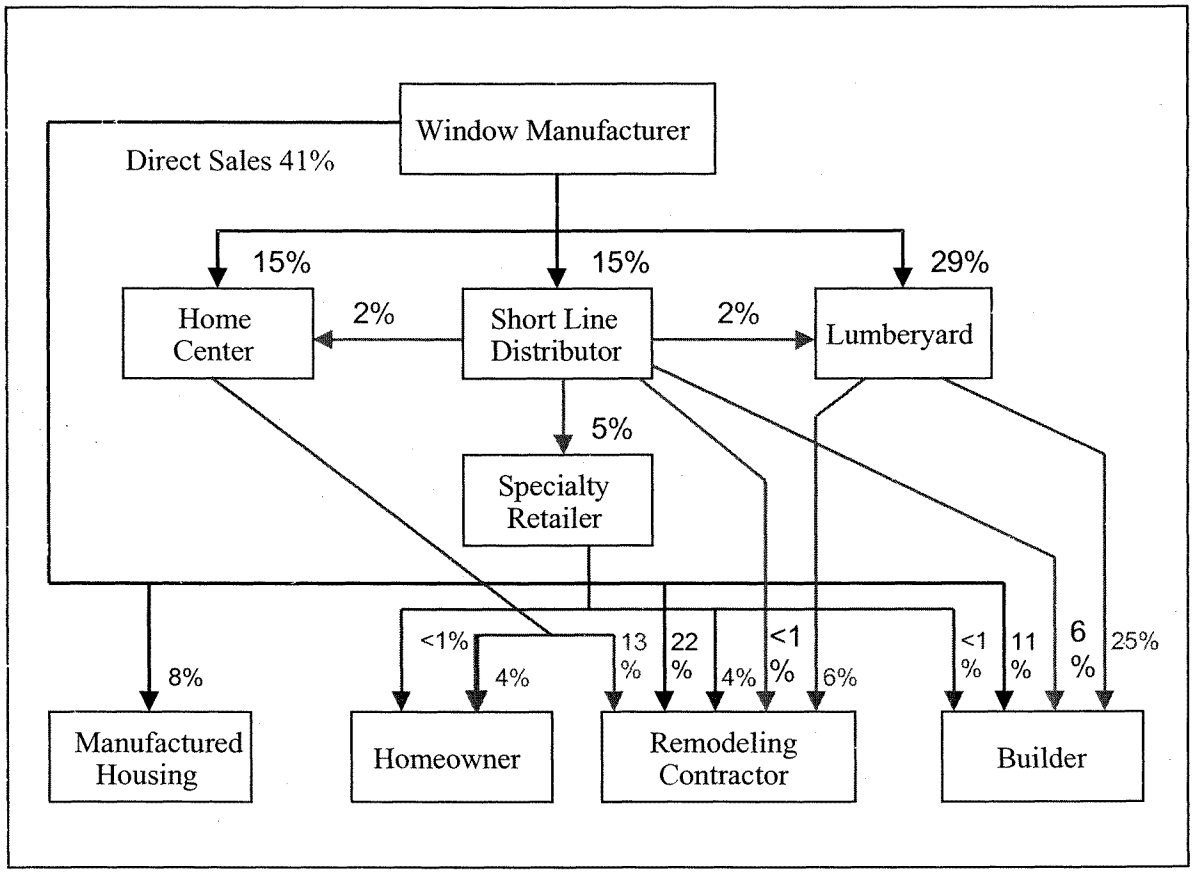

Figure 1. Residential Window Distribution Channels

In new home construction, builders are the primary decision-makers as to which windows are installed. This is especially true for production builders and specification (spec) homes. In the higher end spec and custom markets, homebuyers and architects often have a substantial say in window type and brand. A recent study in the Northwest found that in the residential new construction sector

- 92% of builders usually make the window purchase.
- in 68% of the cases, builders have the most influence on the type or style of window, followed by architects at 17% and homebuyers at 15%.
- dealers/distributors and trade contractors had the least influence on type or style, at 2% and 1% respectively.

Builders (76%) have greater influence over brand selection, followed by the homebuyer (11%) and the architect (8%). Again, dealers/distributors and trade contractors had the least influence, at 5% and 2% respectively (Macro International 1998).

It can be seen, then, that the distribution channels and more importantly, the influence points are quite different between the replacement/remodeling windows market, and the new construction windows market in the residential sector. In replacement/remodeling, there is considerably more influence by the homeowner, architect (if one is employed), and the remodeling contractor. These actors use home centers and manufacturers as their primary channels of supply. In new construction, on the other hand, builders have tremendous influence, with homebuyers and architects playing a role in selected niche markets.

Market Actors

As discussed below, these market actors also have different motivations, which must be identified and addressed in a market transformation program strategy.

Architects. Architects play a strong role in window specification on projects in which they are involved. Architects pay special attention to aesthetics, comfort, and function in their window selection. They tend to communicate closely with home owners on the latter's general desires and values.

Builders. Builders primarily are concerned with keeping costs down. Price is a major factor (as is general quality). Builders also are concerned with window units that are local code compliant, and availability and shipment accuracy. In the higher end spec market, builders may upgrade to higher quality, premium brand windows.

Contractors. Contractors have the greatest impact in remodeling markets. They are concerned with cost, but still want to provide value to the customer. Often, there is, or can be, more opportunity for communication between contractor and homeowner as to the characteristics of the replacement windows than is the case in new spec construction.

Retailers. Retailers seek to carry product lines that can sell to their local customer base. Retailers are concerned with product availability, price level, quality, and importantly, margin. In windows, many retailers and regional wholesalers carry product that meets local or state building codes (most retailers today buy windows direct from the factory). Code compliance and price point, followed by margin are usually the key stocking factors. Retailers will generally carry one primary window brand and one secondary window brand. The brand decisions are made typically at the headquarters level.

Homeowners. Homeowners tend to guide the decisions of architects, contractors, and builders more generally by communicating how they value energy savings, aesthetics, and function. Increasingly, do-it-yourselfers are playing a key role in the purchase decision for windows. They are typically more likely to purchase energy-efficient products than are contractors, and are often willing to pay more for a higher quality product (Macro International 1998).

Market Barriers to Energy-Efficient Windows

The first step in developing an effective market transformation strategy for energy-efficient windows is to clearly understand the key market barriers facing widespread adoption of energy-efficient, ENERGY STAR® windows. Eto, Prahl, and Schlegel have articulated several generic types of market barriers impeding the widespread adoption of energy-efficient products (Eto, Prahl and Schlegel 1996). These include:

- **Performance Uncertainties**, regarding the enhanced performance of ENERGY STAR® and energy-efficient windows. Sales associates and consumers are not sure how much energy these windows can save.
- **Information/Search Costs,** borne by sales staff, contractors, and consumers and associated with discovering necessary information about energy-efficient windows.
- **Hassle/Transaction Costs**, increased effort to identify, order, and purchase the energy-efficient alternative.
- **Asymmetric Information**, where dealers/installers are the primary source of detailed information to the consumer on product costs and benefits, and often control the flow of information to the consumer.
- **Bounded Rationality**, where the preponderance of product information is provided by dealers/sellers who often use rules of thumb, or may sacrifice quality to make a sale.
- **Financing**, particularly the need to finance the often higher first cost of the energy-efficient alternative windows.
- **Hidden Costs**, such as potentially higher installation cost of the energy-efficient windows.
- **Organizational Practices or Custom**, such as dealers only carrying certain lines (e.g., retailers who only carry lower cost window lines).
- **Service or Product Unavailability**, such as general unavailability of high efficiency windows that exceed local code.

The Northwest study of ENERGY STAR® windows found that information is generally lacking concerning ENERGY STAR® windows, and in particular, the distinguishing of ENERGY STAR® windows from their code-compliant relatives (Macro International 1998). Information is necessary for both homeowners and contractors to fully understand the life cycle benefits of energy-efficient windows, and to override performance uncertainties. In some states, ENERGY STAR® graded windows are more expensive than their code-compliant relatives on a first cost basis—though this is not always the case. In this case, the "value" associated with these windows must be clearly communicated through information, *experience,* and brand (ENERGY STAR®) *credibility*. That is, residential windows must be moved, through market intervention, from a "search" good (where consumers search for the lowest price, based on the perception that windows are a commodity) to an "experience" and "credibility" good, with the associated value clearly conveyed. This requires clear information on the performance of ENERGY STAR® windows over their less efficient alternatives. Often times, energy-efficient windows can be purchased for the same price as less efficient alternatives. Lack of information and consumer/retailer/contractor education are the primary reasons for this.

Demand for energy-efficient windows must be increased to allow market transformation to be completed. Retailers and wholesalers respond to customer demand. Their customers are primarily homeowners and remodeling contractors (in the replacement market), and builders in the new construction market. Manufacturers respond to their customers' demand, which could include builders and contractors, as well as retailers and wholesalers. All must be cognizant of state and local code requirements. Market transformation strategies must therefore be focused on two key categories of market barriers, information/performance uncertainties (educate retailers and consumers on the benefits of ENERGY STAR® windows) and organizational practice/product unavailability (promotions to manufacturers and retailers to stock and promote ENERGY STAR® replacement windows).

Recent Window Program Initiatives

During 1999 and 2000, several programmatic efforts were initiated to promote greater overall transformation of the replacement windows market in Southern California. The goal is to have the vast majority of replacement windows installed in Southern California homes be ENERGY STAR® compliant.

The strategy consists of three major thrusts. First, manufacturers, distributors and retailers (upstream and midstream market actors) are being targeted to promote ENERGY STAR® windows. This will provide increased product availability and promotion in key distribution channels associated with the residential replacement market. Second, a program of consumer education centered on point of purchase materials, is being initiated to increase consumer understanding of the benefits of ENERGY STAR® windows, and hence increase consumer demand (which will have a "pull" effect). Thirdly, energy-efficient windows will be promoted aggressively under the overall ENERGY STAR® brand, which is manufacturer neutral, and will leverage other ENERGY STAR® promotional efforts. These efforts are designed to address the key market barriers defined above, and result in significantly increased stocking and sell through of ENERGY STAR® compliant replacement windows. The following sections detail specific activities under each of these strategies.

Upstream and Midstream Activities

Upstream activities were focused on enlisting window manufacturers who are active in the Southern California markets to promote their ENERGY STAR® compliant lines. Initially, proposals were solicited from manufacturers. Contracts were signed with several manufacturers to undertake a variety of promotional activities in conjunction with their normal distribution channels. Participating manufacturers included Andersen, Windowmaster, and Amerimax. Superior will be added in the 2000 program. A step to be taken in the 2000 program delivery will be to structure manufacturer activities to a much greater extent around promotion of the ENERGY STAR® brand.

Manufacturers tend to have different market niches and distribution channels. For example, Andersen and Amerimax do not typically stock units in retail outlets, but rather must be special ordered at the millwork desk. This is not untypical of the higher end product lines. All Amerimax lines, for example, are ENERGY STAR® compliant but they must be ordered. Windowmaster, on the other hand, is Home Depot's "primary" line in Southern California, and sells through all 51 Home Depots in the SCE service territory. Units are

stocked in Home Depots, but not all Windowmaster lines are ENERGY STAR® compliant. Therefore, a major emphasis will be to promote the stocking and promotion in Southern California, by both Windowmaster and Home Depot, of the ENERGY STAR® compliant lines. Superior has yet a third niche, primarily selling to builders in the Southern California market.

Major program activities also were directed at midstream market actors. These included major distributors and retailers in the SCE service territory, particularly those carrying participating manufacturer lines. A program extension in 2000 will involve expanding midstream support activities to additional major outlets that can promote the ENERGY STAR® brand in general, independent of their association with any particular manufacturer's lines.

A key aspect of this approach was the assignment of a full-time circuit rider to service retail outlets promoting the ENERGY STAR® window lines. The role of the circuit rider was to visit retail outlets for residential replacement windows in the SCE service territory. The circuit rider checked on the status of the store kiosks that had been installed during the 1998 program, distributed program literature, monitored in-store stocking and display activities relative to ENERGY STAR® windows, conducted ad-hoc intercept surveys, and served as a general contact point between the SCE windows program, the manufacturers' activities, and the retailers.[2]

During the 1998 program, retail activities centered around those outlets that stocked or sold the window lines of the manufacturers who participated in the SCE program. (NOTE: a different set of manufacturers participated in the 1998 program than participated in the 1999 program. Windowmaster was the only manufacturer who participated in both the 1998 and 1999 programs). Principally because of Windowmaster's participation, the 51 Home Depot stores in the SCE territory formed a major portion of the stores supported by the circuit rider during 1999 under this activity.

A key midstream activity has been specialized training directed at retail sales associates. The underlying market transformation concept is that sales associates have a major role and major influence in promoting consumer choices in replacement windows. Sales associates can affect both consumer decisions and contractor recommendations. If sales associates are properly trained on the value propositions and benefits of ENERGY STAR® rated windows, they can better promote the advantages of this grade of windows to contractors and consumers.

The objective of the sales associate training was to bridge the knowledge gap associated with high performance windows especially ENERGY STAR® models. The training was approached with the intent of assisting sales associates with enhancing and / or developing skills related to the characteristic of High Performance Windows, including:

- the use of the spectrally selective glazing – NFRC label;
- the use of the ENERGY STAR® label; and
- techniques for comparing ENERGY STAR® products.

A discussion type-training format was used, which made use of a variety of visual aids, props, displays, and demonstrations. The 1999 training sessions were held at the Home Depot

[2] In 1998, audio kiosks had been placed in major retail and distribution outlets near the millwork desks/departments. The kiosk contained an audio message about the advantages of ENERGY STAR® windows and associated literature. After assignment of the circuit rider in 1999, it was found that not all kiosks were still in service due to a variety of store actions.

training center in Southern California. Sessions for 2000 are planned to include other distributor and retail channels as well.

A sales associate training handout was provided that included

- color copies of the PowerPoint™ slides used during lecture;
- excerpts from the CWI manual;
- window reference sheet;
- the NRFC Certified Products Directory;
- the AAMA directory;
- AAMA/NWWDA 101.I.S.2.97;
- Corner Samples Made From
  - Vinyl
  - Wood
  - Expanded Vinyl
  - Engineered Wood
  - Fiberglass
  - Composites;
- Glass Samples;
- Spacers; and
- Accessories.

The most useful item and the one that seemed to have the most impact with sales associates was the beam splitter. The beam splitter was used to quantitatively measure and demonstrate the effects various glazing options have on the U-factor (thermal transmission), SHGC (solar heat gain), and VT (visible transmission) for each window. A pre-test and a post-test were administered before and after each session. Each test consists of 17 multiple-choice questions. The test, developed for use in CWI, was adopted for use in the SCE 1999 windows program. The average post-test scores were approximately 50% higher than the pre-test scores.

An important component of the midstream support activity was the development and distribution of a "Tip Sheet" for use by sales associates in promoting the sale of ENERGY STAR® windows. In addition to advising on the brand benefits and energy savings associated with these products, the Tip Sheet also contained collateral benefits of ENERGY STAR® windows which would be of interest to consumers and useful in the sales approach for these products. These included factoids, such as low-e glazings, which can reduce ultra-violet radiation by as much as 75%, thus reducing fading and sun damage to internal furnishings, and that ENERGY STAR® windows can reduce air pollution as well as save consumers money on their electric bills.

Downstream Activities

A variety of downstream activities have been undertaken as part of the program to promote the benefits of ENERGY STAR® replacement windows with consumers, and thus increase the demand for these products, and their "business as usual" use in replacement applications. These activities included production and distribution of in-store collateral materials, use of point-of-purchase (POP) displays, and coordination of special events.

An ENERGY ®windows brochure targeted toward consumers was developed. This full-color brochure was then distributed by the circuit rider to major retail outlets, where it would be available at the millwork desk/department. The brochure, featuring the ENERGY STAR® logo, advised consumers on the benefits of ENERGY STAR® windows, in terms of energy savings and collateral benefits. (A key message stated that if all residential windows in the United States were replaced with ENERGY STAR®-compliant models, more than $7 billion in energy costs would be saved over the next 15 years. Moreover this would also have the pollution avoidance effect of removing 336,000 cars from the roads, and would save enough energy to light every home in the Los Angeles metropolitan area.)

In addition to the brochure, ENERGY STAR® windows banners were produced. These attractive full-color banners are designed to be hung in retail and distribution outlets. They are sized to either be hung from the rafters, from aisle end-caps, or under the millwork desk. They are attractive, demonstrate environmental sensitivity, and are being distributed free to all participating retailers. They are designed to not only appeal to customers immediately interested in window replacement, but also to serve as a marker for customers who may face window replacement needs several years in the future (the key message being, to look for the ENERGY STAR® label).

A particularly popular POP tool for consumer education has been a demonstration unit produced by Cardinal Glass, a major manufacturer of low-e glazing. This tabletop unit features samples of clear glass and solar control low-e glass behind a heat lamp, with thermostats behind each glass panel. Customers can see the dramatic difference in heat gain. Sales associates report that this POP tool is very successful in selling customers on the benefits of ENERGY STAR® grade windows with solar control low-e glazings.

Another successful approach that has supported both midstream and downstream efforts has been the use of special events at selected retailers. These events typically involved the use of SCE's Mobile Education Unit (MEU). The MEU is a van featuring the advantages of ENERGY STAR® products. Program efforts have focused on "special events" at retail locations, coupled with do-it-yourselfer training on window replacements and the benefits of ENERGY STAR® windows. For example, an event was held at the Cerritos Home Depot in November of 1999 that focused on ENERGY STAR® windows, and the MEU was present. The event was held in the parking lot of the store on a Saturday morning (a key time to reach homeowners and do-it-yourselfers). Three manufacturers participated in this event (Windowmaster, Andersen, and Viplex). Each had tables set up promoting their ENERGY STAR® window lines. The MEU was present and provided a consumer education forum. The program circuit rider was also in attendance.

A potential add-on element under consideration would be training sessions for homeowners, contractors, and do-it-yourselfers at these events. This training would focus on the benefits of ENERGY STAR® windows and general information on how to replace existing residential windows with energy-efficient ENERGY STAR® models.

Branding Leverage

An integral and ongoing feature of the program is to leverage the ENERGY STAR® brand. Consumers perhaps cannot be expected to fully comprehend and value U-factors and SHGC ratings. However, they can readily recognize that the ENERGY STAR® label means energy efficiency and environmental friendliness. Thus, the windows initiative continuously

seeks to leverage all outreach aspects of the ENERGY STAR® brand. Program literature, banners, promotions, and communications use the readily recognizable ENERGY STAR® logo. The program also seeks to leverage other programs which promote ENERGY STAR® products in California and nationally, such as the California Residential Lighting and Appliance Program. ENERGY STAR® replacement windows, after all, are just as integral to homeowner interests, as ENERGY STAR® appliances and lighting products.

Additional Market Transformation Concepts

Design activities for promoting ENERGY STAR® windows also have resulted in several new marketing and promotional channels. These are being explored for future program additions. Key additional market transformation concepts include:

Contractor Program. New construction and the homebuilder community are handled largely by the residential new construction program category. However, contractors, either those that specialize in windows or general remodeling contractors handle a large portion of replacement window work. This design element would develop an outreach and education program specifically oriented toward the contractor community for the replacement window market. It would educate contractors on the business aspects of promoting ENERGY STAR® windows, and the benefits to them. These could include marginal, if any, cost premium, better margins, a better quality product, and improved customer satisfaction resulting from improved comfort and lower utility bills. A critically important feature of the contractor initiative would be training in proper installation techniques for energy-efficient windows. Just as in the case with heating, ventilation, and air conditioning, improperly installed windows may sacrifice all of the energy savings available from the unit itself.

Realtor/Mortgage Lender Program. Realtors and mortgage lenders are critical actors in the home resale market. Upgraded windows can be a tremendous selling point on a resale, from both the energy-efficiency perspective, and perhaps more importantly, the aesthetic perspective. Studies have shown that windows, both aesthetically and functionally, are very important parameters in an existing home purchase decision. Lenders have begun to realize the improved risk factors (through lower utility bills) of providing mortgages to energy-efficient homes. This design element would therefore develop educational and outreach materials focused at the realtor and mortgage lender sectors. Materials would explain the value of ENERGY STAR®-rated windows, aesthetically, functionally, and economically. Realtors also frequently meet on a local basis through their local Boards of Realty. This would provide an excellent venue for guest speakerships to promote ENERGY STAR®-rated windows.

Appraiser/Home Inspector Program. Closely allied to the above would be a program component targeted to professional property appraisers and home inspectors. All financed resales are appraised professionally, and the employment of professional home inspectors has been increasing (as housing prices have increased). These groups can exert a very important influence on resale transactions. Like realtors, they are also relatively few in number and congregate periodically through professional associations. Materials targeted toward this group would also explain the value of ENERGY STAR® compliant windows to both the

homeowner and the lender, in the form of reduced utility bills, and increased comfort for the occupants. Appraisers and inspectors could be shown the ENERGY STAR® label, how to determine if a window is ENERGY STAR®, and the value features of ENERGY STAR® fenestration products. SCE is launching an appraiser program along these lines as part of its 2000 Third Party Initiative program.

Landlords. Most rental housing incorporates residential grade windows. From strictly an energy-efficiency perspective, landlords have little incentive to invest in upgrading windows in their rental units, since typically the tenant pays the utility bills. However, landlords are motivated by maintaining their properties as modern and aesthetically pleasing, so as to maintain high occupancy rates. They know that windows are one of the most noticeable features in a rental unit. Updated, easy-to-operate windows are a very positive feature, whereas outdated, stuck, or non-functional windows can affect occupancy. In weatherization programs in New York City, with its very high concentration of multifamily housing, window upgrades are always the single most sought after item by landlords (though they cannot be cost justified on a strictly energy savings basis). This program element would therefore target landlords specifically on the value to them of upgrading to ENERGY STAR®-rated windows, including aesthetics, property value, tenant comfort, high occupancy, and lower tenant utility bills.

Financing. Whole building window upgrades are typically a high cost upgrade project. Often, homeowners must obtain financing. Offering an improved rate-financing package when ENERGY STAR® rated windows are chosen can be an attractive alternative. This intervention strategy also could be closely coordinated with other financing initiatives, such as under the California Window Initiative, which offers $1 per square foot for more energy-efficient replacement windows. The lower cost financing can be structured as an upstream activity in that lower cost money is provided to retailers and contractors, who can then decide if they want to, and in what form they want to, pass these savings along to consumers.

Coordination with HVAC Program. Another design concept which can be explored is co-merchandising window and HVAC upgrades. HVAC contractors can be informed of the value of recommending window upgrades when HVAC systems are changed out, and vice versa. This creates a strategic alliance between HVAC and window contractors, and allows cross leveraging of sales approaches leading to a more comfortable, more energy-efficient home.

New Technologies. Advanced low-e glass coatings, which offer solar heat gain control with little loss of visible light transmittance, low conductivity frame enhancements, and low-conductive inert gas fills are some of the recent window technological advancements. In addition, technology vision roadmaps are being developed by DOE. The Window Industry Roadmap has the following vision statement: "In 2020, consumers recognize windows as affordable 'appliances in the wall' that are active and interactive parts of a true building system." Windows offer added value by providing energy, entertainment, and information with enhanced comfort, lighting, security, and aesthetics in harmony with the natural environment" (DOE 1998).

Conclusions

ENERGY STAR® windows offer residential customers the opportunity to save significant energy costs, and offer significant collateral benefits. In addition, recent research has suggested that, in addition to the immediate energy savings, they can often return their full capital cost in the resale value of existing residences (Nevin et al. 1999). Therefore, transforming the market for residential replacement windows can yield substantial benefits, both from an energy and an environmental perspective.

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