

Market Progress Evaluation Report

ENERGY STAR® Windows, No. 5

prepared by

Quantec

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Final Report

**Market Progress Evaluation
Report for the
ENERGY STAR[®] Windows
Project**

Prepared for:
Northwest Energy Efficiency Alliance

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Executive Summary

The Northwest ENERGY STAR Windows Project has been a great success. The goals of the Northwest Energy Efficiency Alliance's ENERGY STAR WINDOWS Project were to:

- **Increase market share for high-efficiency fenestration products** in the residential new construction and remodel market to 54% after 2001.
- **Decrease at least two market barriers** – lack of awareness and initial cost premiums – that limit sales of high-efficiency fenestration products

The ENERGY STAR Windows Project met and exceeded these goals. Project highlights included:

- ***ENERGY STAR windows have achieved high market penetration.*** In the second quarter of 2001, energy-efficient windows were reported to have 66% market share. The triangulation approach of analyzing penetration through surveys of retailers, wholesalers, builders and remodelers corroborated the reported penetration by manufacturers. The estimated market shares from each of these market actors were similar in magnitude and show the trend of increasing penetration throughout the distribution channel.
- ***The Northwest has high ENERGY STAR penetration relative to rest of nation.*** Experts at D&R International approximate that the national average of ENERGY STAR windows is 25%. By region, they report the Midwest with 30% penetration, the northeast with 35%, California with 30%, and Florida and Texas falling far behind with less than 2% penetration.
- ***Market penetration is increasing and will likely continue to increase.*** Many sources agree that market penetration will increase in the future. Our experts at D&R International believe the number will be 90% in a few years. More conservatively, but still impressive, our Delphi survey of experts expects market penetration of 76% by 2010. All the manufacturers we spoke with in 2000 say that energy-efficient windows are an increasingly larger percentage of sales. This is likely to continue due to changes manufacturing processes that are producing more energy-efficient windows. Further, even without additional funding from Alliance's ENERGY STAR Windows Project, about 40% of dealers say they will continue to promote ENERGY STAR window products.
- ***Cost is becoming less of an issue.*** The estimated price premium of energy-efficient windows above standard windows is between 5-10%.

Delphi study experts predict that most efficiency features costs will fall, leading to overall reductions in the price premium. Additionally, the sheer production focus by manufacturers such as Jeld-Wen, with all of their vinyl window production converting to 100% production of ENERGY STAR windows—will serve to create economies of scale and drive down incremental prices. Yet, for states such as Oregon where code and ENERGY STAR criteria are very close, there may be almost no extra cost for the windows. Further, an important barrier has been the perception of higher costs for ENERGY STAR windows. For example, at the beginning of this evaluation we found that cost was builders' primary purchase barrier. After two years, the price barrier became least important relative to availability and information.

- ***ENERGY STAR windows are “worth the extra cost”.*** The majority of window retailers and wholesalers/distributors say energy-efficient windows are a good value to their customers. Three-quarters of builders say that energy efficient windows save their customers money through lowering energy costs. The overwhelming majority of salespeople in mystery shopped stores mentioned that they believe energy efficient windows to be worth the extra cost.
- ***ENERGY STAR windows are very available.*** For end consumers, we found through the Mystery Shopper Survey that the choice of energy-efficient windows was nearly double that of standard windows.
- ***High customer demand.*** Even without a large consumer push by the Project, there seems to be high customer demand for energy efficient windows. Over half of builders and retailers reported that consumers have high interest in efficient fenestration products.
- ***We attribute the success of the ENERGY STAR Windows Project to following primary factors:***
 1. The implementation flexibility of Alliance, D&R International and implementation staff
 2. D&R International's strategy of targeting and signing “market share hungry” manufacturers to create competition for share within the market
 3. The application of creative, tailored marketing strategies for individual manufacturer partners which created value for the ENERGY STAR to the manufacturers
 4. Relatively small incremental change in U-value (from .4 to .35) that did not require major plant retooling as well as manufacturers desire to keep up with code changes

5. Focus of one very large retailer into promoting ENERGY STAR products in general.

I. Introduction

The goals of the Northwest Energy Efficiency Alliance's ENERGY STAR Windows Project were to:

- **Increase market share** for high-efficiency fenestration products in the residential new construction and remodel market to 54% after 2001.¹
- **Decrease at least two market barriers** – lack of awareness and initial cost premiums – that limit sales of high-efficiency fenestration products.

The ENERGY STAR Windows Project (Project or Energy Star Project) sought to affect energy efficiency awareness and behaviors of key market actors through a variety of Project strategies. Key actors included a wide range – window product manufacturers, regional utilities, building code officials, builders, the manufactured home industry, retailers, wholesalers, and other government agencies. The Project specifically tried to increase the brand awareness and value of energy-efficient windows and to positively influence ENERGY STAR window purchasing decisions.

D&R International, Ltd., the Project implementer of the ENERGY STAR Windows Project, said the foundation of its business is the ability to broker partnerships, building coalitions to build upon relationships within the industry. They began this project in April 1998 and ended June 30, 2001. D&R's scope of work included the following.

- Determine the Northwest window products market baseline and establishing the ENERGY STAR Windows Project
- Develop solutions for major market barriers
- Develop promotional materials and launch awareness and information campaigns
- Conduct marketing
- Seek ongoing feedback to the Project

Structure of this Report

This is our fourth and final report examining the progress of the ENERGY STAR Project in transforming the energy efficiency of the Northwest residential

¹ This original goal was actually exceeded by the end of the year 2000, with the market share rising to 57% ("Northwest ENERGY STAR Windows Project, 2000 Final Report" D&R International).

fenestration market. It examines the Project's performance over the period from summer 2000 through spring 2001, plus longitudinal comparisons to Project results from 1998 through spring 2000. The report updates findings from our first three Market Evaluation Reports, highlights the Project's progress towards meeting its goals, and discusses the Alliance's exit strategy. The main body of this report is divided into eight chapters. This chapter (Chapter I) provides a summary of evaluation methods employed and an overview of the ENERGY STAR Project in relation to market barriers.

Chapter II summarizes the findings on the Project's penetration of the market through first quarter 2001 and data on ENERGY STAR and standard window costs. It also contains the future predictions of market share and prices from a Delphi panel of selected national window efficiency and ENERGY STAR Project experts. Chapter III revisits the impact of the ENERGY STAR Project on window manufacturers' perceptions and levels of energy-efficient production.

Chapters IV and V re-examine window retailers, wholesalers and distributors, and homebuilders energy-efficiency perceptions and practices. Chapter VI presents the findings from a mystery shopper survey. Chapter VII summarizes the overall performance of the Project in the Pacific Northwest and provides recommendations for the Alliance's exit strategy.

Methodology

The following approaches were used for collecting the research and data used for this Report:

1. Review of monthly ENERGY STAR Project reports
2. Interviews with D&R International Project staff
3. Assessment of window manufacturer sales data reports
4. Window manufacturer cost catalogue analysis
5. In-depth interviews of window product manufacturers
6. Surveys of retailers and wholesalers and distributors, and builders
7. Mystery shopper survey to obtain retail cost estimates for different types of windows, as well as the relative absence/presence and prominence of ENERGY STAR window products
8. Use of the Analytic Hierarchy Process (AHP) approach for assessing preferences

The ENERGY STAR Project implementers, D&R International, Inc., provided window manufacturer sales data. Information on market effects was elicited directly from market actors. Surveys of window manufacturers, retailers, wholesalers, distributors, builders, retail customers, and mystery shoppers were conducted between March and May 2001 (Table I-1). Quantec staff interviewed ten regional window manufacturers, 50 retailers, wholesalers and distributors, and 74 builders. Gilmore Market Research also conducted mystery shopper surveys at 13 stores across the Idaho, Oregon, and Washington on behalf of Quantec.

The AHP approach was employed to assess retailers', and wholesalers' and distributors' ranking of the importance of various decision-making factors.² The appendix contains the questionnaires used for the direct elicitation and AHP portions of this study.

**Table I-1
Final Report Survey Summary**

Segment	Completed Surveys	Notes
Window Product Manufacturers	10	A mix of ENERGY STAR participants and nonparticipants across the region by size and type (windows).
Retailers and Wholesalers	50	A mix of ENERGY STAR participants and nonparticipants from the four states
Builders	74	Selected from all four states
Mystery Shoppers	13	Large retail stores in Idaho, Oregon and Washington

Overview of the Alliance's ENERGY STAR Project

The Project's objective was to make the choice of purchasing energy-efficient windows an easy decision for Northwest consumers by using the marketing potential of ENERGY STAR labeling and by offering marketing incentives and promotional assistance.³ Targets markets included new residential construction, multi-family, remodel, and manufactured housing.

² A description of the AHP methodology is included in Chapter IV.

³ The window target is aligned with the U.S. DOE/EPA Northern Region ENERGY STAR criteria. All ENERGY STAR Window products must be rated and certified by the National Fenestration Rating Council (NFRC) and be labeled for both U-Factor and Solar Heat Gain Coefficient (SHGC). One recommended window product designation is made for each of three climate regions: Northern ($U \leq 0.35$, no applicable SHGC), Central ($U \leq 0.40$, $SHGC \leq 0.55$), and Southern ($U \leq 0.75$, $SHGC \leq 0.40$). Skylights must have a U-factor of ≤ 0.45 in the Northern or Central climates and ≤ 0.40 or below in the Southern climate region.

Key partners and allies included window product manufacturers, regional utilities, retailers, wholesalers, distributors, builders, the manufactured housing industry, building code agencies, and other government agencies.⁴ Industry Partners signed a Memorandum of Understanding (MOU) to use the ENERGY STAR logo in advertising, educational, and other promotional materials. In return, they labeled qualified ENERGY STAR products and educated staff on the advantages and selling points of energy-efficient products.⁵

In January 1999, in addition to promotional materials, training, and sales support, the Project began to offer monetary incentives to selected window manufacturers in order to leverage ENERGY STAR windows marketing, advertising and promotional activities. The Project continued to build these relationships through mid-year 2001, and reached out to other market actors (utilities, retailers, builders, glass manufacturers, etc.) to build and leverage the ENERGY STAR Project. The Project met or exceeded all of its goals, and ended on June 30, 2001.

The Northwest ENERGY STAR Windows Project initially set a target U value of 0.30. When the national Program set its standard of 0.35, the Alliance and D&R International recognized the value of maintaining consistency with the national marketplace, and raised the Northwest ENERGY STAR U value target to 0.35. The Northwest ENERGY STAR Project also leveraged national marketing materials with Alliance funds to create an individualized marketing strategy for fenestration-market players.

Intervention Strategies

The Project focused on developing industry partnerships and leveraging these to induce changes in the marketplace. Partnership efforts were initially focused on six large regional window manufacturers, and were expanded throughout 1999, 2000 and the first half of 2001 to include utilities, window component manufacturers, retailers, and builders.

An overall Strategic Marketing Plan was developed to reach a diverse audience with a wide variety of media approaches to increase the brand awareness and value, and to positively influence the purchasing of ENERGY STAR windows. Key messages were that ENERGY STAR windows provide more comfort, have aesthetic appeal, reduce maintenance, provide protection from fading due to sun, and are more energy efficient than standard windows.

⁴ These include DOE, EPA, SEO's, and the NFRC.

⁵ Includes Oregon, Washington, Montana, and Idaho. Skylights must have a U-factor rating of 0.45 for the Northern region, 0.45 and a SHGC rating of 0.55 or below for the Central region, and a U-factor of 0.75 or below and a SHGC of 0.40 or below for the Southern region.

Materials developed by D&R to market ENERGY STAR windows included fact sheets, press releases, brochures, newsletters, trade show exhibits, print media advertisements, special “give-a-ways,” sales team training kits, point-of-purchase materials, and builder sales kits. Media and promotional campaigns have included trade shows, the Street of Dreams, the Parade of Homes, monthly trade association meetings, industry conferences, golf tournaments, and advertising such as promotional banners at special events (e.g., a Seattle Mariners baseball game) to recognize achievements of leading ENERGY STAR partners.

ENERGY STAR Windows Project History/Overview

1998

The first year of the Project focused on building a positive image for ENERGY STAR in the Northwest, particularly in the market sectors that ultimately serve the consumer: utilities, window manufacturers, the building industry, and window retailers. At the beginning of 1998, the Northwest Project was still a separate regional effort. In February 1998, the Alliance supported the decision to move to the federal ENERGY STAR performance level. By spring 1998, the Northwest ENERGY STAR Windows Project was rolled out.

Throughout the remainder of the year, meetings with builders, window manufacturers, and attendance at trade shows in the region continued. A retailer “kit” was developed, premised on a boxed point-of-sale set of materials ready for use by the retailer in the store. By December, the ENERGY STAR Windows Project was working with the window industry to find alternative technologies to make high-efficiency window products without argon gas by using stainless steel spacers, spectrally selective low e coatings, and better frame design. The end result of the new approach is reduced production time and decreased costs for high-efficiency windows.

By the end of 1998, a new marketing direction was developed, shifting emphasis toward marketing incentives and aid to regional window manufacturer Partners. The hope was that the strategy would actively engage industry Partners to achieve higher margin sales to retailers through value-added marketing assistance and simple messages to consumers. The strategy envisioned that retailers in turn would order more ENERGY STAR Window products, thus increasing production by manufacturers of high-efficiency windows, completing the cycle.

1999 – Spring 2000

From 1999 through Spring 2000, ENERGY STAR staff continued to meet with window manufacturers, retailers, wholesalers, distributors, manufactured home

builders, and builders to present marketing strategy, seek cooperation, and provide marketing aid to the six partner window manufacturers that represented an estimated 80% of the Pacific Northwest sales.

Regional partner recruitment was expanded to include manufactured home builders, retailers, single- and multi-family builders, and a window component manufacturer. ENERGY STAR met with utilities (Idaho Power, PGE, Seattle Power, Montana Power, EWEB, etc.) and other potential project partners.

Project marketing materials were developed and distributed to the media, partners and their affiliated window distributors and retailers, and at home shows in all four states. Meetings with builder associations and selected builders continued and public relation plans developed for the single-family, multi-family and remodel sectors. Meetings began again with manufactured home builders, and specific promotional campaigns included television ads to be co-sponsored by partners and a Seattle Mariners baseball game promotion for retailers. Retailer training was held throughout the region. Co-op ads were developed with Parr Lumber and Best Built Windows.

By the end of 1999, the six window manufacturer partners and three window glass and window distributors had made matching contributions to ENERGY STAR of more than \$760,000. Northwest manufacturers' estimated advertising/promotion budgets for 2000 were expected to reach \$1.2 million.⁶

The Project had worked with a total of 33 Partners by the end of 1998 (including window manufacturers, retailers and distributors, manufactured home builders, glass manufacturers, etc.). By May 2000, there were a total of 55 Partners. Much of the increase was attributable to ENERGY STAR Project efforts to add window retailers and distributors.

ENERGY STAR Project efforts during the rest of that year included continued coordination of market approaches with regional utilities, windows manufacturers, their clients and the distribution infrastructure, including:

- Point-of-sale projects
- Continued project training
- Co-operative advertising and promotional projects.

Also included was a "Retailer Round-Up" promotion that kicked-off in July. It was designed to encourage window manufacturer representatives to obtain signed MOUs with their retailers and builders.

⁶ Sharon Spencer and Gary Curtis, D&R, International, Inc., June 23, 2000.

Summer 2000 – June 2001

The ENERGY STAR Windows Project gained momentum in the Pacific Northwest from Summer 2000 through the end of the Project in June 2001. It continued to emphasize window manufacturing and the development of their distribution infrastructures. By the end of the year 2000, the number of active manufacturers rose to 12 (Empire Pacific Industries, Velux, LBL, Philips Products, Insulate Windows, Viking Industries, McVay Brothers, Jeld-Wen, Milgard Windows, Western Window, Alside, and K-Designers). This was a 100% increase from the original six that formed the basis of Project activity in 1999 and represents essentially 100% of windows produced in the Northwest.⁷

The manufacturers across the region continued the process of integrating ENERGY STAR into their business infrastructure. By the end of the year 2000, the ENERGY STAR market share was 57%.⁸ Additionally, Jeld-Wen committed to converting its two northwest plants that produce vinyl windows to 100% ENERGY STAR-qualified products.

Funding for marketing activities was provided to active manufacturer partners (on a very limited basis relative to the previous year), along with continued Project training at the manufacturer and retail levels, and continued assistance with advertising and promotional materials. A competition (“The ENERGY STAR Partner Round-Up”) was also instituted among window manufacturer partners to encourage them to sign-up their builder, remodel, and retail partners into the Project.

A brand new marketing approach was also unveiled in 2000: DrPane.com, a Web site dedicated to providing customers and industry professionals with information about the ENERGY STAR Project and associated window industry partners. The site (www.drpane.com) was introduced in the fall, and refinements continued throughout the winter and into Spring 2001.

D&R International redesigned the site to more effectively communicate with its visitors in 2001. As part of the Project’s exit strategy, D&R International acquired the site at the end of the contract period. The company’s current plan involves a partnership with Jeld-Wen, where Jeld-Wen is the licensee and the owner with D&R as the operator. Therefore, the site will not be a site for sales of Jeld-Wen products, but their windows will be highlighted as energy efficient options.

⁷ July 2001 telephone interview with D&R International’s project leaders. Note that there are a few small non-participating, boutique manufacturers that produce specialty windows.

⁸ “Northwest ENERGY STAR Windows Project, 2000 Final Report” D&R International.

Other, non-window industry market actors have also expressed interest in the Dr. Pane marketing approach. Some appliance, lighting, and HVAC manufacturers have expressed are exploring an affiliation with DrPane.com. These conversations are still in the very early stages, but D&R International believes that the site could provide a vehicle for cross-promotion activities between different manufacturing actors.

Exit Interviews with D&R International

Quantec held exit interviews with two senior ENERGY STAR Project managers from D&R International to elicit their views on the Project strengths and weaknesses. Both managers were very impressed with the success of this Project. When asked what led to success, they mentioned the following:

- ***Leveraging resources and creating competition.*** Rather than only promoting the environmental and energy saving aspects of ENERGY STAR windows, they pushed the approach of gaining market share of manufacturers. By leveraging Alliance funds, D&R was able to target and sign manufacturers who were hungry to gain share. This created a snowball, bandwagon effect in the marketplace and led to significant increases in penetration.
- ***Tailored incentives and creative marketing expertise.*** D&R spent time learning the individual needs and strategies of manufacturers in order to give tailored advice and incentives to promote market share for each manufacturer.
- ***Technical assistance.*** Offering technical assistance and ideas to manufacturers allowed significant price barriers to fall. For example, early in the Project, they helped manufacturers to create a low-cost, high-efficiency alternative to argon fill.
- ***Alliance flexibility.*** D&R International also credited the flexibility of Alliance Project Management toward marketplace realities. This flexible implementation approach allowed D&R to change its methods as the market changed, and allowed for the tailored, manufacturer-specific assistance mentioned previously.

One aspect of the project that struggled was the Loan Program, which was initiated in 2001.⁹ D&R International felt that the late start and funding limitations did not allow this program to rise to the potential shown in California.

⁹ An analysis of the Loan Program was not part of this Project Evaluation work scope, so the exit interviews represent the only information collected on this aspect of the Project.

Relative to the rest of the country, the Northwest's penetration is outstanding. One manager approximated ENERGY STAR penetration at 25% as the national average, the Midwest at 15%-20%, Northeast at 35% and Florida and Texas with less than 2% penetration. Therefore, the Northwest's most recent estimate of 66% is impressive, yet D&R International believes this number will rise to 90% within a few years.

In terms of consumer opportunities, one manager sees an opportunity for education and marketing of ENERGY STAR to consumers in Washington State due to the lenient code requirements¹⁰. However, he also noted that if Washington codifies standards of new construction, the need for a consumer push is not as great.

Market Barriers and Project Intervention Strategies

Table I-2 presents a brief summary of market barriers and Project intervention strategies identified for key market actors. Issues identified as potential market barriers to transformation of the Northwest windows market included lack of awareness, lack of information, first cost, split incentives, bounded rationality, product inseparability, and lack of availability. Lack of awareness and lack of information are self-explanatory; if end consumers cannot define the parameters of a product because they lack information, they cannot meaningfully express their demand for it in the market.

The problem of first cost is illustrated by manufacturers and retailers who produce and market a better, but more costly, good (such as energy-efficient windows) that must compete with a wide array of cheaper, although inferior, products. Split incentives is the issue that those who must incur the initial cost of a better, but more costly, product (such as builders) may not also incur the benefits of that product. This is particularly the case when the product is energy-efficient windows, which have higher initial costs for the builder but provide a steady stream of energy savings and other benefits to the end user over the lifetime of the measure.

Bounded rationality refers to the problem that end consumers may not be able to evaluate the cost-effectiveness of energy-efficient windows due to the amount of information required to make a meaningful decision. Product inseparability is best illustrated by the dilemma that the new homebuyer faces when he or she tries to choose a new house – house style, location, price, and windows are all dimensions

¹⁰ Washington requires a less efficient window for houses with heat pumps or gas heat. Requirements: East of the Cascades, U-value of .6, West of the Cascades, U-value of .65. Homes with electric heat are required to have .4 U-value windows.

of a bundled good that cannot be meaningfully separated. Lack of availability refers to whether a product, such as high-efficiency windows, are available in the marketplace.

**Table I-2
Market Barriers and Intervention Strategies**

Market Actor	Market Barriers	Intervention Strategies
Window Manufacturers	<ul style="list-style-type: none"> • Lack of Information • First Cost 	<ul style="list-style-type: none"> • Developing strategies to facilitate the production and lower the cost of producing ES Windows • Signing MOUS (marketing grants) to promote marketing of ES Windows • Marketing promotions • Dissemination of information through design and provision of brochures, advertising, articles, media spots, point-of-sale kit, etc
Retailers and Wholesalers/Distributors	<ul style="list-style-type: none"> • Lack of Information • First Cost • Split Incentives • Bounded Rationality 	<ul style="list-style-type: none"> • Signing MOUs to promote marketing of ES Windows • Marketing promotions • "Buddy Calls" to manufacturer representatives • Dissemination of information through design and provision of brochures, advertising, articles, media spots, point-of-sale kit, etc. • Providing training materials for retail staff
Builders/Developers	<ul style="list-style-type: none"> • Lack of Awareness • Lack of Information • Split Incentives 	<ul style="list-style-type: none"> • Signing MOUs to promote marketing of ES Windows • Advertising in magazines • "Buddy Calls" to manufacturer representatives • Ongoing promotion and attendance at home builder shows • Trade association advertising and public relations contacts • Development of sales kits
New Homebuyers/Remodelers	<ul style="list-style-type: none"> • Lack of awareness • Insufficient information • Lack of Availability • Bounded rationality • Product Inseparability 	<ul style="list-style-type: none"> • Promotions at home and garden, remodeling shows • Point of sale displays • New labels on windows • Increasing availability and lowering cost through upstream interventions (e.g., with manufacturers and builders)

II. Today's Market and Future Predictions (Market Assessment)

The Alliance set the goal of increasing market share of high-efficiency fenestration products to 54% of the residential new construction and remodel market. This goal was to be achieved by decreasing at least two market barriers – lack of awareness and initial cost premiums. Baseline evaluations done in 1997 showed an estimated ENERGY STAR level windows market baseline share in the Northwest of 10%–15%. The overall ENERGY STAR market share for 2000 was estimated at 57%, and the second quarter 2001 market share was estimated at 66%.

Market Share

Product market share for this Report is derived from a number of sources, including:

- 1998, 1999, 2000, and first and second quarter 2001 window sales figures from participating Northwest window manufacturers
- In-depth interviews of window product manufacturers, retailers and wholesaler/distributors, and builders
- Surveys of retail sites and consumers

Northwest market sales penetration for ENERGY STAR rose over the course of the Project. Before the Project began in 1997, 10%–15% was the estimate of sales penetration. By the end of 2000, this figure increased to 57%¹¹ and rose further to 66% in the second quarter 2001.

Using a triangulation approach for finding penetration in the marketplace, Quantec conducted surveys with retailers, wholesalers and distributors of window products, and homebuilders. Table II-1 provides a summary of the data sources collected and analyzed to date. In general, these data support the penetration rates as reported by manufacturers. Thus, the trend in penetration is increasing throughout the distribution channel.

¹¹ Source: Northwest ENERGY STAR Windows Program 2000 Final Report- D&R International; AAMA manufacturer sales data 2000.

Table II-1
ENERGY STAR Windows Market Penetration

Sources	Reported Penetration		
	1998	1999	2000
Window Manufacturers Sales Data ¹	38%	54%	57%
Retailers, Wholesalers, and Distributors ²	40%	53%	52%
New Homes			
• Single-family ³	35%	36%	63% ¹²
• Multi-family ³	44%	38%	79% ¹²
• Manufactured ⁴	19%	NA	NA
• Weighted Average of SF and MF homes	37%	37%	65%
Remodeled Homes ⁶	66%	64%	NA

¹ Monthly sales data provided by the D&R International, early 1998 data provided by AAMA

² Quantec retailer, and wholesalers and distributors 1998, 1999 and 2000 Project year surveys

³ Quantec builder 1998, 1999 and 2000 project year surveys.

⁴ Personal communication, Bob Davis, Ecotope, May 3, 1999.

We also obtained data on the total Northwest windows manufactured, and single- and multi-family housing starts. From there, we estimated the size of the ENERGY STAR market utilizing the market penetration information above. The market size estimates are contained in Table II-2.

Table II-2
ENERGY STAR Market Size: Year 2000 Sales in the Northwest

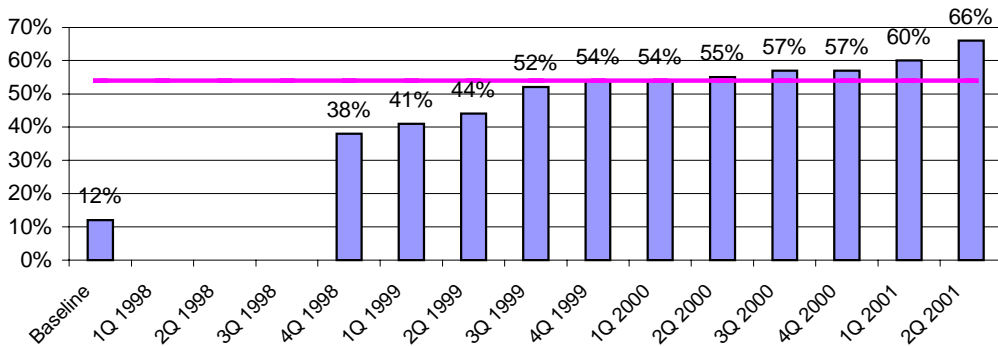
	2000 Northwest Total Market Size (thousands)	2000 ENERGY STAR Penetration (Table II-1 above)	Estimated NW ENERGY STAR Market Size (thousands)
Window Manufacturers Sales Data ¹ (unit: window)	3,918	57%	2233

1) Sum of 2000F Prime windows, skylight and patio doors from 2000 Northwest and Mountain Market for Windows and Doors-Ducker Research Company. Mountain estimates are created using the population proportion of Idaho and Montana.

Figure II-1 shows quarterly ENERGY STAR window penetration estimates sales reported by window product manufacturers.

¹² In 2000, the builder survey reported a weighted penetration of 63%, slightly higher than reported by manufacturers. Given the small sample size, this does not differ significantly from the 57% manufacturer reported penetration.

Figure II-1
ENERGY STAR Window Sales by Northwest Manufacturers:
1997 through 2nd Quarter 2001*



* Source: Monthly sales data provided to D&R International by manufacturers, and quarterly smoothing conducted by Quantec. Early 1998 data provided by AAMA.

Experts at D&R believe that the market penetration jump from the 1997 baseline of 12% to 38% by the fourth quarter 1998 was due to a rapid technical transformation of the market. In early 1998 the Project aided technical advances in reducing the cost of energy efficient windows. Specifically, most manufacturers were using argon fill as their method of creating ENERGY STAR qualifying windows. Yet, this method of production is nine times slower, and thus, much more costly (due to the time involved, not due to the material costs), than production of standard windows. With help from the Project, manufacturers were able to utilize new production techniques to create ENERGY STAR qualifying windows without argon. These included frame design changes, low e coatings, steel spacers, and automatic spacer systems.

Two tests ultimately measure the success of a market transformation project; first, whether the market is measurably transformed, and second, whether that change “locks in” the gains made through the Project intervention. In the first case, we find that the Northwest ENERGY STAR Project is correlated with a rapid, consistent increase in market sales of energy-efficient windows. Indeed, the Alliance’s goal of 54% market penetration was reached by fourth quarter 1999, a year earlier than expected.

In the second case, only the passage of time will provide definitive proof of whether the transformation of the market to ENERGY STAR levels of efficiency is permanent. However, all major manufacturers are producing ENERGY STAR window products, and the largest window and door manufacturer has agreed to produce 100% ENERGY STAR products, so we assume that “sliding back” will be difficult. Also, as described later in this chapter, we successfully applied Delphi

forecasting methods to help ascertain with reasonable probability the likely future of ENERGY STAR residential window penetration.

Window Costs

We developed estimates of the incremental costs for ENERGY STAR windows using a standard 5' x 3' horizontal slider window. We obtained catalogues of window manufacturer and dealer retail costs.¹³ Information for the standard unit was then summed and weighted by proportion of sales for each manufacturer in the Northwest.

The results are summarized in Table II-3, along with the results of a regression analysis performed by the Alliance on window prices from Consumer Reports.¹⁴ Cost statistics include total costs for ENERGY STAR and standard windows, the incremental cost (absolute, percentage, and per square foot) of ENERGY STAR windows, the U-value difference between ENERGY STAR and standard windows, and the incremental cost per U-value increment.

The first three represents a simple average, the second row shows a simple average excluding one very high-priced store (ENERGY STAR and standard windows), and the third row has a weighted-average of prices by manufacturer share, respectively. The fourth row contains the simple average for seven brands where ENERGY STAR is not the standard window, and the fifth row contains the regression results.

¹³ There were 14 outlets in total (minus 1 case, which was out of range). The total number of brands was 12 (11 if Summit and WENCO counted as one): Amsco, Best Built, Capital, Clawson, Insulate, McVay, Milgard, Pacific, Jeld-Wen (Summit and WENCO), and Western. The geographic locations were as follows: 10 OR/WA, 4 ID/MT (Boise, Spokane, Seattle, Missoula, Butte, and Portland).

¹⁴ Consumer Reports October 2000 pp. 42-45

Table II-3
Alternative Approaches to Determining Incremental ENERGY STAR Window Price

Approach	No. Brands	No. Outlets	ENERGY STAR	"Standard"	Total Incremental \$	Incr. %	Inc. \$ per Sq Ft	Standard U to ES U factor	U to U units	Inc. \$ Sq Ft/U Interval
Simple Average	12*	14	\$146.05	ES & non-ES \$139.03	\$7.03	5%	\$0.47	0.39 to 0.33	6	\$0.08
Simple Average (one outlier removed)	12*	13 (1 case out of range removed)	\$141.82	ES & non-ES \$134.78	\$7.07	5%	\$0.47	0.39 to 0.33	6	\$0.08
Average Weighted by Brands' Market Share**	11**	13 (1 case out of range removed)	\$147.33	ES & non-ES \$141.29	\$6.04	4%	\$0.40	0.39 to 0.34	5	\$0.08
Simple Average (one outlier removed; cases pulled for ES = Standard)	8	7 (1 case out of range removed)	\$134.59	\$121.20	\$13.39	11%	\$0.89	0.44 to 0.34	10	\$0.09
Regression on Consumer Report's window prices	16						\$0.75	0.40 to 0.35	5	\$0.15

* Summit and WENCO are counted as different brands although both are made by Jeld-Wen

** Summit and WENCO counted as one brand.

The first three analyses indicate that the average incremental cost is approximately \$7 per window (\$0.50 per square foot window, \$0.08 per square foot U-value increment). The regression analysis and the simple average of the seven brands where ENERGY STAR is not the standard show somewhat higher estimates, but these are probably less accurate measures because they are based on older (i.e., the regression) or partial data.

In a Mystery Shopper survey conducted by Gilmore Research on behalf of Quantec, a limited sample of 13 Northwest stores showed similar, yet slightly higher, results (Table II-4).¹⁵

**Table II-4
Incremental Cost of Energy-Efficient Products: Mystery Shopper Results**

	Incremental Cost (% of standard cost)
Horizontal Slider	9.4%
Patio Door	8.4%
Skylight	8.7%

Cost Effectiveness Assumptions

Given recent market changes and success of the Project, we believe some the cost-effectiveness assumptions should be revisited.

- ***Retrofit market share.*** The April 2000 report prepared by Ducker Research Company, reports that the US residential remodel market is 21.6% and the replacement market is 25.8%. This combines for a US residential retrofit market of 47.4%, which is would make a large difference in savings models.
- ***Electric heat saturation. Consider updating the electric heat saturation values for new and existing housing on a regular basis as these are trending down.***
- ***Many windows on the market surpass ENERGY STAR requirements:*** Current savings are based on a U value of 0.35 but many of the windows that meet that standard also exceed that and these additional savings are not included in the calculations.
- ***Market effects.*** Given current ENERGY STAR penetration of 66% and forecasted increases, the current assumptions of 54% for 10 years appear

¹⁵ A detailed description of the Mystery Shopper Survey and Results is provided in Chapter VI.

to be too low. Retroactive to the beginning of the Project, we recommend that the Alliance use the share data in Figure II-1 (i.e., 66% after the first 3 years), 75% after 5 years and 90% after 10 years.¹⁶

The Future of ENERGY STAR in the Northwest: Delphi Study

The Delphi forecasting technique was based on the pooled knowledge and judgement of selected national window efficiency and ENERGY STAR Project experts. This information was utilized to predict what the windows market would look like five to ten years from now. We asked these window experts to provide their judgements of the future of window energy efficiency in terms of future residential window U values, estimated incremental costs of ENERGY STAR equivalent windows, energy codes, and the direction of the national ENERGY STAR effort. The resulting “pooled” predictions indicate a remarkable level of agreement on the future of high-efficiency windows and an indication of continued transformation.

Delphi Methodology

The Delphi method is a qualitative method of forecasting that utilizes successive polls of experts over time. Each expert is individually polled for his or her forecast. Those experts whose forecasts lie outside the middle of the distribution are asked to provide their reasons why their judgement was appreciably higher or lower, thus adding information to the forecasting process.¹⁷ Findings are then provided anonymously to the whole group. The process is repeated until the forecasts appreciably converge and stabilize.

Twenty-five experts agreed to participate in the Delphi panel; 23 finished the complete process. Experts were chosen for their knowledge of the energy-efficient window market based on their roles in manufacturing, sales, building, or national/regional projects. Each was individually polled via e-mail (or fax if necessary) for their forecasts. The results were then summarized and provided to the whole group again, along with general group findings. It was necessary to poll the Delphi panel only twice before results substantially converged and/or stabilized on most major indices. Forecasts were developed for market penetration

¹⁶ These estimates for the future are based on the exit interviews with D&R International and the Delphi panel projections. Linear trends are appropriate for the “in-between” years.

¹⁷ Note that the hoped-for trend towards central tendency based on inclusion of additional information may or may not be also linked to a directional shift of the entire distribution. The Delphi method produces fair to very good short-, intermediate-, and long-range forecasts. Thomas W. Knowles, Management Science: Building and Using Models, Stuart School of Business Administration, Illinois Institute of Technology, 1989, pp. 651-653.

and incremental costs. Participants were also probed for their predictions of future energy efficiency goals and Project strategies.

Specific steps followed to develop the Delphi forecasts were as follows:

- **Step 1:** A list of “experts” knowledgeable about window energy efficiency through their Northwest or national roles in manufacturing, sales, building, etc., were selected to participate, based as shown in Table II-5.

**Table II-5
Delphi Participants**

Source	“At Large” Experts	Project Experts	Large Manufacturers	Large Dealers	Large Builders
Internet Search	5	3			
Project Knowledge		2			
Interview Contacts			5	5	5

- **Step 2:** Participants were then invited into the Delphi forecast by telephone, followed by a formal letter of invitation stating the terms of participation and the specifics of the process to be followed. If a specific participant was unable to participate in three rounds of polls, he or she was replaced by another “eligible” from the list.
- **Step 3:** The experts were then given certain current baseline information based on our to-date evaluation findings and then asked to forecast results for these parameters five and ten years out in the first wave of Delphi polls.
- **Step 4:** Those who provided forecasts substantially different from the majority of the group in the first poll were then asked to provide their reasoning. The logic for their choices was then provided anonymously to the Delphi experts along with overall panel findings (mean, range, and standard deviation).
- **Step 5:** All participants were then re-pollled and the degree of convergence assessed. As the majority of forecasts had appreciably converged in the second Delphi round, results were analyzed and provided to the panel of Delphi experts.

Delphi Results

Window Features. The panel of experts were queried as to which window features were necessary to reach U values ≤ 0.35 (the current ENERGY STAR

Northern Tier U value), as well as the even more energy efficient U values of ≤ 0.30 and ≤ 0.25 at minimum cost.

Table II-6
Features Necessary to Reach Alternative Window U Values

Feature	U < 0.35	U < 0.30	U < 0.25
Double Pane	Required	Required	Medium
Low E hard Coat	Low	Low	Medium
Low E Soft Coat	Required	Required	High
Argon Gas	Medium	High	High
Triple Pane	Medium	Medium	High
Frame	High	Required	Required
Spacer	Required	Required	Required
Other High Efficiency Materials	Medium	High	Required

Recommendation	% Experts Mentioning Feature as Component
Required Feature	> 90%
High	75%-89%
Medium	50%-74%
Low	< 50%

We observed two patterns in Table II-6: (1) an increasing importance of certain factors at lower (more efficient) U values, and (2) a falling importance for some features that are prominent in current ENERGY STAR windows. Double pane glass and low E coatings are required by most experts for U values of 0.30 or higher, but are insufficient to achieve a 0.25 U value. Conversely, the remaining features become more prominent with U values of 0.25.

Cost Trends by Window Feature. Experts predicted a wide variance in cost trends by feature over the next five years. Table II-7 shows the predicted cost trends. Approximately 80% of experts agreed that there would be drops in the cost of most features including glass, low e soft, coat argon fill, and warm edge spacer. On the other hand, the experts predicted that other high efficiency materials and advanced window frame design would increase in cost.

**Table II-7
Cost Trends by 2005**

Feature	Predicted cost trend over next 5 years	% of Experts Agreeing
Glass	-19%	83%
Low E Hard Coat	-50%	64%
Low E Soft Coat	-25%	82%
Argon Gas Fill	-23%	80%
Window Frame Design	29%	85%
Warm Edge Spacer	-11%	77%
Other High Efficiency Materials	67%	80%

Those experts who disagreed with the above findings provided a variety of comments.

- Five argued that the cost of glass could not drop any further because it was a largely mature technology.
- One expert predicted that the low e hard coat technology would vanish within the next five to ten years, presumably fully replaced by the low e soft-coat technology.
- Four experts thought that the cost of advanced window frame design should decrease, not increase.
- Three experts thought that the costs of warm edge spacer couldn't decrease much more than now.
- Four believed it more reasonable to predict a price decrease in high efficiency materials than an increase.

Northwest Market Penetration. Up-to-date findings on available manufacturer sales data were provided to the Delphi Panel for the first round of polls. Market experts were asked, based on this information and their own knowledge and expertise, to provide estimates for high-efficiency market penetration in 2005 and 2010. The average of scores stayed relatively the same. However, while most experts did not change their original answers, the range of responses diminished, indicating convergence over the two polls. The average predicted market penetration rate of $U \leq 0.35$ windows was 64% by 2005 and 76% by 2010.¹⁸ For

¹⁸ Note that respondents were unaware of the penetration of 57% by the end of year 2000 and 60% in the first quarter of 2001. We believe their projections would have been even higher had these recent statistics been available.

the higher efficiency value of 0.30, the average predicted market penetration was 11% and 27% (by 2005 and 2010 respectively).

**Table II-8
Northwest Market Penetration**

U Value	U ≤ 0.35		U ≤ 0.30	
	Mean	Range	Mean	Range
2005	64%	35%-80%	11%	0%-35%
2010	76%	40%-95%	27%	1%-75%

Of those four experts who did change their U ≤ 0.35 predictions in the second Delphi round on window predictions for 2005, one indicated that he thought that those markets with varying penetrations of energy-efficient windows (e.g., Washington and Oregon) will ultimately even out in the long run. Of those three who changed their comments for 2010, one expert argued that it would take serious intervention to get above 70% in the foreseeable future.

The experts had less confidence in their predictions of market penetration for windows meeting the U ≤ 0.30 energy efficiency threshold, especially five and ten years out. Six of the 21 respondents revised their original predictions from the first poll.

Their comments were as follows:

This technology has not reached the level of practicality and affordability necessary to capture a larger market.

By the end of 2005, manufacturers will be looking at retooling their plants again and will begin to explore different frame materials, which should support the higher efficiency levels.

If it were not for the non-electric energy efficiency code in Washington, the tradeoff methodologies offered under the electric code would provide support for the move to this higher standard. Unfortunately, the non-electric code undercut this possibility.

I still think that the importance of these technologies will be significant in the market only if there is either utility projects or code language that encourages their use.

The building industry will resist, and I don't see the market moving without it. The next generation of windows will have composite frames, replacing vinyl, implemented between 2005 and 2010. It will require high energy costs, deregulation, and utility support.

National ENERGY STAR Forecast. We asked the Delphi panel to predict the average national U factor and market penetration rate of ENERGY STAR windows by 2005 and 2010. They were provided with an estimate that ENERGY STAR windows comprised 20%-25% of the national market in 2000.

**Table II-9
National ENERGY STAR Market Forecast**

U Value	ENERGY STAR U Value		Market Penetration	
	Mean	Range	Mean	Range
2005	0.45	0.30-0.65	36%	24%-52%
2010	0.41	0.27-0.50	49%	23%-75%

Although there was some movement between the first and second Delphi polls on the predicted U value, experts stuck to their initial predictions of market penetration through both rounds as a rule. Some experts still did not believe that the market would change so quickly; one said “if we got to a national U factor of 0.65 [in 2005] we’d be doing great. I still have divisions across the country that make single-pane glass.” At the other end of the predicted U value range, another expert commented that, by 2010, it would be difficult to reduce the national U value below 0.27 because “there’s basically little we can do (technically) to reduce U values from 0.32. The next step will be foam-filled extrusion in combination with ceramic or foam spacers which would take us somewhere around 0.26-0.28.”

Future Incremental Prices. The panel of experts was provided with information on quotes for current window prices for a standard 5’ x 3’ horizontal slider window with an average incremental price of \$0.50 per square foot for moving from a U Factor of 0.39 to 0.33 (or about a 5% incremental difference).¹⁹ Results of their incremental cost predictions for 2005 and 2010 are shown in Table II-10.

¹⁹ An approximate average per square foot cost of \$0.50 was utilized based on the results of the manufacturer catalog cost analysis described previously.

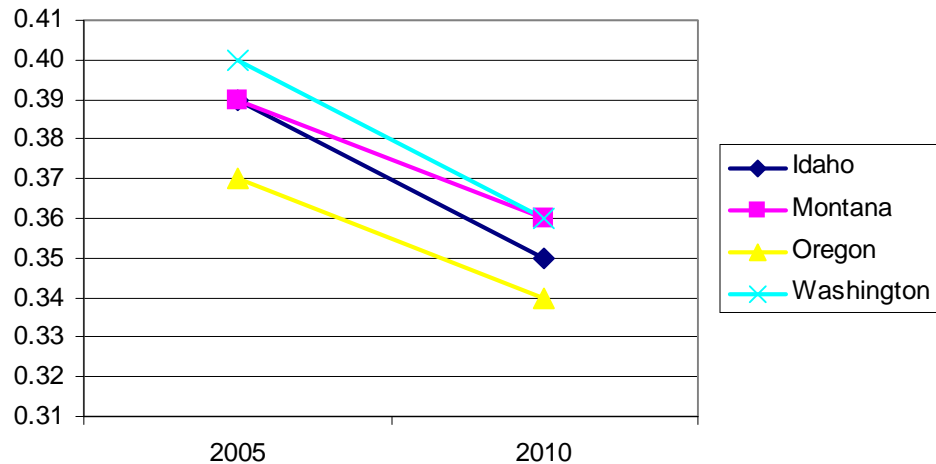
**Table II-10
Predicted Incremental Prices**

Year	Mean	Range
2005	\$0.42	\$0-\$1.28
2010	\$0.54	\$0-\$2.50

Although the arithmetic means were \$0.42 and \$0.54 for 2005 and 2010 respectively, these values are skewed upwards by a few experts' predictions. Of these experts, one argued that inflation, the rising costs of energy, fuel, labor, and materials would have to significantly inflate the costs per square foot. However, 17 out of 18 in 2005 and 16 out of 19 in 2010 predicted incremental costs of less than \$1.00 per square foot.

Future Northwest Energy Codes. The Delphi panel was asked to try to predict the energy efficiency codes in the Northwest (Idaho, Oregon, Montana, and Washington) by 2005 and 2010 in round one. In Round 2, respondents were asked to indicate their agreement (or disagreement) with the tabulated averages. Figure II-2 shows a graphic representation of the trends as predicted by the great majority of window efficiency experts.

**Figure II-2
Predicted State Code Trends**



Experts pointed out that Idaho's bulk of new home construction is in the Treasure Valley (Nampa-Boise) area, where enforcement of the Idaho Residential Code is nearly zero and the "perceived" demand for entry level (i.e., low-cost) housing appears to drive builder decisions. They also noted that Idaho has not had great success in getting codes adopted. One expert vehemently disagreed with the

predictions for Idaho, saying “there isn't likely to be an energy code in Idaho, let alone a stringent one [in the foreseeable future]”.

Montana also has not had great success in getting codes adopted, but the colder weather tends to create a need for more energy-efficient windows. The market itself may continue to drive builders towards more energy-efficient window alternatives.

Oregon, the experts said, had a better political climate to achieve ENERGY STAR or better standards, despite its relatively mild climate overall. Experts predicted that current and future escalating energy costs would most likely aid the improvements predicted in the Oregon energy efficiency code.

The experts' perspectives were split on the future of energy codes in Washington. Some felt that current and future escalating energy costs, along with the proximity of Oregon's predicted increases in energy efficiency, would move Washington to more energy-efficient standards or even up to Oregon's energy efficiency standards. Others believed that the political climate in the state was not particularly supportive of aggressive increases in energy efficiency.

Market Barriers.

- In Round One experts were asked for their perceptions of continuing barriers to energy-efficient windows in the Northwest and nationally. They were given a chance in round two to review the summarized comments and add any additional thoughts. Following is a summary of what the experts believe to be continuing barriers to high-efficiency windows beyond 0.35. ***Low energy costs act as a barrier to raising awareness of the benefits of energy-efficient windows.*** Low energy costs were mentioned as a barrier to energy-efficient windows in the first round; by the time of the second round, the California energy cost crisis had hit with resulting positive effects on consumers' awareness of the benefits of energy-efficient windows. At least one expert in the second round argued that energy costs and deregulation were likely to provide strong incentives to consumers – driving consumer education and awareness of windows as an energy-saving device.
- ***Lack of government action in developing, implementing, and enforcing standards is a barrier to increasing energy efficiency in windows.*** The federal government's slowness to establish national standards and incentives for energy-efficient windows was also mentioned as a barrier, as was lack of code enforcement on the state and local level. The general lack of incentives, which, if available, usually are provided by utilities to customers who retrofit homes was also

mentioned as a barrier. Therefore, the fact that U. 35 is now commonplace is because of ENERGY STAR -type programs, not due to legislative codes.

- ***Building codes and process standards can act as a barrier to use of energy-efficient windows.*** Technical issues in developing national window energy efficiency standards (e.g., U value improvements vs. annual energy impacts) sometimes confused the issue. For example, some reductions in U values could increase energy use if solar tradeoffs are not addressed, particularly in milder climates. The ENERGY STAR standards were also noted as having little or no discussion of cooling issues and shading, which is pertinent in some climates. Technical issues, particularly the increased energy efficiency in codes, which can lead to problems of air circulation and exterior condensation on windows when energy-efficient windows are added, were mentioned as a potential barrier to high-efficiency windows.
- ***In a low-margin, highly competitive industry, window manufacturers face barriers of cost of developing new products.*** Manufacturers are also considered to be resistant to new products as a result of this issue.
- ***On the retail level, lack of knowledge and high turn over of retail staff and sales people*** is as a barrier to increasing the sales and awareness of energy-efficient windows.
- ***Windows were noted as being only one, less understood, component of a home, leading to decisions based on first cost rather than lifecycle cost.*** Builders need more information so that they can understand the benefits of energy-efficient windows in marketing new homes and increasing home value; they now make window decisions based on first cost. Customers lack window energy efficiency awareness – they need to be educated, as do builders, on the benefits versus costs of energy-efficient windows.

ENERGY STAR: Future Directions. In order to reach both the Northwest and national predicted levels of energy efficiency, the experts said that certain things would need to occur. They agree that technology advances, more efficient energy codes, and higher fuel prices are necessary to drive a change toward more energy-efficient windows.²⁰ As market penetration increases, the cost of producing larger volumes of efficient windows will go down. As more states adopt, implement,

²⁰ For example, one expert said that, for the predicted levels of efficiency to occur, vinyl window frames must take hold in the southern US and warm edge spacers and low-e glass must become standard. Another noted that technical advances should include continued improvements in selective emissivity coating and frame technology that improve performance while reducing cost premiums.

and enforce more stringent energy codes, more efficient products will become available in the market. Even though codes serve as a minimum, the efficiency levels in markets with codes will tend to move upwards because some less-efficient product options will no longer be available. The experts also believed that increased manufacturing experience with high-efficiency windows will result in increased standardization, and more complete analyses of the benefits of energy-efficient window components and features. They said that this would result in more manufacturers committing to more efficient product lines and, ultimately, to more consumers demanding more efficient window products.

Experts' Recommendations.

- Continued research on promising energy-efficient window technologies and components.
- Federal government action on global climate change.
- Continued promotion of ENERGY STAR brand and Project at the national level, including the following specific actions:
 - Simplified national energy rating requirements, including a simplified annual energy rating for windows, clarification of the role of cooling impacts, increased consideration of the impacts of solar gains relating to home design and building envelope efficiency, and increased attention to the role of energy-efficient windows on indoor air quality as homes are made more energy efficient
 - Pressure should be put on the U.S. Department of Housing and Urban Development (HUD) to adopt ENERGY STAR level efficiencies in HUD window standards and recalculation of efficient window cost effectiveness calculations based on new fuel prices for both site-built and HUD code homes. HUD code applies to manufactured housing.
 - Federal residential tax credits for ENERGY STAR windows at energy efficient levels 30% to 50% above model energy codes
 - Continued research on promising energy-efficient window technologies and components
- Increased state energy code efficiency requirements for windows and strong enforcement of those codes
- Continued active involvement of the Northwest states promoting ENERGY STAR and regional organizations at the national level. The region should also push the U-values in energy codes through intensive work with the governors of the western states most affected by the

recent energy crisis. A few states actually *can* make a difference in the national forum.

- Utility support for ENERGY STAR efforts in local markets in order to ensure further increases in window energy efficiency.
- Increased marketing to builders and homeowners to increase their awareness of window energy efficiency and its benefits will be necessary to ensure that they understand the benefits of energy-efficient windows, even to the extent. One expert went so far as to recommend incentives be provided to builders for installing energy-efficient windows.
- Inclusion of installation standards and procedures as part of the window package at the retail level is key in guaranteeing performance.
- ENERGY STAR marketing should include consumer tips on contractor selection and proper installation when marketing ENERGY STAR products.

III. Manufacturers Survey

Window manufacturers, like all other manufacturers, base their production decisions on actual or anticipated demand for their products. Their profit motives are driven by their major client needs downstream. This chapter examines the changes in window manufacturers' perceptions and behaviors regarding ENERGY STAR and ENERGY STAR-equivalent energy efficiency window products since our last interviews with manufacturers.

Methodology

In order to understand their needs and perceptions, Quantec conducted three waves of interviews, each one year apart, with Northwest window manufacturers.²¹ A few of these, including Jeld-Wen, Empire Pacific Industries, Insulate Industries, Philips, and Milgard Manufacturing, are responsible for the majority of the regional sales. Ten window manufacturers were interviewed for this Report. Residential window sales by these manufacturers are estimated to comprise approximately 65% of windows sold in the Northwest during 2000.²²

For each interview, we attempted to reach the most senior marketing person available. The quotas for the three rounds of interviews ranged from ten to fifteen manufacturers, focusing on the largest companies plus a number of smaller companies (Table III-1).²³ By 2000 all the manufacturers had participated as a partner in the Northwest ENERGY STAR Windows Project during the previous two years.

Effort was made to ensure that the third wave of interviews included manufacturers (and the same respondent, if possible) interviewed in the first and second rounds. D&R International, Ltd., provided the initial sample of manufacturers to which additional names were added.

²¹ Skylight manufacturers were also contacted during the first two studies.

²² Confidentiality concerns prevented direct computation of market share for individual manufacturers.

²³ The increase in the 1999 quota was to ensure that the viewpoints of more skylight manufacturers were included.

**Table III-1
Manufacturer Samples 1998-2000**

Interview Date	Program Year	Interviews
March 1999	1998	10
March 2000	1999	16
April 2001	2000	10

The manufacturers were asked a number of direct elicitation questions during interviews, including:²⁴

- Is the market for high-efficiency fenestration products increasing, decreasing, or staying the same? Why?
- What is the difference in production costs and prices between regular and high-efficiency fenestration products?
- What are consumers willing to pay for high-efficiency fenestration products?
- What are the major market barriers to high-efficiency fenestration products?
- What can be done to decrease these market barriers?
- What are the strengths and weaknesses of the ENERGY STAR Fenestration Project?
- Are manufacturers labeling ENERGY STAR products?

Data Analysis

Sales of High-efficiency windows

Nearly all of the manufacturers indicated that an increasing percentage of their windows sales were from high-efficiency windows. The respondents estimated a “best guess” percentage of windows sold that would qualify as ENERGY STAR, and the percentages varied widely, from 15% to 100%.²⁵

²⁴ We also employed Analytical Hierarchy Process (AHP) questions in conducting the interviews. Manufacturers were asked AHP questions to establish their preference ranking of energy efficiency compared to other factors in terms of marketability of windows. They were also asked to rank their perception of the importance of the various market barriers to the implementation of energy efficiency. However, the small sample size led to widely fluctuating results, so the AHP analysis is not included in this report.

²⁵ Actual overall sales data was provided to D&R by AAMA and appears in Chapter II, Market Characterization and Assessment.

Many of the respondents were unaware of how their company sales compared to the overall regional sales²⁶, although most believed that sales of ENERGY STAR windows were substantially higher in the Northwest than in the rest of the United States. They attributed the increasing sales of high-efficiency windows and the greater sales in the Northwest to four factors:

1. ***The ENERGY STAR Windows Project.*** A few respondents believed the Project had increased both awareness and sales in the Northwest.
2. ***The California Energy Crisis.*** This was repeatedly cited as a factor for increasing awareness and interest in high-efficiency windows.²⁷
3. ***General Efficiency Awareness in Northwest.*** A number of respondents believed that the West Coast was more “energy enlightened” – making far more conservation efforts – than the rest of the U.S. Also, the large heat swings in a single day (such as in eastern Oregon) make energy-efficient windows more appealing.
4. ***Idaho Loan Project.*** The low-interest loan project in Idaho for home improvements using ENERGY STAR products was cited by two manufacturers that were active in the Idaho market.

All the manufacturers we spoke with also felt that ENERGY STAR windows were an important part of their product line, increasingly becoming a standard; in many cases manufacturers indicated that 100% of the windows they produce could easily be converted to ENERGY STAR for a nominal additional fee. Most cited the importance of quality:

“High-efficiency windows are represented in all our product lines. We build the highest quality window we can, ...It permeates all our products.”

“ENERGY STAR fits in all our products, everything we produce. We are a high end product company and include energy efficiency as a major feature of our product line.”

Cost of Production

Most respondents indicated that the incremental cost of going from a U-factor of 0.40 to 0.35 would only be about \$10-\$20 for a 5’x3’ horizontal slider. This is slightly higher than the \$7 estimate reported in Chapter II, but still only about 10%-15% of the initial product cost.

²⁴ D&R International will be providing a copy of this report to each partner manufacturer.

²⁷ This probably had little effect on year 2000 sales, but was a major factor at time of interview in 2001.

There were no major technological innovations in the last year reported by the manufacturers that would reduce the cost of producing ENERGY STAR windows. Many respondents reported that overall production costs have increased slightly over the last year or two because of increases in the cost of materials due to increasing energy costs in the Pacific Northwest. All the respondents, however, believed the cost increases were minor and were also proportional for both code and ENERGY STAR windows. Two respondents did mention the use of super-spacer technology, reporting that switching to this technology would increase the efficiency of windows to below the 0.35 level, but would increase the cost of production.

Market Barriers for ENERGY STAR windows

A few the manufacturers believed there were no longer any market barriers for ENERGY STAR windows. They believed consumers were increasingly aware of the benefits of ENERGY STAR windows and the cost difference from code to ENERGY STAR was minor.

However, most of the manufacturers indicated that there are some remaining market barriers to increasing sales of high-efficiency windows:

- **Cost.** Builders are still focusing on the “bottom line” and are not responsible for future utility bills, so they still tend to focus on building as inexpensively as possible (typically at code). Also, some consumers are extremely price conscious and want the absolute lowest cost window.
- **Education.** Many respondents felt that consumers were not looking at the return on investment from upgrading to ENERGY STAR. Respondents reported the following.

“Sometimes it’s a nebulous concept about dollars saved from heating or cooling savings, nothing to ‘hang your hat on.’ The materials and process are in place, but it’s not clear that the demand is really there.”

“ROI at 25% is much better than the market has been doing! ENERGY STAR should do a matrix to show estimated cost savings based on different kWh costs. Homeowners do not look over the lifetime (horizon) of the windows. People are not looking at the return on investment like other issues. Consumers need to see benefits; would drive demand way up and maybe even shift code to 0.35.”

Respondents believed that increasing education projects among builders and consumers is still necessary to overcome these barriers:

“Builders will only build to code. In 1991, over 90% of installed windows were aluminum; when code changed to vinyl, they waited as long as possible (some locked in permits for more homes with aluminum) to switch. They deny change until the 9th inning with 2 outs! It’s up to builders to be leaders in energy efficiency.”

“Consumers need repeated exposure to and discussions about the benefits of energy-efficient windows. It’s not clear that the ENERGY STAR logo and label is benefiting them. May need a video/multimedia to help demonstrate benefits. Consumers may not recognize the ENERGY STAR symbol yet in the building market, may only be understood with appliances. It may not be clear to them how the logo on the computer monitor or refrigerator also relates to windows.”

Use of the ENERGY STAR Symbol and Label

Most of the manufacturers are now using the ENERGY STAR logo on all their marketing materials, including print ads, mailers, TV, and radio commercials. Like last year, respondents reiterated that the ENERGY STAR Project provides an important third party endorsement, or quality verification, to high-efficiency window products. The recognizable symbol, or icon, also provided a natural way for distributors to extol the virtues of energy-efficient window to consumers.

“It’s important to have a third party explaining why you want ENERGY STAR windows, as opposed to dealers starting from scratch. You get a ‘leg up’ to focus on.”

“It’s one more ‘thing’ to help sell windows. It’s a good selling tool: here’s a government project to support energy savings. People are starting to recognize it now. It’s in public eye more, backed by the government.”

“It gave us (and dealers) an opportunity to speak to the consumer about this endorsement, quality verification from a ‘higher powered’ authority.”

Only about half of the manufacturers, however, regularly use the ENERGY STAR label on ENERGY STAR qualified windows. Manufacturers cited two reasons for not using the labels:

- **An “oversticker” problem on windows.** These manufacturers reported that consumers (and builders) already have enough stickers to remove from their windows (low-e, NFRC, company name, etc.). Also, removing the sticker and the glue can be time consuming.

- **Logistics.** Some manufacturers reported that it is difficult to custom label just some windows to show the ENERGY STAR label. They simply use the NFRC label that shows the U-values by climate zones.

This is fairly important because 94% of retailers report that they use in-store displays to promote window products, thus, an important component is the ENERGY STAR logo on each window.

Other manufacturers, however, found creative ways around these hurdles. For example, one manufacturer simply used a cling label with the ENERGY STAR logo, which is easier to remove than a glued on label. Others used the ENERGY STAR logo on all their display and sample windows that qualify, but not on the final product unless the client asked for it.²⁸ One idea may be to recommend that the manufacturers include the ENERGY STAR logo on their own label.

Project Satisfaction

Project participants were overwhelmingly satisfied with the Northwest ENERGY STAR Windows Project. There were four main features that appealed to participants:

- **The increased branding of the ENERGY STAR Symbol.** As discussed above, the increasingly recognizable ENERGY STAR symbol provided both an endorsement and a sales tool for manufacturers and dealers.
- **The simplicity of the Project.** In last year's evaluation, one customer complained about the "red tape" associated with participation; this year many participants celebrated the lack of red tape required by the Project. Participants found the Project was "user friendly" with few restrictions: it gave participants the opportunity to create their own message with Project support.
- **Helpful staff.** Participants were extremely pleased with the D&R staff. They were described as friendly, pleasant, and easy to get along with. One respondent even credited one D&R staff member for going "above and beyond the call of duty" by providing a talk during a box lunch for builders. Another respondent credited D&R for good ideas and creative suggestions.
- **Marketing assistance.** The smaller manufacturers were extremely grateful to have the assistance in terms of both budget and marketing ideas. The larger manufacturers, however, appreciated the assistance but

²⁸ Customers in Idaho needed the ENERGY STAR label on the window to qualify for the low-interest home improvement loan.

found it was only a small part of their overall marketing budget (less than 1% in one case).

In terms of improving the Project, most respondents were extremely pleased with the Project and had no suggestions for improvements. A few respondents, however, felt that the Project could have done a better job of improving customer education. These respondents felt it was primarily a “push” effort, focusing on manufacturers, but falling short on adequately educating builders, retailers, and consumers.

Another suggested improvement was to focus on retrofit windows more; one respondent believed that going from a 0.4 to 0.35 only provides a small improvement and that there are millions of single glazed aluminum windows that could provide far greater energy savings if retrofitted.

Project Impact

All but one of the manufacturers stated that the Northwest ENERGY STAR Windows Project clearly helped their sales of high-efficiency windows. They believed the assistance to marketing budgets and ideas contributed to a more recognizable ENERGY STAR logo, thus increasing the sales of high-efficiency windows. Only one manufacturer felt neutral about the Project, stating that it certainly didn’t hurt, but that many of their own projects generated far greater interest and sales.

Another sign of the Project’s efficacy is that half of the manufacturers reported that they would have made little or no effort to promote ENERGY STAR windows without the Project. Some stated that they would have used traditional selling techniques – pointing out the benefits of low-e, argon, or discussing the NFRC label – but that these methods would have been far less effective without the Project support:

“We would have pushed the NFRC label name and focused on the U-value, but it’s not as easy”

“We would have done nothing if not approached by D&R. It would not have been in the front of our mind. It’s not asked for on the consumer end.”

Future Directions

Most of the respondents believed that sales of ENERGY STAR windows would continue to increase during the next five years, although they believed that increased sales would be dependent on two factors:

- ***Consumer awareness.*** Many consumers remain uneducated about the benefits of ENERGY STAR windows.
- ***More stringent code requirements.*** Increasing consumer awareness and requests for ENERGY STAR would then lead to more stringent code requirements.

Respondents believed that consumer awareness would have to come from the national level, with additional promotions and increased branding for ENERGY STAR products. Consumer awareness could also increase if the California energy crisis continues to “spill over” to other parts of the United States.

IV. Retailers, Wholesalers, and Distributors Survey

Window product retailers, wholesalers, and distributors²⁹ play a crucial role in the windows market, influencing the perceptions and demand of builders and consumers as well as manufacturers' product lines. This chapter compares the results from the Project year 2000 survey of retailers, wholesalers, and distributors to similar surveys completed for the 1998 and 1999 Project years.

Methodology

The survey was designed to gather opinions from retailers, and wholesalers and distributors (“dealers”) who were ENERGY STAR Partners and those who were not. The sample was designed to include participants with a wide range of window sales in 2000. As a result, this study provides information on market share and ENERGY STAR market penetration for retailers, wholesalers, and distributors making up 42%-45% of residential window product sales in the Northwest. The survey instrument was developed to address a number of questions, including:

- How important is high-efficiency fenestration to end customers (e.g., professional homebuilders, professional remodelers, and retail consumers)?
- Are retailers and dealers informed and aware of the benefits of ENERGY STAR window products?
- Where do retailers and dealers obtain information on window products?
- What is the current penetration rate of ENERGY STAR-level window products?
- Is the market penetration rate of ENERGY STAR-level window products increasing?

²⁹ Retailers sell products in relatively small quantities to consumers. Wholesalers sell products in large bulk or quantity, usually at a lower price than retailers. Distributors market and supply goods from manufacturers usually (but not always) under contract to retailers or large bulk purchasers.

Sample Design

This year's sample was based on last year's with updated information on ENERGY STAR Partners and supplemented by window directory listings.³⁰

Quotas were developed using a proportional approach for the number of window retailers/wholesalers in Idaho, Montana, Oregon, and Washington based on the number of window dealers listed in the telephone directories for each state. Efforts were made to include a wide range of respondents to reflect the regional population of window product dealers, including those focusing mostly on sales to builders and contractors, and those with mostly retail sales.³¹

Table IV-1 shows the survey completions³² by state. Quantec conducted a total of 50 surveys. This represents less than 5% of the total number of stores selling window products in the northwest, so we aimed at larger retailer/wholesalers to give a better representation of different window sales.

Table IV-1
2000 Evaluation Retailer and Dealer Surveys by State

	ID	MT	OR	WA	Total
Completed*	7	6	16	21	50

* 18% of participants were interviewed in both the 1999 and 2000 evaluations.

Company Characteristics

Retailers and dealers of window products in the Northwest vary in terms of types, sizes, and buying and selling behaviors. Table IV-2 summarizes the retailer and wholesaler/distributor company characteristics based on location, type of sales, and source of window products.

³⁰ We attempted to complete interviews with the ENERGY STAR partners and last year's interviewees before contacting the sample from telephone directories. Telephone listings were screened to select those selling window products for installation in new homes or residential remodeling.

³¹ Results of this survey approach are indicative rather than representative of the total population of Northwest regional retailers and wholesalers/distributors.

³² Quotas and Completions are same value

**Table IV-2
Retailer and Dealer Characteristics**

	Number of Stores			Percent		
	1998	1999	2000	1998	1999	2000
ENERGY STAR Partner						
Yes	10	8	10	20%	16%	20%
No	39	41	40	80%	84%	80%
Location of sales**						
Idaho	13	15	6	27%	31%	19%
Montana	6	6	4	12%	12%	13%
Oregon	19	16	8	39%	33%	26%
Washington	26	29	15	53%	59%	48%
Services Offered *						
Sales and installation	42	40	36	86%	70%	72%
Sales only	7	17	14	14%	30%	28%
Sales to professionals*						
Sales and installation	---	12	7	---	52%	39%
Sales only	---	11	11	---	48%	61%
Sales to retail sales/home improvement*						
Sales and installation	---	28	28	---	82%	90%
Sales only	---	6	3	---	18%	10%
Sales to builders who build 20+ homes per year						
None	27	20	15	59%	41%	23%
1%-50%	16	25	44	35%	51%	69%
Over 50%	3	4	5	7%	8%	8%

* In the 2000 survey, "services provided" was broken into "retail sales/home improvement" and "sales to professionals." Some interviewees reported that their company provides both services.

** Percents sum to greater than 100% because respondents could report sales in more than one state as a function of markets spilling over state boundaries.

This sample was chosen at random, so only ten of the 50 stores surveyed were ENERGY STAR Partners (Table IV-2). Partners tended to be larger in terms of window sales- an expected outcome based on the Project's expressed strategy of partnering with larger, more influential retailers and wholesaler/distributors. The distribution of sales by state was much the same this year as last year.

Although the majority of respondents offered both sales and installation in all years there were more sales-only businesses in 2000 and 1999 than in 1998. The number of respondents offering sales and installation to retail customers increased slightly. Results from the three years' of surveys also show an increasing proportion of sales to large home builders.

The array of types of retailers and dealers resulted in a wide range of annual window sales volume. In 2000, 8 respondents were small companies with sales of less than \$100,000. While only 3 surveys were of companies with sales of over \$3,000,000, they comprised over 60% of the total window market. However, this large retail segment is a dynamic market as can be seen with HomeBase's departure and Lowe's entry into the Northwest market.

Market Segmentation of Sales

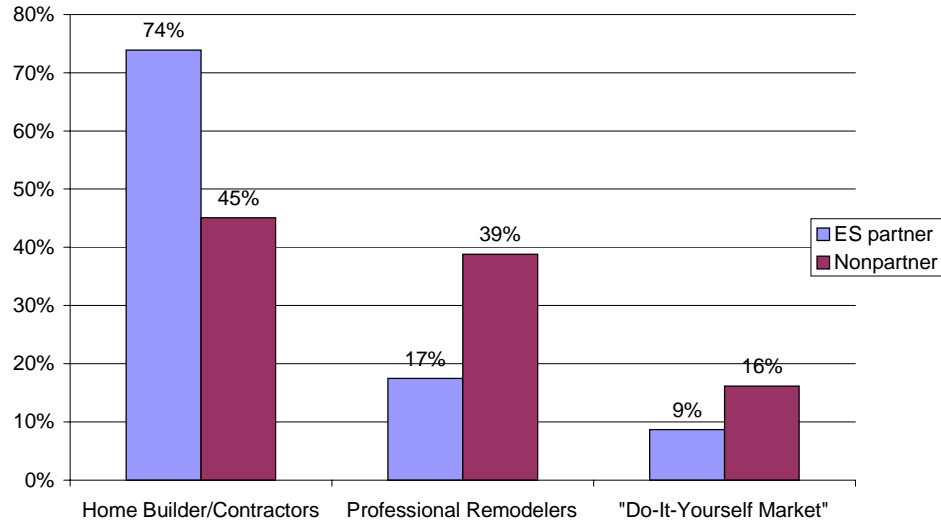
Sales percentages of various market segments are shown in Table IV-3 and Figure IV-1. The "Do It Yourself" category nearly tripled during the past year, and there was a slight increase in the percentage of sales to homebuilders. These combined to pull down the "Professional Remodeler" category. ENERGY STAR Partners, although representing only 20% of the sample, represented 52% of total window sales in 2000 (Table IV-3 and Figure IV-1).

Table IV-3
Window Product Sales by Segment

	% of Sales		
	1998	1999	2000
Purchaser of Windows			
Home builders	51%	62%	53%
"Do-it-yourself" consumer	15%	10%	25%
Professional remodeler	34%	28%	11%
Sell to end user and install for end user	N/A	N/A	11%
ENERGY STAR Partner			
Yes	58%	65%	52%
No	42%	35%	48%

Relative to nonpartners, ENERGY STAR Partners indicate that they made more sales to professional home builders, and had slightly lower sales to remodelers (Figure IV-1). From this, we recognize that an ENERGY STAR partnership does not mean that they sell solely energy-efficient windows, thus, there is not necessarily a direct correlation between who was buying and what they were purchasing.

Figure IV-1
2000 Window Sales by ENERGY STAR Partnership

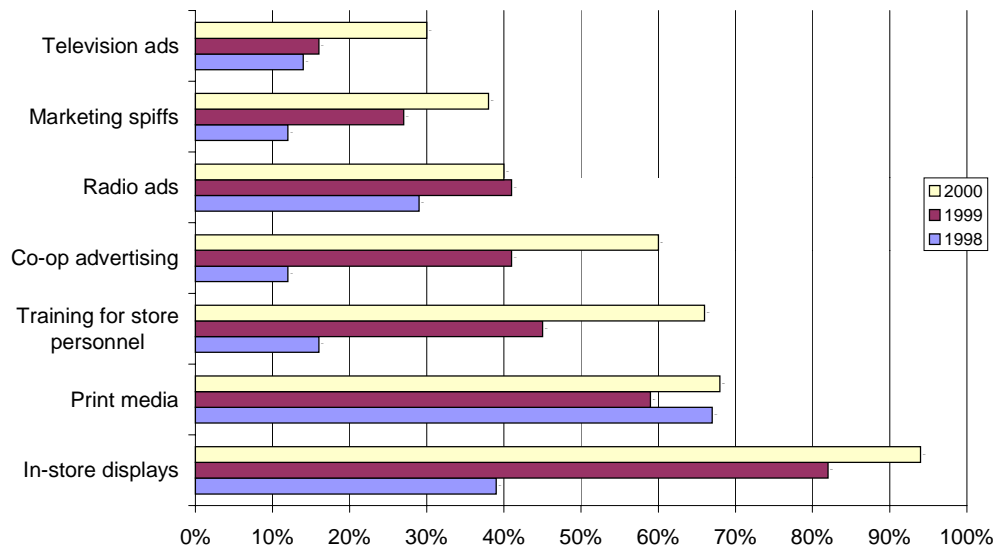


Retail Promotion of Products

Retailers and dealers promote window products in varying ways, but overall, in this year's survey, they strongly favored in-store displays, an increase compared to last year's respondents (Figure IV-2).

The figure below shows that over the past 3 years, all types of promotional techniques have increased for dealers.

Figure IV-2
Preferred Ways of Promoting Window Products



Now, nearly all dealers are using in store displays, relative to less than 40% two year ago. Correspondingly, the use of co-operative advertising and employee training has jumped significantly in the past year. Interestingly, the use of radio and print media- two typical marketing techniques- seems to have leveled off. The rapid increase in other types of marketing may be due to the Project’s promotion of creative and unique types of marketing.

Retailer Perceptions of Customer Interest in Efficient Fenestration

More than 60% of retailers and dealers continue to believe that their customers had a high demand for high-efficiency windows (Table IV-4).

**Table IV-4
Current Customer Demand for High-efficiency Windows***

Ranking of Customer Demand	All Respondents			ES Partner			Not Partners		
	1998	1999	2000	1998 (n=10)	1999 (n=8)	2000 (n=15)	1998 (n=39)	1999 (n=39)	2000 (n=35)
Low Demand (1 or 2)	22%	23%	22%	10%	13%	33%	26%	26%	17%
Neutral Demand (3)	27%	23%	14%	30%	50%	7%	26%	18%	17%
High Demand (4 or 5)	51%	53%	64%	60%	38%	60%	49%	56%	66%
Average Ranking	3.4	3.4	---	3.7	3.4	3.2	3.3	3.4	3.7

* Percentages may not add to 100% due to rounding.

Those who were evenly split last year between believing that customers had neutral and low demand for energy-efficient windows, have tilted decidedly to the “low demand” side. This could be a reflection on comments from respondents who say that many customers believe that code is “good enough,” and perhaps a spoken desire to buy less expensive windows that are no longer available. Those who believed that customers had a high demand for energy-efficient windows commented that the high demand was a result of increased consumer awareness, energy cost savings, and increased comfort. The perceived higher price of energy-efficient windows was the most common reason for those with neutral or low ratings.

Although it is difficult to generalize from these results due to the small number of ENERGY STAR Partners in the sample, last year ENERGY STAR Partners reported a slightly higher customer demand for high-efficiency windows than did nonpartners.

These results indicate that the Alliance’s market transformation activities have worked very well in the retailer and wholesaler arena, with all respondents

reporting significant increases in the demand for energy-efficient windows regardless of partnership.

Retailers and dealers were also generally positive about the benefits, affordability, and availability of high-efficiency windows (Table IV-5).

**Table IV-5
Perceptions of High-efficiency windows for Customers**

	All Respondents			ES Partner			Not Partner		
	1998 (n=49)	1999 (n=49)	2000 (n=50)	1998 (n=10)	1999 (n=8)	2000 (n=15)	1998 (n=39)	1999 (n=41)	2000 (n=35)
Provide a good value to the customer	92%	92%	88%	100%	100%	87%	90%	90%	88%
Are hard to explain to customers	33%	16%	26%	20%	13%	20%	36%	17%	40%
Are too expensive from the customers' point of view	31%	41%	31%	40%	38%	35%	28%	41%	21%
Are hard to get	6%	4%	0%	0%	0%	0%	8%	5%	0%

Respondents continue to believe that high-efficiency windows provide a good value to customers. In terms of price, in 2000, fewer retailers interviewed stated that customers think energy-efficient windows are too expensive.

What is the level of awareness and information on ENERGY STAR?

Essentially all dealers of fenestration products are familiar with energy-efficiency ratings (U-values) for windows and the vast majority carry ENERGY STAR windows (Table IV-6).

**Table IV-6
Awareness and Interest in ENERGY STAR Fenestration Products**

	All Respondents			ES Partner			Not Partner		
	1998	1999	2000	1998 (n=10)	1999 (n=8)	2000 (n=15)	1998 (n=39)	1999 (n=41)	2000 (n=35)
Familiar with U-value	96%	96%	96%	100%	100%	93%	95%	95%	97%
Heard of ENERGY STAR	67%	73%	68%	100%	100%	85%*	59%	68%	60%
Carry ENERGY STAR fenestration products	53%	51%	79%	100%	100%	100%	41%	41%	81%
Customers have asked for ENERGY STAR	16%	14%	32%	60%	25%	38%	5%	12%	29%

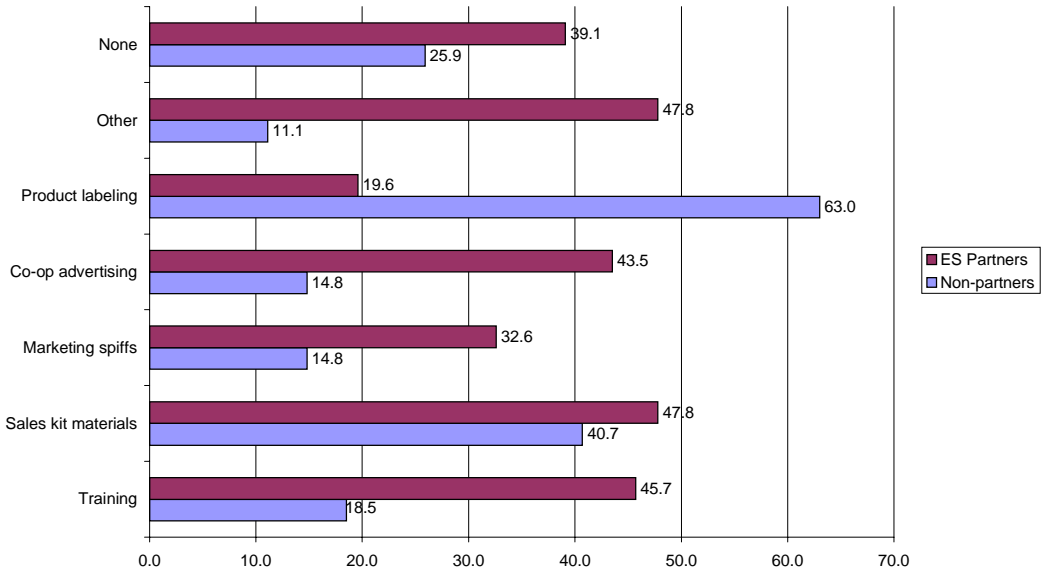
* Two respondents, whose companies are ENERGY STAR Partners, did not know what ENERGY STAR was.

Awareness of ENERGY STAR has not increased significantly over the three years indicating that there is still room for educating retailers on the benefits and features of ENERGY STAR. Additionally, two respondents that we spoke with had not heard of ENERGY STAR – even though their companies are ENERGY STAR partners. Simple ENERGY STAR sales tools with a focus on continual training of new employees would aid in reaching this segment of dealers.

In previous years, about half of dealers said they carried ENERGY STAR window products. This year, the percentage jumped to almost 80%.³³ Furthermore, there have been significant increases in customers asking specifically for ENERGY STAR.

In reporting sales and promotional assistance (Figure IV-3), ENERGY STAR-partnered respondents reported more support from ENERGY STAR-partnered manufacturers than did non-ENERGY STAR respondents. Window manufacturers may want to increase their marketing support to non-ENERGY STAR-partnered retailers and wholesalers.

**Figure IV-3
Sales and Promotional Assistance:
ENERGY STAR (Project and Manufacturers) and
Non-ENERGY STAR Retail partners**



³³ This value is higher than the awareness value because respondents who were “unfamiliar” with ENERGY STAR were told what it was before being asked whether they carried the product.

ENERGY STAR Market Penetration

Retailers and dealers reported that, on average, over two-thirds of the windows they sell are ENERGY STAR level efficiency (a U-factor of 0.35 or less). When this figure is weighted based on window sales, the market penetration for high-efficiency windows is over half not changing from last year (Table IV-7).

Table IV-7
ENERGY STAR Windows Market Penetration

Unweighted			Weighted by Sales		
1998	1999	2000	1998	1999	2000
46%	64%	67%	40%	53%	52%

Future ENERGY STAR Promotion

A new group of questions was added this year regarding future plans for promoting ENERGY STAR products.

Respondents were asked if their companies were actively planning on promoting ENERGY STAR products in the future, and 37% indicated that they do. Of those that responded, the most common plans for future promotion included:

- more advertising (39%)
- more use of the ENERGY STAR label (31%)
- more promotion materials (15%)
- more shelf space and endcaps (8% each)

AHP Analysis

The Analytic Hierarchy Process (AHP) is a technique for assessing the relative importance of decision criteria that has been successfully applied for similar purposes in several hundred applications (including the previous market progress evaluation reports for the ENERGY STAR Windows Project). The AHP involves three basic elements:

1. Describe a complex multi-criteria problem with objective and/or subjective elements as a hierarchy.
2. Estimate the relative weights for importance of various criteria (or subcriteria) on each level of the hierarchy.

3. Integrate the relative weights to evaluate the hierarchy with respect to the overall objective of the problem.

AHP uses ratios as a measure of comparative judgments. Specifically, it uses pairwise comparisons to estimate the relative importance of specific criteria within each hierarchy level. A popular commercial software program (Expert Choice™) performs all of the computations and provides detailed reports for the generated weights of the criteria and alternatives.

In this application, AHP is used to assess the relative importance of energy efficiency in terms of marketability of windows, and the relative importance of the main market barriers to increased adoption of energy efficient windows. Our primary focus in this evaluation is the change or trend in the relative importance weights.

Retailers and dealers were asked the relative importance of energy efficiency, appearance, quality, and price in marketing windows. As shown in Table IV-8, the importance ranking of energy-efficiency increased this year, while all other features remained the same or decreased in relative importance.

Table IV-8
Window Marketability Characteristics: Relative Mean Importance

	1998	1999	2000
Energy Efficiency	0.18	0.19	0.25
Appearance	0.19	0.18	0.18
Quality	0.33	0.32	0.29
Price to purchaser	0.30	0.31	0.28

Table IV-9 shows the relative importance of the dealers' perceived market barriers to energy efficiency. Price to purchaser is now the largest barrier, closely followed by lack of information. However, the weights have changed little since 1998. Perhaps the best way to view these data is to note that lack of information and price continue to be perceived as the most important variables in a relative sense.

**Table IV-9
Market Barriers: Relative Mean Importance**

	1998	1999	2000
Lack of information	0.45	0.41	0.39
Price to purchaser	0.40	0.42	0.46
Lack of availability	0.15	0.17	0.16

Table IV-10 shows these importance weights by size and ENERGY STAR Partnership status. The relative importance of barriers remains remarkably consistent across partnership status. There are, however, differences within the size category; in 2000, small retailers and dealers perceived information deficit as the most important barrier, while the largest retailers and dealers felt price was the key issue.

**Table IV-10
Mean Importance Ratings for Market Barriers**

Group	Lack of Information			Price to Purchaser			Lack of Availability		
	1998	1999	2000	1998	1999	2000	1998	1999	2000
Overall	0.45	0.41	0.39	0.40	0.42	0.46	0.15	0.17	0.16
Size of 1998 Sales									
Sales above \$1 million	0.50	0.45	0.37	0.39	0.37	0.51	0.12	0.18	0.13
\$100,000 to \$1 million	0.48	0.44	0.35	0.36	0.40	0.48	0.17	0.16	0.17
Sales below \$100,000	0.37	0.46	0.55	0.49	0.40	0.32	0.14	0.13	0.13
ENERGY STAR Involvement									
Partner	0.49	0.43	0.39	0.37	0.42	0.44	0.14	0.15	0.18
Non-partner	0.44	0.40	0.40	0.41	0.42	0.45	0.15	0.17	0.15

V. *Builder Survey*

Changes in Northwest builders' awareness and perceptions of energy-efficient window products and the ENERGY STAR Project were assessed by comparing results of the survey conducted for 2000 with those conducted for 1998 and 1999.

Methodology

The builders' survey was developed to examine a number of issues, including:

- Building practices across the region – type of homes, where window product materials are obtained and from which manufacturers
- Current incidence of high-efficiency window, skylight, and door products
- Perceived importance of energy efficiency in general and energy-efficient windows in particular
- Awareness of energy-efficient windows and their associated energy and non-energy benefits
- Builders' importance rankings of various marketing factors (e.g., location, price, size of home, energy efficiency, etc.)
- Builder's importance rankings of lack of information, price, and lack of availability of energy-efficient windows as market barriers

Sample Design

Quantec interviewed a total of 74 builders across the four states. Efforts were made to obtain as representative a sample as possible by size of builder and state. Figure V-1 shows that surveyed builders ranged in size from those constructing less than 20 to more than 300 homes a year. Fifty-one respondents reported that they had constructed only single-family dwellings, and 11 built both single- and multi-family dwellings.

**Figure V-1
Number of Homes Represented by Builder Size**

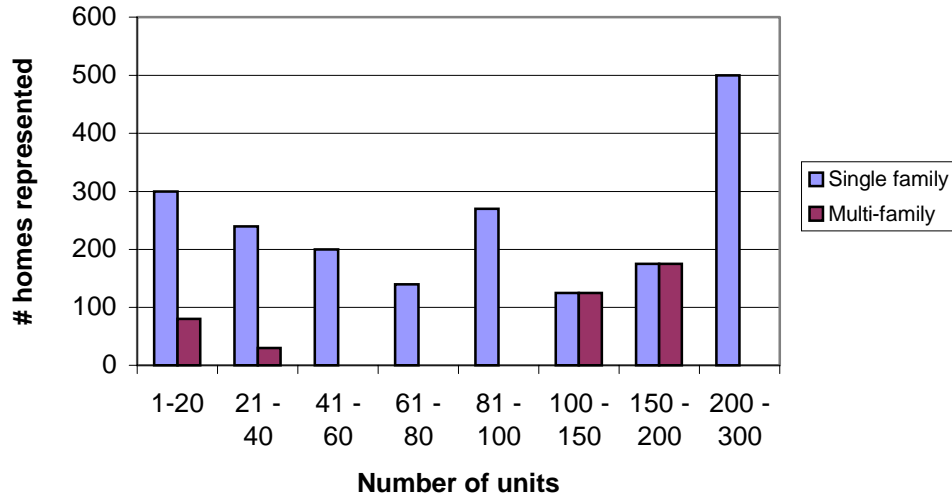


Table V-1 shows distribution of builders by state. Larger builders tended to be concentrated in Washington, where they constructed 50% of homes that were built in the year 2000.

**Table V-1
Sample Distribution: State and Number of Homes**

State	Builders Interviewed	Number of Units Built in 2000		
		Single-Family	Multi-Family	Total Units
Idaho	11 (15%)	535 (27%)	178 (49%)	713 (31%)
Montana	4 (5%)	101 (5%)	2 (1%)	103 (4%)
Oregon	20 (27%)	338 (17%)	24 (7%)	362 (16%)
Washington	39 (53%)	999 (51%)	156 (43%)	1,155 (50%)
Total	74 (100%)	1,973 (100%)	360 (100%)	2,333 (100%)

Comparison to Region

The builders in our survey built about 3% of the new residential housing units in the region (Table V-2).

Table V-2
Percent of 2000 Housing Starts³⁴

	2000 Housing Starts	Units in Sample	% Total Housing Start Market
Single-family	66,647	1,973	3.0%
Multi-family	19,030	360	1.9%
Total	85,677	2,333	2.7%

Source: 2000 US Census, Manufactured homes included in Single Family

Data Collection

Quantec conducted surveys in March and April of 2001. Up to five attempts were made to reach each builder, and callback times were arranged to work within the builders' schedules. Efforts were made to interview the person most knowledgeable about the type of windows that each builder installed.

Data Analysis

The survey examined a number of questions concerning the use of energy-efficient fenestration products. Each of these questions is examined below.

Window Selection

Builders were asked to identify the brands they normally install (Table V-3). The manufacturer most mentioned by respondents this year, as well as last year, was Milgard (51%). This year, unlike previous years, every window manufacturer used by builders was an ENERGY STAR partner.

³⁴ 2000 Census

Table V-3
Which window manufacturers make the windows you usually install?

	Frequency	% of Respondents
Milgard	30	51%
Insulate	13	22%
JeldWen*	11	19%
Andersen	10	17%
EPI	8	14%
Pella	7	12%
Weathervane	1	2%

* Formerly Summit

Builders were also asked where they purchased their windows. Sixty-three percent of the builders surveyed purchase their windows directly from a manufacturer, 32% from a distributor, and about 10% from lumberyards.³⁵ This differs from national sales data due because it is a percentage of builders rather than sales. This shows an increasing trend towards buying from manufacturers (51% in 1999) and away from lumberyards (19% in 1999).

Awareness of ENERGY STAR

Awareness of ENERGY STAR windows doubled among builders. Forty-one percent of builders in 2000 (accounting for about 35% of the units constructed in our sample) reported that they had heard of ENERGY STAR windows, compared to 21% of builders sampled the previous year (Table V-4).

Table V-4
Awareness of ENERGY STAR Windows

	1998	1999	2000
Total Participants	68 (100%)	70 (100%)	74 (100%)
Aware of ES	14 (20%)	15 (21%)	30 (41%)
Identify ES Features	2	3	19
Don't know ES Features	12	12	11

Among the 30 builders in the current study that were aware of ENERGY STAR windows, two-thirds could identify specific characteristics such as double paned,

³⁵ Respondents could mention more than one location for purchasing windows. Last year, 50% of builders reported that they purchased windows directly from the manufacturer, 40% from a distributor.

low e-coating, and gas/argon filled. Unlike the previous surveys, 38% of the respondents mentioned U-factors as an ENERGY STAR characteristic. In a separate question, 90% of builders said that they were familiar with the U-factor used to rate a window's thermal efficiency.³⁶

Installation of Efficient Windows/Fenestration Products

Builders were asked to provide an estimate of the proportion of energy-efficient (U-factor ≤ 0.35) windows they installed.³⁷ As shown in Table V-5, builders estimated that 65% of the total units they constructed in 2000 were built with windows with ENERGY STAR quality rating.

Table V-5
Estimated Market Share of Energy-Efficient Windows

Market Share	Single-Family	Multi-Family	Weighted Average
2000 Building Period	63%	79%	65%
Total No. Units*	1,969	360	
U-Factor ≤ 0.35	1240	284	

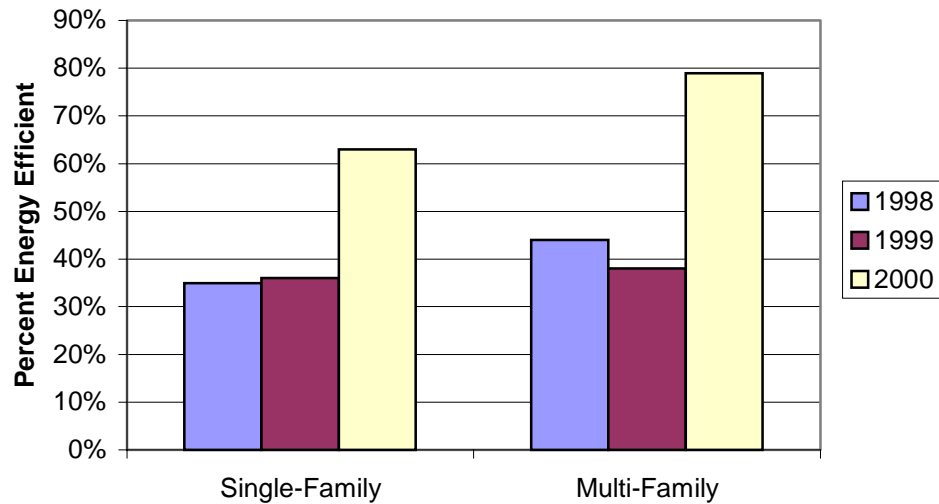
* Based on respondents that could also provide energy-efficiency information.

Figure V-2 shows how the single-family and multi-family shares have changed since these evaluations began. The increase from 1999 to 2000 of builders installing ENERGY STAR windows represents a large jump in the reported overall market share. In 1999, the builder survey reported significantly less ENERGY STAR penetration than the manufacturer survey (see Figure II-2). In 2000, the builder survey reported higher penetration. These differences may be due to the relatively small sample size of builders. However, note that the differences between manufacturers and builders are not statistically significant. Note also that the awareness level in Table V-4 is below penetration for two reasons. First, many builders who reported using energy-efficient windows said they were not aware of the ENERGY STAR label. Secondly, the penetration rates are weighted by number of units built while awareness is based on number of respondents.

³⁶ D&R has designed a window campaign to address this issue entitled, "The Best Window for U."

³⁷ Respondents that were not familiar with the meaning of a U-factor were provided with an explanation of energy-efficient windows.

Figure V-2
Estimated New Construction Market Share of Energy-Efficient Windows:
1998 -2000



Interest in Efficient Windows

The 24 builders reporting that energy-efficient windows made up less than 80% of the windows they installed were asked why they didn't install more energy-efficient windows.³⁸ Although almost 40% of these builders reported that energy-efficient windows cost too much (Table V-6), this figure is much less than the 84% who blamed costs in the previous year's survey. One point of interest to note is that no builders felt that window availability was an issue.

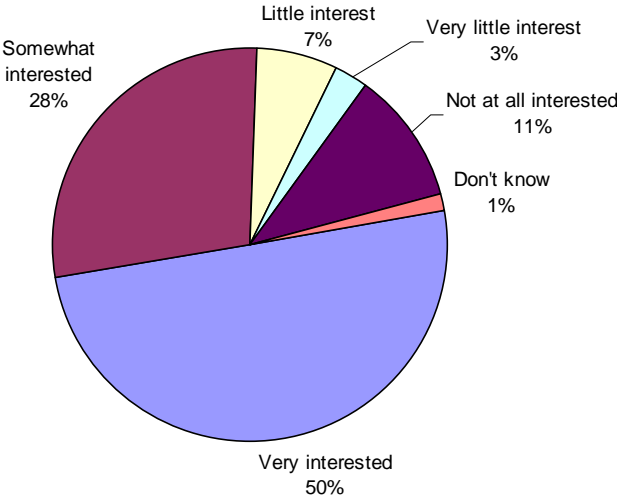
Table V-6
Reason for Not Installing More Energy-Efficient Windows

	Frequency	Percent
Installing less than 80% EE	24	100%
Cost too much	9	38%
Not readily available	0	0%
Energy savings not great	2	8%
Lack of customer interest	4	17%
Other	2	8%
No response	7	29%

³⁸ Although admittedly arbitrary, 80% was chosen as the cut-off to ensure that we were asking further questions of only those not installing ENERGY STAR as a general rule.

All builders were asked about their perceptions of homebuyers' interest in energy-efficient windows. Half of the respondents said they believed that homebuyers were very interested in energy-efficient windows, (Figure V-3).

Figure V-3
Builders' Perception of Homebuyer Interest in Energy-Efficient Windows



When asked what they saw as the main advantages of energy-efficient windows to homebuyers (Table V-7), the vast majority of builders responded that the main advantage was saving money/lowering utility bills. The second most common response was increased home comfort.

Table V-7
What do you see as the main advantages of energy-efficient windows to those who buy your homes?*

Main Advantages	1998 (%)	1999 (%)	2000 (%)
Save Money/Lower Utility Bills	65%	81%	75%
Save Energy	9%	16%	27%
Increased Home Comfort	21%	10%	33%
Better Insulation/Reduced Drafts	10%	9%	12%
Quality/Aesthetics/Value**	0%	7%	- - -
Reduce Maintenance**	0%	4%	- - -
Helps the Environment	1%	1%	10%
Reduced Noise/Quieter	1%	1%	15%
Reduced Glare/Protect from Sun	4%	1%	4%
Reduced Condensation	3%	1%	1%
Other	0%	4%	12%
Don't Know	0%	1%	0%
None	4%	4%	4%

* Respondents could give more than one answer, so percentages sum to over 100%.

** These questions were dropped from the 2000 Project year survey.

The share of builders who felt that energy-efficient windows provided energy saving benefits or lower utility bills increased over this time period. A lower percentage of builders this year report that energy-efficient windows are useful in advertising and promotion, or differentiating them from competitors. This is not surprising given the increased penetration of ENERGY STAR windows in the region – we expect any marketing advantage to erode as ENERGY STAR becomes standard practice.

Marketability of Windows: Importance of Energy Efficiency

The Analytic Hierarchy Process (AHP) asks respondents to rank the importance of a series of pairs of factors in relation to one another. Mathematical modeling is then applied to develop each group’s overall ranking of factors. The AHP rankings from all of the survey years were compared to assess whether builders’ perceptions have changed as an indication of Project success.

Table V-8 shows the comparison of window marketability characteristics – energy efficiency, selling price, location, style of home, floor plan, and square footage. As in previous years, builders rank location, selling price, style of home, floor plan, and square footage as most important in marketing homes, with relative mean rankings ranging from 0.13 to 0.27. Although location has increased

in importance and price, style, floor plan and square footage have decreased in importance, these findings remain relatively unchanged overall. While energy efficiency is still last, it shows the largest increase.

Table V-8
Window Marketability Characteristics: Relative Mean Importance

	1998	1999	2000
Energy Efficiency	0.050	0.061	0.084
Selling Price	0.190	0.226	0.227
Location	0.232	0.230	0.270
Style of Home	0.185	0.174	0.148
Floor Plan	0.198	0.177	0.145
Square Footage	0.146	0.134	0.126

Table V-9 shows the builders' rankings of the marketing importance of different types of energy-efficient measures – windows, space heat, appliances, insulation, lighting, and water heat. Among energy-efficient measures, the importance of windows increased slightly, but fell from first to second in importance as space heat had a 7% increase from .209 to .223. Energy-efficient water heat and insulation showed a substantial increase in marketing importance between the 1999 and 2000 surveys. Energy-efficient appliances and lighting decreased in builder's estimation of importance in marketing. The relative importance of lighting dropped by half. The changes in the relative rankings may reflect that the most obvious sources of energy efficiency are also the most important in marketing.

Table V-9
Energy-Efficient Measures: Relative Mean Importance

	1999	2000	2001
Windows	0.147	0.211	0.218
Space Heat	0.213	0.209	0.223
Appliances	0.095	0.142	0.132
Insulation	0.176	0.168	0.209
Lighting	0.108	0.154	0.080
Water Heat	0.260	0.116	0.137

Table V-10 shows builders' rankings of market barriers to energy efficiency. The relative rankings of lack of information, price, and lack of availability changed. In this year's survey, price dropped by 76% from the previous year (0.51 to 0.122) in

terms of importance as a market barrier. Information and availability both increased and were ranked about the same (0.438 and 0.441, respectively).

Table V-10
Market Barriers: Relative Mean Importance

	1998	1999	2000
Information	0.326	0.328	0.438
Price	0.519	0.510	0.122
Availability	0.156	0.162	0.441

VI. Mystery Shopper Survey

Methodology

We conducted a limited mystery shopper survey to get a sense of what advice and assistance customers receive, in terms of fenestration products' energy efficiency. The goal of a mystery shopper approach is to collect information without letting salespeople know that it is a market research endeavor.

Our interviewers shopped at various large and small windows retail outlets. They collected information and engaged salespeople without written instruments in order to maintain their mystery shopper status and to find out what the window-shopping experiencing is at various retail outlets. Table VI-1 below outlines the number of shoppers and stores by state. All of the stores were ENERGY STAR partners on the EPA web site. Approximately 50% of national window sales are through retail outlets.³⁹

Table VI-1
Mystery Shopper Survey Characteristics

	# Mystery Shoppers	# of Stores	% Market Based on Population
Idaho	1	3	12%
Oregon	3	4	32%
Washington	2	6	56%
Total	6	13	100%

The mystery shoppers first asked salespeople general questions about energy-efficient, or windows better than code, versus standard windows. They proceeded to ask about specific types and sizes of windows, including:

- 5' x 3' Horizontal Slider
- 6' x 8' Patio/Sliding Glass Door
- 2' x 4' Skylight

³⁹ September 1999 Window & Door report Ducker Int.- Distribution of Residential Windows and Doors.

The mystery shoppers then asked for recommendations on these windows. The final aspect of the survey was to describe the store- and non store-specific features of the manufacturer and ENERGY STAR promotional displays.

Findings

Availability of Energy-Efficient Windows

One hundred percent of the stores visited had energy-efficient windows available. Energy-efficient windows were available for all three of the window types listed above. In fact, five of the attended stores did not stock standard windows for any of the types in this survey. Because almost 40% of the stores carry only energy-efficient windows, 58 (65%) of the 90 windows detailed by the shoppers were energy efficient. Comments concerning ENERGY STAR availability from various salespeople follow:

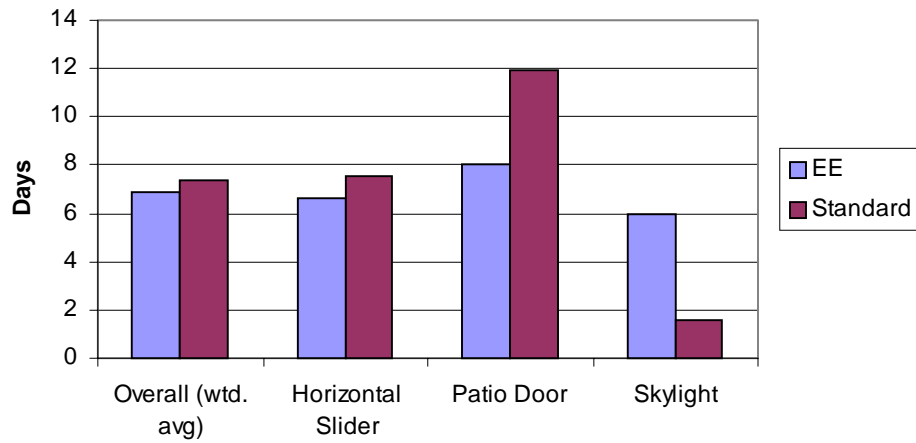
Burien, Washington, “there’s really no standard window anymore. Only the energy-efficient choices of each manufacturer are available, and these are chosen as best by customers.”

Boise, Idaho, “[their store] only carried energy-efficient [windows] as the difference in cost was minor and energy efficient [windows are] much better.”

One shopper pushed her Aloha, Oregon, salesperson about the availability of standard windows. [He] said, “I could probably special order products without low E coatings, but they definitely would cost more than the energy-efficient products.” Although this is not yet the norm, these comments represent the kind of market transformation that the ENERGY STAR Project was seeking.

From the time for availability quoted by the salespeople, we estimated the average time it takes to get energy efficient windows for a home. In-stock windows are available immediately and special orders required from seven to twenty-one days to arrive. On average, energy efficient windows and doors require less waiting time than standard products (Figure VI-1 below).

**Figure VI-1
Time to Availability**



Standard windows require more time in the patio and horizontal sliding doors, but the standard skylights require less time. This may not be representative as only seven of the thirteen stores offered standard skylights.

Table VI-2 shows the number of standard and energy-efficient window products in stock and those requiring special order. Generally, there are twice as many energy efficient windows available in the retail stores and the proportion of in-stock versus special order windows do not differ by efficiency levels.

**Table VI-2
Number of Windows Available**

	Energy Efficient		Standard	
	In Stock	Special Order	In Stock	Special Order
Horizontal Slider	10	10	6	6
Patio Door	6	14	1	10
Skylight	9	9	7	2
Total	25	33	14	18

Price

Energy efficiency windows were, on average, slightly more expensive than standard windows.

**Table VI-3
Incremental Cost of Energy-Efficient Products**

	Incremental Cost (% of standard cost)
Horizontal Slider	9.4%
Patio Door	8.4%
Skylight	8.7%

These numbers are a bit higher than reported in Section II, yet still consistent with our findings. With the small sample size these differences are not statistically significant.

Given this relatively slight price difference, the recommendation of the salesperson is probably vital to the decision of the customer. In 21 cases where the prices were comparable between standard and energy-efficient windows of same brand and frame material, the standard window was never recommended over the energy-efficient model. For example, one Spokane said, when speaking of a standard window, “[it’s a] good product, but I recommend high-efficiency.”

In terms of energy efficiency products paying for themselves in energy savings, the salespeople in this survey generally agreed with a Spokane employee who recommended energy-efficient windows and said they were “worth the extra cost.” A few variations to this theme included:

Spokane salesperson, “They will eventually pay for themselves, especially as energy prices increase.” This salesperson also let our shopper know that energy-efficient windows are “more efficient during both winter and summer months.”

While it was a consensus that energy-efficient products pay for themselves over time and are worth the extra cost, we did actually find some windows where the standard model was more expensive than the energy-efficient model. In this case, our salesperson from Tigard, Oregon, recommended ENERGY STAR, stating, “Why buy standard when you can get ENERGY STAR for less? Costs more, uses more energy – why do that?”

Salesperson Knowledge

Recommendations and advice from knowledgeable salespeople is an important way of promoting energy-efficient products. When asked about the differences between energy-efficient and standard windows, the number of features

salespeople mentioned varied between one and ten. As shown in Table VI-4, we rated the salespeople based upon number of features mentioned.

**Table VI-4
Salesperson Knowledge**

No. Features Mentioned	Perceived Knowledge	No. Salespeople
0-3	Low	5
4-7	Medium	3
8-10	High	5

As shown on Table VI-4 the “Low” knowledge salespeople fell into two categories. Three of the low scorers came from stores that sold only energy efficiency products. Either they did not feel it necessary to explain the differences because there was not a choice at their store (i.e., because they only carried energy-efficient products), or they are in fact not as knowledgeable about the differences. The other two low scorers were in Idaho and may have been busy that day because they were generally unwilling to talk to our shoppers. One interviewer commented, “Salesperson did not appear eager to answer questions, vague in prices and best buy. I did not feel I got my questions answered.”

Salesperson ‘Promotion’ of Energy Efficiency

In terms of salesperson promotion of energy efficiency products, we ranked salespeople at stores that sold both energy-efficient and standard windows (eight stores). The idea here is to attempt to measure the salesperson’s excitement or level of promotion of energy-efficient windows in instances where there is head-to-head competition in the store with standard windows. Zero or one positive comment about energy efficiency gained a “low” score, two or three gained a “medium” score and more than three comments earned a “high” score.

Of the eight salespeople, half of them scored “high” on promoting energy-efficient products. The other half earned “low” scores. This suggests that salespeople were either very excited about energy-efficiency, or didn’t seem to care even though the mystery shopper was asking about energy efficiency.

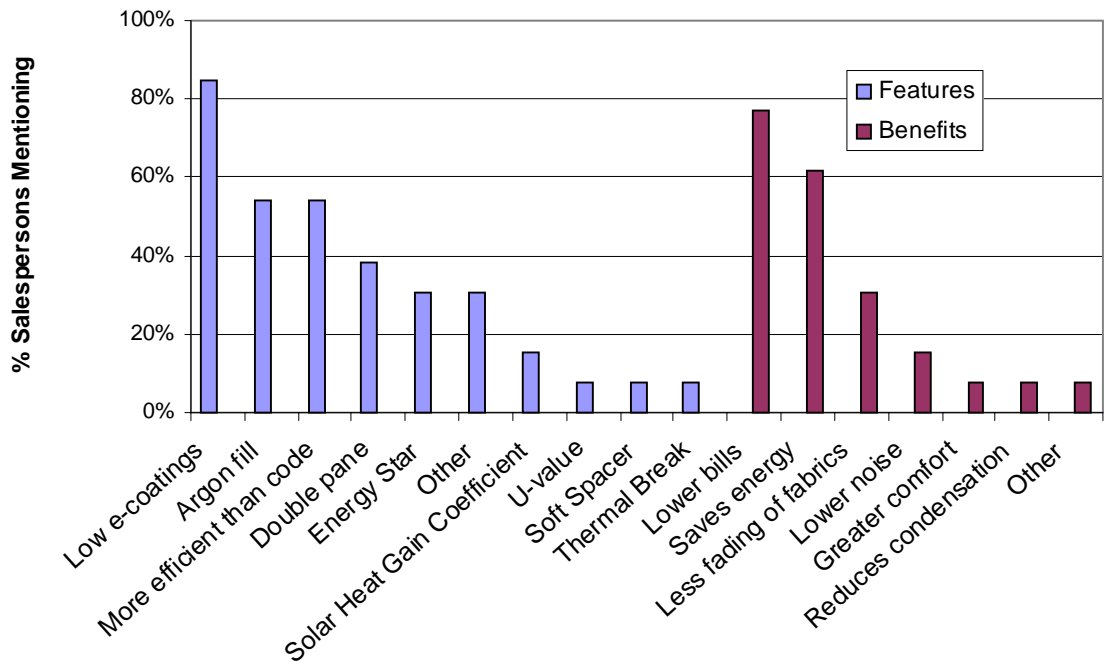
Table VI-5
Promotion among Stores that Carry both Standard and Energy-Efficient Windows

Energy Efficiency Comments	Perceived Promotional Effort	No. Salespeople
0-1	Low	4
2-3	Medium	0
4+	High	4

Energy-Efficient Features and Benefits Promoted

One of the first questions our mystery shoppers asked the salesperson was “How are energy-efficient windows different from other windows?” This was an open-ended question that, as mentioned above, received answers varying from one to ten features. As shown in Figure VI-2, the most popular answers for features included low e-coatings, argon fill, and higher-than-code efficiency. The ENERGY STAR label was mentioned by more than 30% of our participants surveyed. In terms of benefits, lower bills and electricity savings were mentioned in more than half of the surveys.

Figure VI-2
Features and Benefits



There are a few patterns within this information. Many salespeople mentioned and recommended low e-coatings. This was the most highly mentioned feature of energy-efficient windows over standard. Comments regarding features follow:

Portland salesperson: “[does not] recommend purchasing windows without low E; you probably will not meet code and the small difference in price is worth the extra money.”

In general, salespeople agreed that low e-coatings were a necessary aspect to energy efficiency and worth the money, but they were not convinced that other features were cost-effective.

Aloha, Oregon salesperson said, “windows with the standard energy efficiency features such as low e-coatings are the best value.”

A Portland salesman, when describing their policy of only selling energy-efficient windows, said, “it is possible to purchase additional features . . . such as argon fill and additional coatings. But windows without these additional features are the best value.”

The second-most mentioned feature was argon fill. This was not because of salespeople’s recommendation of argon fill; rather these mentions were explanations of doubt to its value. One salesperson, in Spokane, mentioned that argon filling was “worth the money,” but five salespeople recommended against argon filling. Additionally, there seemed to be no clear understanding of how long argon fill lasts. Three salespeople mentioned that no one was sure how long it lasts, one estimated an argon filling’s useful life at two years, and another mentioned a five to ten year life span.

Other Promoted Features

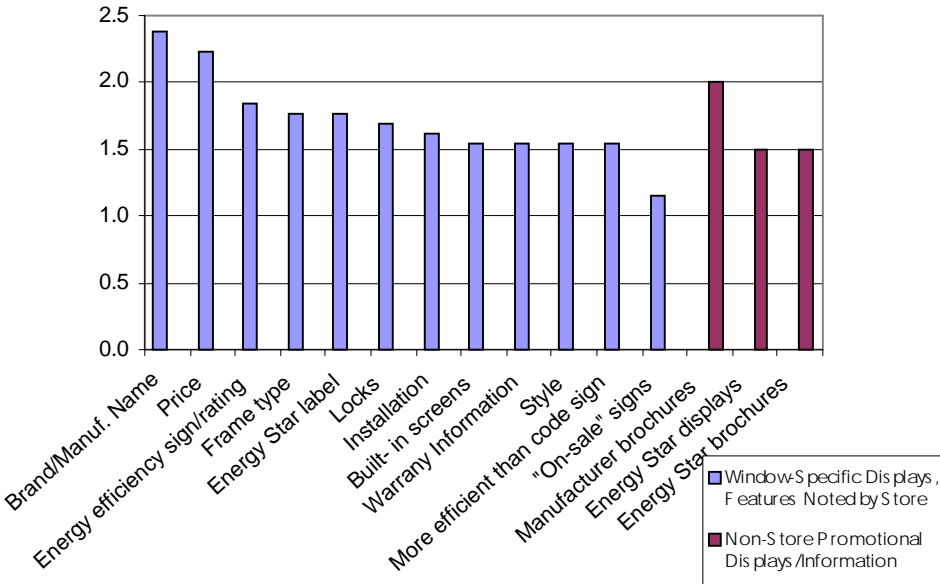
As noted above, when stores sold only energy-efficient windows, the salespeople tended to mention few features of energy-efficient products. Rather than mentioning the energy-efficient features, these employees tended to focus on the availability of special features such as matching the new to the old windows on the house, multi-point locks, grids, built-in screens, and beveled edges.

Also, a major selling point for many salespeople was the lifetime warranty. This was mentioned in by at least five sales staff as a reason to buy a certain window.

Store-Promoted Features

One aspect to our survey concerned displays drawing attention to features, brands, and promotions. In Section IV above, retail stores report that their preferred way of promoting ENERGY STAR products is through in-store displays. Our mystery shoppers gave a value between one and three to specific features displayed such as locks and price, where 1 signaled “Not Displayed,” two “Displayed for Some Windows,” and three “Displayed for most/all windows.” As Figure VI-3 displays, both energy efficiency signs and ENERGY STAR labels averaged just below two (i.e., they are displayed for some but not all windows). In terms of non-store or manufacturer displays, the most prominent were manufacturer’s brochures.

**Figure VI-3
Promoted Features**



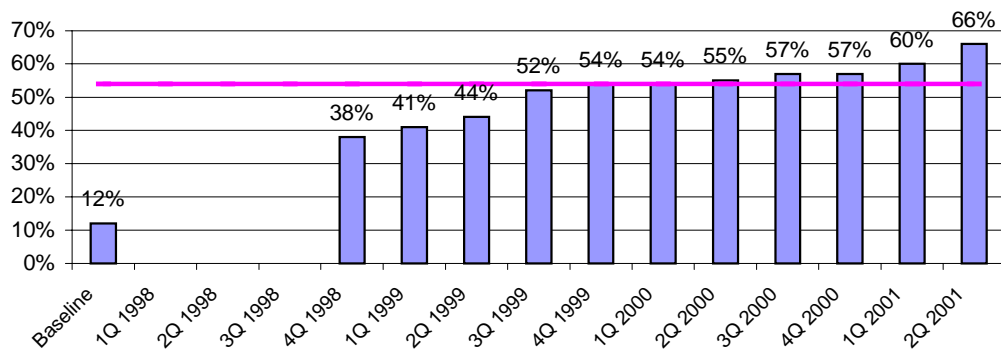
In conclusion, the Mystery Shopper survey showed that energy efficient windows are well established in Northwest retail stores. There are a large variety of energy-efficient windows and they are fairly well promoted by displays and salespeople. No salespeople recommended standard over energy-efficient windows, and many were very enthusiastic promoters of energy efficiency.

VII. Conclusions & Recommendations

Market Share, Awareness, and Cost of ENERGY STAR Windows

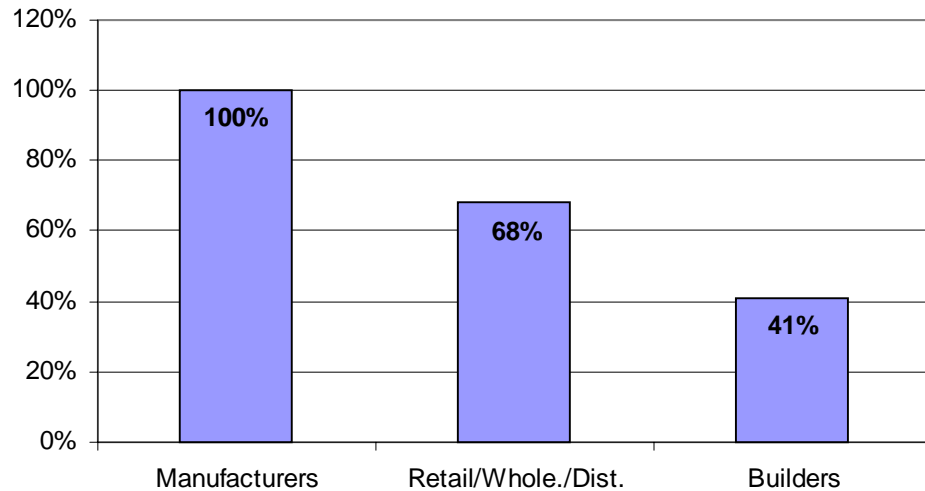
The first goal of the ENERGY STAR Fenestration Project was to increase market share for high-efficiency fenestration products in the residential new construction and remodel market to 54% by 2001. Market share for ENERGY STAR windows in the Northwest has significantly increased since the inception of the Project. The time trend is depicted in Figure VII-1. The Project exceeded its original market share goals, and appears to be well on its way toward sustaining this market transformation having achieved a 66% penetration rate in the second quarter of 2001.

Figure VII-1
Market Share of Energy High-Efficiency Fenestration Products



The second goal of the ENERGY STAR Fenestration Project was to decrease the lack of awareness of high-efficiency windows and their initial cost premiums that limit sales in the Northwest. Our research indicates that all window product manufacturers surveyed are now aware of ENERGY STAR and are active in the Northwest ENERGY STAR Fenestration Project. Awareness among retailers has hovered around 70% for the past three years indicating that there is still room for educating the one-third of retailers that do not know of the brand. However, awareness of ENERGY STAR windows increased significantly among builders. The share of builders who are aware of ENERGY STAR windows almost doubled from a year ago to 41%.

Figure VII-2
Awareness Levels of ENERGY STAR Windows



The third goal of the project was to reduce cost barriers associated with energy efficient windows. There are two components to this obstacle. First is actual prices viewed, and second is the perception of value or cost-effectiveness of buying ENERGY STAR windows. First, energy efficient windows are slightly higher in price than standard windows. We estimate this difference to be between 5%-10%. We expect this price to fall as more manufacturers commit fully to the Project and begin to create economies of scale. Further, we believe an important element is the perception of consumers, builders and retailers on the ultimate value of energy efficient windows. Throughout this Report we have shown that there is an overriding perception that ENERGY STAR windows are worth the incremental cost. Salespeople convinced our Mystery Shoppers that future energy cost savings far outweighs the extra cost of windows.

Findings for window product manufacturers, retailers and wholesaler/ distributors, builders, and consumers are summarized as follows.

Window Manufacturers

- ***Manufacturers were overwhelmingly satisfied with the Northwest ENERGY STAR Windows Project.*** There were four main features that appealed to participants: The increased branding of the ENERGY STAR symbol, the simplicity of the Project, helpful D&R staff, and marketing assistance.
- ***The ENERGY STAR Project provides an important endorsement.*** Respondents reported that the ENERGY STAR Project provides an important third party endorsement, or quality verification, to high-

efficiency window products. The symbol also provides a natural sales tool that dealers can use with end-users.

- ***Half of the manufacturers reported that they would have made little or no effort to promote ENERGY STAR windows without the Project.*** Some stated that they would have used traditional selling techniques – pointing out the benefits of low-e, argon, or discussing the NFRC label – but that these methods would have been far less effective without the Project support.
- ***Manufacturers are increasingly using the ENERGY STAR logo.*** Most of the manufacturers are now using the ENERGY STAR logo on all their marketing materials, including print ads, mailers, TV and radio commercials. Most manufacturers plan to continue using the logo even after the Project is completed.
- ***Manufacturers state that there is little cost difference between a standard (0.4) window and an ENERGY STAR window (0.35).*** Manufacturers indicated that the incremental cost to the consumer for a 5’x3’ horizontal slider ENERGY STAR window is only about \$10-\$20 (or about 10%-15%).
- ***Manufacturers believe that consumers still do not understand the benefits of ENERGY STAR windows.*** Respondents felt that many consumers remain uneducated about the benefits of ENERGY STAR windows, and indicated that consumer awareness would have to come from the national level, with additional promotions and increased branding for ENERGY STAR products.

Retailers, Wholesalers, and Distributors

- ***High demand by consumers.*** Nearly two-thirds of retailers and dealers believe that their customers have a high demand for high-efficiency windows. Furthermore, one-third of dealers reported that customers asked specifically for ENERGY STAR window products, double that of previous surveys.
- ***Good value.*** Approximately ninety percent of respondents believe that high-efficiency windows provide a good value to customers. The share of respondents who believe they are too expensive from the customers’ point of view dropped from the estimates in previous surveys.
- ***Awareness.*** Sixty-eight percent of dealers had heard of ENERGY STAR.
- ***Importance of price and quality.*** When asked the relative importance of energy efficiency, appearance, quality, and price in marketing windows,

respondents continued to rank quality first and price second. However, energy efficiency rose to number three in the rankings.

- ***Rising availability of information.*** Lack of information fell in importance from the previous year, indicating that retailers and dealers view this barrier as diminishing.
- ***ENERGY STAR availability.*** None of the respondents felt that energy-efficient windows are hard to obtain (down from 4% last year). In previous years, about half of dealers said they carried ENERGY STAR window products. In 2000 the percentage jumped to 79%.⁴⁰

Builders

- ***Awareness doubled.*** ENERGY STAR window awareness nearly doubled from the previous year. Two-thirds of those who were aware of ENERGY STAR windows could identify ENERGY STAR window features, whereas only a few could do so the previous year.
- ***Use of energy-efficient windows in new construction.*** Builders' responses to the 2000 survey showed a large jump in the use of energy-efficient windows. Due to a drop in sample size, the exact level of penetration is less relevant than the significantly upward trend in penetration among builders.
- ***Cost is less of an issue.*** Builders who installed less than 80% energy-efficient windows in homes they constructed most often mentioned cost as their reason for not using energy-efficient windows. However, the share reporting costs as the primary driver fell from 84% in 1999 to 41% in 2000. Further, the relative rankings of lack of information, price, and lack of availability changed substantially. In this year's survey, price dropped by 76% from the previous year in terms of importance as a market barrier.
- ***Consumer interest in energy-efficiency.*** Fifty percent of builders said homebuyers were somewhat or very interested in energy-efficient windows. The great majority (75%) of builders said that the main advantage of energy-efficient windows to homebuyers was saving money/lowering utility bills.

⁴⁰ This value is higher than the awareness value because respondents who were "unfamiliar" with ENERGY STAR were told what it was before being asked whether they carried the product.

Mystery Shopper Survey

- ***More availability in ENERGY STAR windows.*** Our shoppers found nearly double the choices of energy-efficient windows relative to standard windows.
- ***Higher cost is less important than overall value.*** The salespeople repeatedly mentioned the value and cost-effectiveness of ENERGY STAR windows. They felt that these would pay for themselves over time, especially a rising energy cost environment.
- ***Salespeople are knowledgeable and excited about ENERGY STAR.*** Eight of 13 salespeople could mention at least four features that distinguished energy efficient from standard windows. Five salespeople mentioned at least eight features. Half of the salespeople who sold both standard and energy-efficient windows made at least four comments promoting ENERGY STAR.
- ***Lower bills and saving energy*** was the message from salespeople about the benefits of ENERGY STAR windows.

Expert's Assessment of the Future of ENERGY STAR in the Northwest

Using a Delphi forecasting technique, we asked window experts to provide their judgements of the future of window energy efficiency in terms of future residential window U values, estimated incremental costs of ENERGY STAR equivalent windows, energy codes, and the direction of the national ENERGY STAR effort. The resulting “pooled” predictions indicate a remarkable level of agreement on the future of high-efficiency windows:

- ***The features that are cost effective change at different U values.*** Experts agreed that in order to create a U value of 0.35, double panes and low e coating are necessary. Yet, as you increase efficiency to a U value of 0.25, the combination of features changes and focuses more on frames, spacers and triple panes.
- ***Falling cost of most energy efficient features.*** Experts predicted falling costs of features including double pane glass, low e hard or soft coat, argon fill, and warm edge spacer. However, large cost increases were predicted for advanced window frame design. Perhaps as a hedge against uncertainty, 80% of experts also predicted a very large increase in the cost of “other high efficiency materials.”
- ***Increasing market penetration.*** The average predicted market penetration rate of $U \leq 0.35$ windows was 64% by 2005 and 76% by

2010.⁴¹ For the higher efficiency value of 0.30, the average predicted market penetration was 11% and 27% (by 2005 and 2010 respectively).

- **Increasing code requirements.** The Delphi panel was asked to try to predict the energy efficiency codes in the Northwest by 2005 and 2010 in round one. Overall, there is a general expected trend in the codes from $U \leq 0.39$ to $U \leq 0.35$ over the next ten years.

Experts' Recommendations

Experts' recommendations to move the predicted levels and market penetration of energy-efficient windows upwards included:

- Continued research on promising energy-efficient window technologies and components
- Federal government acceptance of the need for action on global climate change
- Continued promotion of ENERGY STAR brand and Project at the national level, including the following specific actions:
 - Simplified national energy rating requirements, including a simplified annual energy rating for windows, clarification of the role of cooling impacts, increased consideration of the impacts of solar gains relating to home design and building envelope efficiency, and increased attention to the role of energy-efficient windows on indoor air quality as homes are made more energy efficient
 - Pressure should be put on HUD to adopt ENERGY STAR level efficiencies in the HUD window standards that impact manufactured housing.
 - Federal residential tax credits for ENERGY STAR windows at energy efficient levels 30% to 50% above model energy codes
 - Continued research on promising energy-efficient window technologies and components
- Increased state energy code efficiency requirements for windows and strong enforcement of those codes
- Continued active involvement on of the Northwest states and regional organizations at the national level. The region should also push the U-

⁴¹ Note that respondents were unaware of the penetration of 57% by the end of year 2000 and 60% in the first quarter of 2001. We believe their projections would have been even higher had these recent statistics been available.

values in energy codes through intensive work with the governors of the western states most affected by the recent energy crisis. A few states actually *can* make a difference in the national forum.

- Utility support for ENERGY STAR efforts in local markets in order to ensure further increases in window energy efficiency.
- Increased marketing to builders and homeowners to increase their awareness of window energy efficiency and its benefits will be necessary to ensure that they understand the benefits of energy-efficient windows, even to the extent. One expert went so far as to recommend incentives be provided to builders for installing energy-efficient windows.
- Inclusion of installation standards and procedures as part of the window package at the retail level is key in guaranteeing performance.
- ENERGY STAR marketing should include consumer tips on contractor selection and proper installation when marketing ENERGY STAR products.

Recommendations

We believe the Alliance's ENERGY STAR Windows Project is an extremely successful model of market transformation. Still, there is room for improvement, and our specific recommendation follow:

- Builder and retailer awareness can be improved further. As this is more fragmented segment of the market than manufacturers, the current Alliance Consumer products initiative, aimed at brand maintenance, may aid in this goal.
- The triangulation approach was successful in creating confidence in the manufacturer reports of ENERGY STAR penetration. Using several methods addressed expected sample size problems within each market actor group, while still giving reliable information for the market as a whole.
- Cost Effectiveness Assumptions should be revisited, specifically in terms of :
 - Retrofit market share
 - Electric heat saturation
 - Prevalence of windows that surpass ENERGY STAR requirements
 - High current penetration and updated future predictions

- The Mystery Shopper Survey gave valuable insight into the way that consumers are presented with information from retailers. This may be useful for other consumer product evaluations.
- To impact the market further, the Alliance may consider supporting industry demands for new codes or tax incentives for energy efficient products.