

## **Market Research in MT Program Design: Commercial Windows in the Pacific Northwest**

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### **ABSTRACT**

The Northwest Energy Efficiency Alliance (NW Alliance) uses market research as an integral part in the design and development process of effective market transformation programs as was the case of the Commercial Windows Initiative (CWI). Success with a residential windows market transformation project created interest in developing a commercial sector project. The NW Alliance partnered with Lawrence Berkley National Laboratory on a national non-residential windows market characterization and assessment. The market research framework incorporated (1) market actors and how they interact, (2) window technologies, (3) market barriers to the adoption of more efficient window technologies, and (4) market interventions that could be used to overcome those barriers.

The market research identified one specific market sub-sector (punched openings) and a technology (manufactured vs. site built) that were good candidates for market transformation. The market research also revealed there are only a small number of national manufacturers that dominate the sector, a number of non-energy benefits, as well as an industry supported energy performance rating council (NFRC); all leverage points that would increase the probability of a MT project's success.

Combining the market research findings with an unsolicited proposal, the NW Alliance then went on to develop the CWI. It has developed into a collaborative industry partnership involving the major industry trade organization and many of the major national and regional manufacturers. CWI has developed specifications for commercial windows that go significantly beyond current energy code and will be verified by the NFRC process. The project operates primarily through marketing strategies driven by manufacturers.

### **Introduction**

The Northwest Energy Efficiency Alliance (NW Alliance) is a coalition of electric utilities, state governments, public interest groups and efficiency industry representatives working to bring energy efficient products and services to the marketplace through the process of market transformation (MT). Since the NW Alliance's founding in 1997, the organization has come to use market research as an integral part in the planning process of effective market transformation programs. A recent example of this approach is embedded in the Commercial Windows Initiative (CWI).

In 2000, the NW Alliance was slowly winding down its successful Residential ENERGY STAR Windows project. This project's goal was to increase the market penetration of ENERGY STAR qualifying windows to 54% market share from a baseline of 10-15% in 1997. This goal was met a year early in 1999<sup>1</sup>. It was thought that success in the residential market could be

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<sup>1</sup> The residential ENERGY STAR Windows eventually had a northwest market share of 75% in Q1 2002.

translated into success in the commercial windows market and the NW Alliance received an unsolicited proposal to pursue this opportunity. Additional, reasons for interest in this sector were the desire to provide energy efficient products and services to the commercial sector and the intersection between window systems and daylighting; a design strategy that the NW Alliance was promoting.

However, little information was available, both regionally and nationally, on the commercial glazing industry. What was known was that the structure of the commercial windows market differed significantly from that of the residential, in that there were a number of significantly different major product types (i.e. curtain wall, storefront, and punched opening) and that national manufacturers and not regional, dominated the market. It was determined by the NW Alliance staff that to correctly assess any proposed market transformation initiative aimed at the commercial windows sector and to provide a foundation on which to develop and plan such an initiative, baseline market research was needed.

As the scope of the market research was being developed, NW Alliance staff learned that Lawrence Berkeley National Laboratory (LBNL) was pursuing a similar market research effort under a Department of Energy (DOE) contract. After discussions it was agreed to jointly fund and develop the market research and Eley and Associates was selected to perform the market research. The purpose of this study was to characterize the nonresidential fenestration market in order to better understand the market barriers to and opportunities for energy efficient fenestration products and services.

Specific goals of this market research were to:

1. Better understand the structure of the industry and how products flow between industry groups.
2. Identify the major decision makers for specific technologies and products.
3. Identify industry trends.
4. Characterize the role of codes and standards on the industry.
5. Assess the impact of product testing and certification programs.

Information for the market assessment<sup>2</sup> was drawn from a combination of existing secondary data and interviews with key market actors all levels of the supply chain.

**Table 1. Market Actor Interviews**

<b>Sector</b>	<b># of Interviews</b>
Glass Manufacturers and Coaters	9
Glass Coaters	4
Glass fabricators	6
Glass Equipment Manufacturers	3
Metal and Component Suppliers	5
Window Manufacturers	3
Laminate and Applied Film Manufacturers	4
Glazing Contractors	12
Trade Associations and other Industry experts	9
Architecture and Engineering Firms	16
<b>Total</b>	<b>70</b>

<sup>2</sup> The study "A Characterization of the Nonresidential Fenestration Market" was completed in June 2002 and is available at <http://www.nwalliance.org/resources/reportdetail.asp?RID=109>.

## Market Characterization

The U.S. glass industry is a \$27 billion dollar industry. Nonresidential glazing represents approximately 18% of total production. In 1999, nonresidential glazing was supplied to approximately 2.2 billion ft<sup>2</sup> of new construction and additions<sup>3</sup>. That same year, nonresidential glazing was also supplied to approximately 1.1 billion ft<sup>2</sup> of remodeling construction<sup>4</sup>.

Figure 1 succinctly provides a picture of how product flows through the market. Many levels of the supply chain are also very concentrated starting with primary glass manufactures (PGMs) where only six companies operate all 30 plants in the U.S. Three firms also dominate the coating sector. Control of the nonresidential fenestration market remains national at many other levels of the supply chain as the 50 largest firms in both the fabricating and glazing installation sectors are also responsible for over half the national market. It must also be stated that many firms operate across the identified sectors with many PGMs acting as coaters and fabricators, frame manufacturers acting as glazing contractors, and glazing contractors fabricating framing on site.

The supply chain in the region the NW Alliance operates, the Pacific Northwest, was found to mirror the national. There were some slight differences in that thermally broken or improved framing systems were more common. The demand side of the market was also seen as different with architects more typically specifying insulated glass (IG) units with low-e (70% regionally vs. 40% nationally).

Surprisingly many of the interviewees advocated an increase in window performance levels in energy codes. Many glazing contractors, fabricators and some architects felt that codes drive what products are specified in buildings and that raising code levels would also raise the awareness of architects of higher performance products. Most agreed that guidelines or regulations should not be too complex and be streamlined as much as possible, while relying on window products that were readily available. However, the exact types of products, product specifications or methods to be used varied for many respondents.

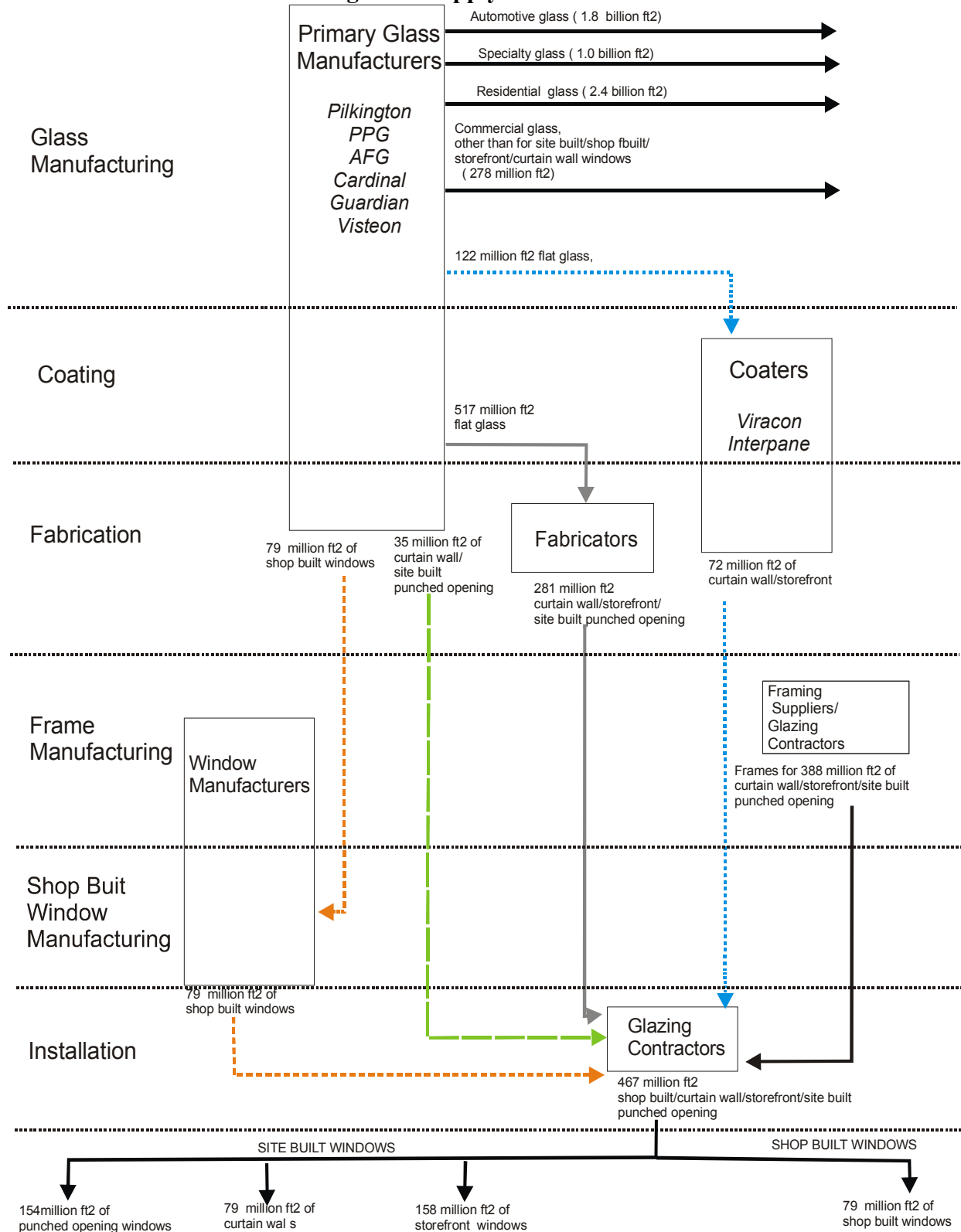
The study found that the National Fenestration Ratings Council (NFRC), which conducts an energy rating and labeling program, rated and labeled most “shop-built” fenestration. Product specifications are all calculated using consistent and accurate methods and address the combined glass and frame performance. NFRC standards for site-built fenestration are new and just beginning to be implemented, with one of the few places requiring them being Seattle, Washington. However, issues with site-built certification costs and methods have not yet been resolved at a national or regional level. Some respondents also favored a less complex “chart certification” “system for site-built certification.

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<sup>3</sup> The Distribution of Residential Doors and Windows in the 1999 U.S. Market,” *Ducker Research Company*, April 2000.

<sup>4</sup> Ibid

**Figure 1. Supply Side Market\***



Source: Eley and Associates 2002

\* Glazing Contractors include builders and installers

A variety of industry trends were identified from the survey:

- Increased use of transparent glass: possibly due to increased glazing products that have low SHGC and U factor but high VLT as well as an aesthetic trend toward clearer glass.
- General availability of high performance tints.
- Increasing market penetration of low-e products.
- Increased availability of improved window components (thermally broken frames, spacers and post-temperable low-e coatings).
- Increased market share of punched opening windows possibly due to higher insurance rates for site built fenestration installations, lack of qualified labor, architectural trends or increase in window replacements, and older buildings have more punched openings.
- A move from monolithic (single pane) to insulated glass (double pane) units.

The barriers to energy efficiency are different for each channel and the opportunities for changing the market vary. For instance, shop-built windows perform the best and have a relatively high penetration of low-e coatings and other high performance features. Most of these products are also NFRC rated. However, shop built windows are typically used only for punched openings, a market still dominated by site-built windows. At the other extreme, the supply channel for storefront windows, which are used especially in small projects, make very limited use of energy efficient features. Local fabricators typically stock only a fraction of the glazing types produced by the PGMs. Glazing contractors working on smaller projects generally work with local fabricators and rarely work directly with PGMs or coaters that have the technology for advanced coatings and other energy efficient features.

Major barriers identified by the research were:

- Lack of availability of higher efficiency product from local fabricators.
- Owners/developers perceive no incentive to invest in high performance features in speculative buildings.
- Perceived higher initial costs as well as bidding process that favors low bids hinder greater adoption of high performance windows.
- Perceived reliability of new products.
- Window specifiers (i.e. architects) not familiar enough with available products and product features to specify window performance features, often using the regional building code as a default.

Opportunities identified include:

- Promoting insulated glass over monolithic glass. Energy efficiency can be increased dramatically with little increase in installation costs. This is especially relevant in the replacement market.
- Improving awareness of efficient products among owners/developers as well as architects, designers, and glazing contractors.
- Promotion of the “integrated design” process where window performance is considered.
- Promotion of analysis tools.

## Project Planning

The joint national and targeted Northwest market research helped identify the opportunities for the NW Alliance to develop a market transformation strategy in this sector. Several factors influenced project planning. The NW Alliance was already operating initiatives that promoted integrated design. The majority of commercial windows that receive NFRC ratings are shop-built windows, i.e. those windows built off-site by a manufacturer or component assembler. From the market research it was found that shop-built windows primarily go into punched openings and all windows in punched openings represent the largest nonresidential windows product segment, exceeding the installed area of curtain wall and storefront windows. However, shop-built windows are found in only about a third of the punched opening market and compete with site-built windows for this large and growing market. Shop-built windows were also identified as tending to be more energy efficient and having other benefits associated with them as a better quality assurance and lower installation costs due to reduced insurance costs and the need for more qualified labor.

This led the development team to favor working with manufacturers on a project that would focus on improving the market penetration of high performance window systems in the punched opening market, primarily through promotion of qualifying manufactured windows. This sector was large and growing, already had a NFRC rating procedure for shop-built product in-place and accepted by the industry and had a variety of available product. Also, manufacturers were viewed as being highly motivated to gain market share and many were expected to see energy efficiency as a way to capture it. Focusing on manufactured products allowed for higher product quality control at the plant as well as use of a nationally established rating system to assure consistent testing and labeling. However, it also allowed the possibility for confusion on the demand side due to too narrow a focus since architects typically don't think in terms of punched openings and manufactured product alone. They consider the full range of glazing options for any given project.

Two indicators of market transition were identified in this project. First, a change in market practice whereby some easily recognized identification mark (e.g. a label, a logo) helps users identify and select qualifying product. While there is no current ENERGY STAR standard for commercial windows, this project would propose a specification for the Northwest and work with DOE to develop such a standard. This leads to the difficulty of going with an interim or temporary label or brand and then shifting to the ENERGY STAR label later. Second, there is the potential to influence state nonresidential codes to lock in higher efficiency levels. However, improved energy codes were not viewed as a strategic option as they would not, in themselves, garner a broad level of industry support.

A nonresidential windows project was viewed by the NW Alliance as complementing its existing commercial sector projects especially those with a major focus on daylighting. It was thought that a windows sector project would help promote energy efficient window systems that were also appropriate for daylighting applications. The project design called for advising architects on the impacts of Visual Light Transmittance (VLT) on daylighting, providing joint training with daylighting designers and encouraging designers to consult the daylighting experts when specifying VLT.

An energy savings analysis was performed to estimate cumulative project savings and long-term cost-effectiveness. These savings were based primarily on moving from the current practice of installing windows with an average U-value of 0.55 to a target of 0.35 for vinyl

windows and 0.42 for aluminum frame windows. With a target of achieving 50% market penetration for window systems meeting that specification in the punched opening market by 2006 from a baseline of 12%<sup>5</sup>. This baseline was a preliminary adjusted estimate. The evaluation was then charged with refining this estimate. As a result of this lack of certainty, an incremental increase in market penetration of 38 percentage points was established to assure project cost-effectiveness. The cumulative savings from the project were estimated at 33 aMW by 2010 with a solid benefit-cost ratio of 4.7.

Further discussions with regional market actors brought forward additional issues that include:

- Many architects do not differentiate between types of low-e glazing
- Many architects do not differentiate between types of thermal breaks in aluminum frames.
- Architects often reuse the specifications they have used successfully on recent projects.
- Architects often reference out-of-date specification standards.
- Window manufacturers often do not understand how to present information to architects and often do not understand the differing needs of the architect depending on the stage of a project.
- Window and glass representatives tend not to up-sell. They respond to the architect's specifications and want to make sure their brand is specified, but only provide information about higher performance products if asked.

## **Project Design**

Using the market research, the unsolicited proposal and a wide variety of secondary data sources the Commercial Windows Initiative (CWI) was crafted. Following is the resulting framework of the CWI.

### **Initiative Organization and Steering Committee**

Assembling industry leaders representing major component manufacturers, commercial window manufacturers, residential /light commercial windows manufacturers as well as the NFRC and representatives from the specifier community.

### **Product Specification and “Brand” Identity Development**

Development of the exact product specification with the Steering Committee and representatives from laboratories, code organizations and other stakeholders. Performance issues to be addressed include U-factor, Solar Heat Gain Coefficient (SHGC), visible lighting transmittance (VLT). The specifications are aggressive enough to achieve meaningful savings while being applicable to a broad range of product. A two-tiered system was envisioned to avoid favoring vinyl over aluminum frames. After agreement on the specification by the industry a branding strategy would be determined.

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<sup>5</sup> This differs from the market penetration found in the national market research. Additional discussions with manufacturers and regional experts resulted in a lower regional market baseline for high performance windows.

## **Supply-Side Development and Marketing**

CWI focused on the supply side of the market during the first year of the Initiative. CWI works with the manufacturers' marketing and sales staff to ensure that they are familiar with and comfortable promoting qualifying product. Efforts are customized to fit the needs of each participating manufacturer. Activities may include development of training materials, training presentations, sales aids and other promotional assistance. Technical assistance is offered to participants to assist them in the manufacture and marketing of products meeting the Initiative's specifications.

CWI develops general marketing messages and materials as well as messages and materials tailored to fit the product, brand and image of individual manufacturers. CWI develops training, marketing and presentation materials for delivery at industry events including utility sponsored events, manufacturer events, architect/designer association meetings, builder/developer association meetings and other appropriate venues.

## **Demand-Side Marketing**

Beginning in year one but with more emphasis in year two, CWI will develop marketing collateral and actively market to those market actors that control the specification and installation of windows. These include architects, owners, developers, glazing contractors, and general contractors. CWI will develop articles and advertisements for placement in regional trade publications, trade association newsletters and program newsletters. Specific PR stories will also highlight innovative or leading manufacturers.

CWI will also work with a few selected early adopter developers on high visibility projects to obtain stories on successful uses of the qualifying products and then promote those stories under the BetterBricks demand-side marketing efforts.

The project will provide education as needed to assist in designing and specifying appropriate products based on specific design criteria such as orientation or view. The project will develop training, marketing and promotional materials targeting demand-side market actors. The implementing contractor will present these materials at industry meetings and events as well as individual presentations.

## **Coordination Between other NW Alliance Commercial Initiatives, Northwest Utilities and Other State and Federal Programs**

The CWI coordinates marketing activities with the NW Alliance's umbrella commercial sector initiative, *BetterBricks*. Major resources to leverage and work with include the BetterBricks website, the BetterBricks Advisor service, the Daylighting Labs and the Lighting Design Lab (LDL).

CWI also seeks to leverage opportunities within existing utility, state and federal energy efficiency programs. The CWI will perform outreach activities to inform interested parties on CWI activities and work through utility, state and federal energy efficiency programs whenever possible.



## **Investigate Integrating Site-Built Commercial Windows**

If the NFRC rating system is accepted by the industry for the site-built windows market during the period in which the Initiative is operating, CWI will investigate incorporating qualifying site-built windows into the Initiative.

As with most other market transformation projects funded by the NW Alliance, the CWI also developed a set of interim progress indicators to track the Initiative's progress. The progress indicators are:

1. Creation of an industry-supported steering committee.
2. Creation of a broadly accepted product specification.
3. Increased awareness of the Initiative's specification and associated products.
4. Increased total production and sales of qualifying product.
5. Greater numbers of projects with punched openings specifying qualified product.
6. Increased availability and number of qualifying products.
7. Matching funding and in-kind services of at least \$1.5 million.

## **Program Activities**

The NW Alliance Board voted to fund the CWI in June 2002, with \$1,496,000 with an additional \$120,000 going towards evaluation. The project officially kicked-off in September 2002 and is planned to continue through August 2005.

In the short time the Initiative has been underway a number of the progress indicators have been completely or partially achieved:

- The Initiative quickly recruited interested and active members of the commercial windows industry to participate in the CWI Steering Committee. Though the Steering Committee is national in scope most of the major Northwest manufacturers are participating.
- The CWI, in coordination with industry, established accepted criteria for high efficiency product for the Northwest. The agreed upon specifications are: a maximum SGHC of 0.40, a minimum VLT of 0.50 and U-Factor of 0.35 or lower for non-metal frame and 0.42 or lower for metal frame. The initial target of a U-Factor of 0.40 or better did not achieve wide spread industry support. It was determined that having industry support for a common specification that improved significantly over common practice was a primary consideration on this compromise. Also, the ability to change the specifications in the future was also seen as an option.
- Awareness of the CWI "brand" specification has grown. There are 9 completed demonstration projects and 14 additional ones are in the planning or construction phases. Part of this increase is due to the 27 seminars for architects as well as ongoing coordination with the American Architectural Manufacturers Association (AAMA) and NFRC.
- One participating indication of overall Initiative impact is the increase of reported sales of qualifying product in the region to 3 million square feet from an estimated baseline of

1.5 million square feet. These data will be verified through the evaluation effort and adjusted, if needed, based on variables such as economic conditions.

- Participating manufacturers have begun to increase the production of qualifying product.
- To date, twenty-six of the participating manufacturers have contributed \$260,000 in matching support.

## **Conclusion**

Preliminary market research can enhance the planning and development of market transformation projects and, in the case of the CWI, the market research was crucial in focusing the project on a sub-segment of the market-- the shop-built punched opening market. This segment was one that had an infrastructure that enabled a higher likelihood of market transformation success in that most products had accepted the NFRC rating procedures, and this was a growing segment relative to the two other major types of window systems. The market was also revealed as one with a likelihood of integrating relatively higher levels of energy efficient components and technology, as manufacturers have the ability to easily increase production of more efficient glazing systems. There were also a number of non-energy benefits identified that made the business case and marketing of energy efficiency stronger for this particular market segment. Had the project started with all windows, the likelihood of gaining broad manufacturer acceptance of a qualifying set of specifications would have been very low. Taking a smaller first step into the market allows the opportunity to build familiarity and trust and the eventual expansion into the broader market, including site built windows.

## **References**

Eley and Associates, "A Characterization of the Nonresidential Fenestration Market", Lawrence Berkley National Laboratory and Northwest Energy Efficiency Alliance, Report 132, July 2002.