



HIGH PERFORMANCE OFFICE AND EDUCATION BUILDINGS IN WISCONSIN: VIEWS FROM MAJOR MARKET ACTORS

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I. EXECUTIVE SUMMARY

Wisconsin’s Focus on Energy program¹ and the Energy Center of Wisconsin (ECW) jointly funded this research project to investigate questions (or research objectives) related to energy-related decision making in offices and educational facilities. The research objectives for this work were to: determine building decision-maker’s priorities and decision-making processes; assess understanding of “high performance” construction; understand attitudes and awareness concerning energy efficiency and non-energy benefits of “high performance” construction in new office and school buildings; review barriers and potential solutions; and test program approaches and messages. The focus of ECW is to develop a well-tailored training curriculum to accomplish similar goals both in Wisconsin and nationwide. To conduct this work, Focus on Energy and ECW contracted with Summit Blue Consulting (SBC) and Skumatz Economic Research Associates, Inc. (SERA).

This project used 30 detailed in-person interviews, followed by 148 telephone surveys to investigate familiarity, attitudes, practices, and program / training needs regarding High Performance buildings in the State of Wisconsin. The interviews included developers, owner occupants, architects, and engineers around the state associated with office and educational buildings. The results provide information useful in gauging current practices and attitudes, prioritizing program interventions, and designing training sessions on High Performance principles.

Table I-1. About the Telephone Respondents

(telephone results)

	Overall	Actor Type				Building Type	
		Developers	Owners	Architects	Engineers	Office	School
Total (in-person)	30	3	5	12	10	18	12
Offices (in-person)	18	3	2	8	5		
Schools (in-person)	12	0	3	4	5		
Total (phone)	148	37	40	36	35	91	57
Office (phone)	91	37	22	13	19		
Schools (phone)	57	0	18	23	16		

¹ Focus on Energy is a public-private partnership offering energy information and services to residential, business, and industrial customers throughout Wisconsin. These services are delivered by a group of firms contracted by the Wisconsin Department of Administration’s Division of Energy. The goals of this program are to encourage energy efficiency and use of renewable energy, enhance the environment, and ensure the future supply of energy for Wisconsin.

A. OVERALL FINDINGS

Several issues became clear through the interviews and surveys:

High Performance is not a widely used or familiar term among building decision-makers:

The research shows it is understood by less than one-fourth of the decision makers, and by very few owners and developers. Other terms are better recognized, but tend not to incorporate as wide a range of practices as Focus on Energy and the Energy Center of Wisconsin incorporate under the “High Performance” brand. High Performance is not widely understood as a concept and the Program could not assume decision-makers understand the term or program without further explanation. However, decision-makers believe they are getting high performance components in the buildings they design and build – indicating they care about the features. Nevertheless, the “High Performance brand” is not well known, and decision-makers may not be getting all the benefits they might out of the buildings and design.

First costs and perceived performance issues are concerns, and need addressing through interventions:

We found that the common focus on first costs poses a problem, and its paramount priority is voiced by developers, architects, and engineers. First cost is a critical factor in design decisions, but owner-occupants are more likely to make trade-offs between first cost and operating costs. As a result, owner-occupants are more likely to implement high performance features. However, architects and engineers perceive owner decisions to be first-cost dominated to such an extent that it serves as a barrier for them to consider high performance features. Finding a method to internalize operating costs – and to provide reliable real-world cost and payback information on High Performance features would help persuade some actors that have been reluctant to utilize High Performance design practices.

In addition, decision-makers expressed concerns about cost, risk, and liability issues from their perceptions that High Performance equipment may have higher maintenance requirements (and which may exceed the capabilities of maintenance staff), and may require additional call-backs. They are reluctant to be “guinea pigs” for new and relatively less tested equipment. This was especially a concern for engineers regarding HVAC equipment.

Non-energy issues are key factors in implementing High Performance features: A number of benefits of High Performance and efficient construction practices and measures are recognized (including comfort, productivity, equipment performance, and quality of light), but initial cost as well as perceptions about equipment maintenance problems pose barriers. These provide hints about topics to be included in training sessions.

Training and outreach are expected to increase incorporation of High Performance design:

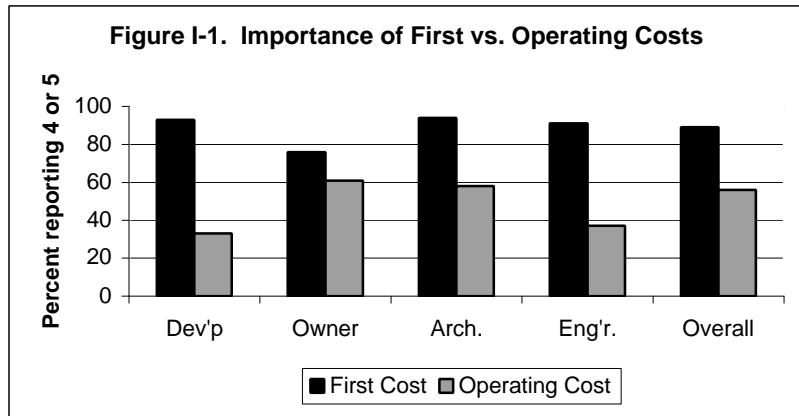
Most of the actors agree that it is more important for architects and engineers to gain additional training than it is for owners/developers. Even though many architects would like to see owners learn more, owners are not very interested in attending training on any High Performance factors, except possibly cost information. A&E professionals are much more willing to attend training sessions. Owners and developers show little interest in training or even in researching High Performance features; they tend to rely on hired A&E professionals for these issues. In addition to priority topics identified by respondents, including costs / payback, indoor air quality (IAQ), HVAC, lighting, and overview topics, real world, credible information on costs and performance (if there is evidence to dispel perceptions) would also be well-received.

B. RESULTS BY KEY TOPICS

A summary of the basic findings for each of the key research objectives follows. Implications are included in the final section.

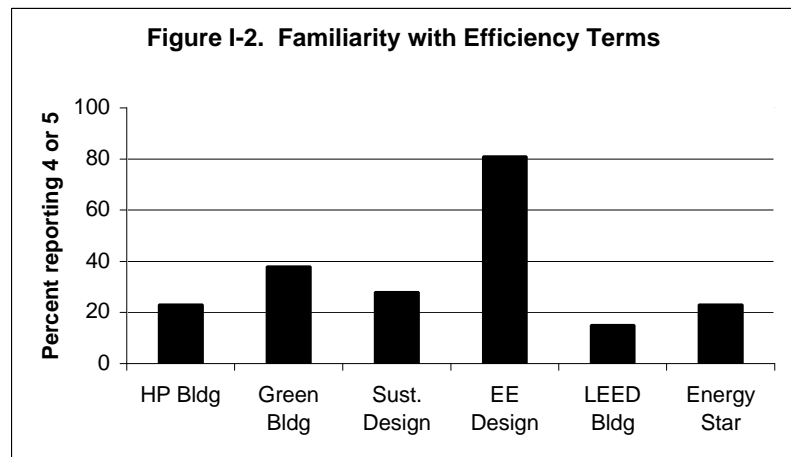
Building decision-making and criteria

While operating cost is important, first costs are paramount to most of the decision makers. A&E decision makers and developers rank first costs very highly, with more than 90% rating first costs as a 4 or higher on a 5-point importance scale (5=very important). Owner occupants are less concerned than others with first cost; fewer than 80% of owner occupants give first cost a 4 or higher rating. About 60% of owners and architects rank on-going costs highly, a ranking held by only about one-third of the other decision makers. Other criteria important in design and construction include: worker productivity, workflow / layout, and building / business specific needs. Daylighting has been incorporated to improve the work environment.



Familiarity with High Performance design / construction features

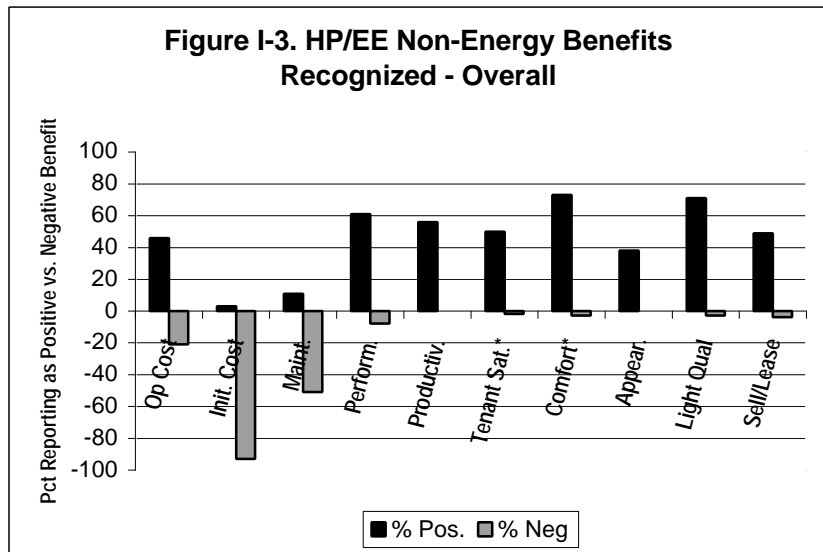
The term “High Performance” is understood by about one-quarter of the decision makers – but only about 5% of the owner occupants. Similar percentages give the terms sustainable design and ENERGY STAR™ scores of 4 or 5 on a 5-point familiarity score. Using similar criteria, LEED ratings are only familiar to about 15% of respondents, (more commonly by A&E respondents). By far the most commonly recognized term is energy efficient building,



recognized by more than 80% of respondents. When asked about the familiarity with specific High Performance features, respondents recognized features in the following descending order: collaborative design, high efficiency HVAC, high efficiency lighting, active daylighting, EMS, indoor air quality measures. Commissioning received a lower average ranking, and sustainable / recyclable materials for construction were considerably less familiar.

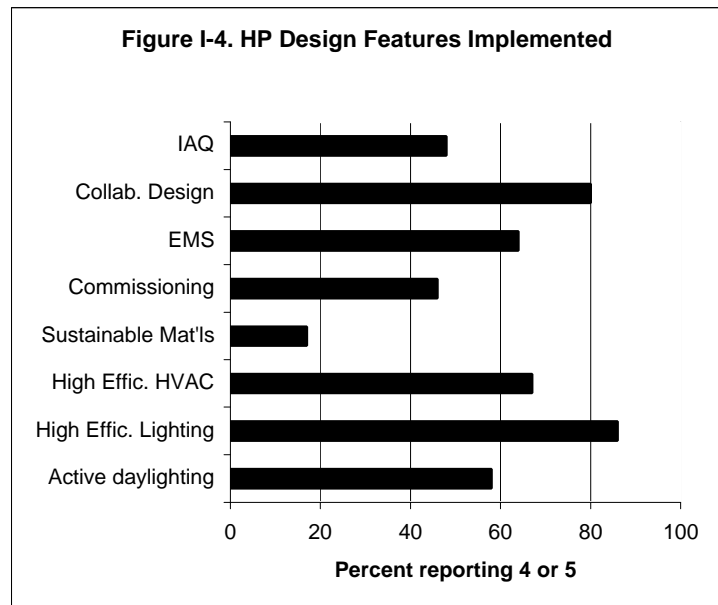
Attitudes / awareness of efficiency and non-energy benefits

The operating cost benefits from greater efficiency are understood, but the first cost barrier remains an issue. A number of non-energy benefits (NEBs) (and negatives) were associated with High Performance design compared to standard design and construction practices. The most important positive NEBs that were recognized included: improved tenant satisfaction, better quality of light, better comfort, increased productivity (workers or students). Two key negatives were mentioned: initial cost (as expected) and concerns about increased equipment maintenance (an especially large concern for A&E decision makers). These results provide some possible guidance for issues that need to be counteracted (or clarified in training sessions).



Use of High Performance design and practices in new construction

Half or more of the buildings we discussed during the interviews had installed the following High Performance features: active daylighting (58%), high efficiency lighting and HVAC (86% and 67%), EMS (64%), and integrated design process (80%). Sustainable or recycled materials were only rarely installed – less than 20%. High Performance design practices and features are more commonly incorporated into educational buildings than offices. It should be noted that these data are based on self-reports by market actors who may use different definitions of what constitutes various high performance elements than do program staff and energy efficiency advocates.



Barriers and possible solutions for High Performance construction practices

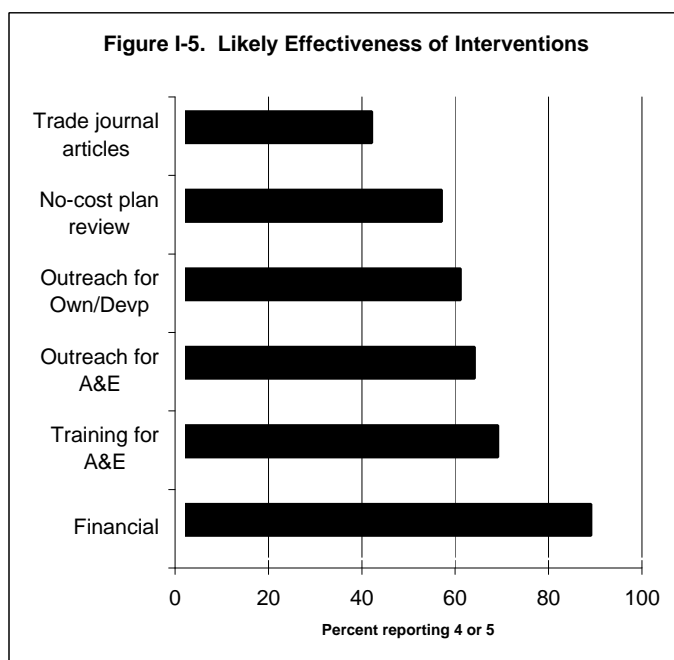
The detailed in-person interviews determined that the biggest barriers to implementing High Performance practices included: higher up-front costs, concerns about equipment performance and associated risks, resistance to change among contractors and inertia in building practices or among decision makers, difficulty in obtaining equipment, educating owners on benefits, and time to analyze options. Decision makers are resistant to using clients as “guinea pigs” for new measures – they prefer well-tested equipment that will perform and will not require extra visits to the location to tweak, replace, or deal with complaints about systems. Liability issues are also a problem. We asked the telephone respondents about the methods they used to overcome resistance to High Performance design. Almost 2/3 cited “educating clients,” and half mentioned “demonstrating paybacks” for the equipment as key strategies. “Case studies” were another method, mentioned somewhat more often by architects than engineers.

Program Needs and Preferences

By far, the intervention deemed most likely to increase the percentage of buildings constructed incorporating High Performance design features was financial incentives. More than 80% responded with a 4 or higher on a 5-point scale. Two thirds of the respondents gave “training for A&E professionals” a score of 4 or higher. Outreach options received about 60% responses of 4 or 5, followed by no-cost plan review. The option deemed least effective was greater exposure of High Performance design in the trade journals.

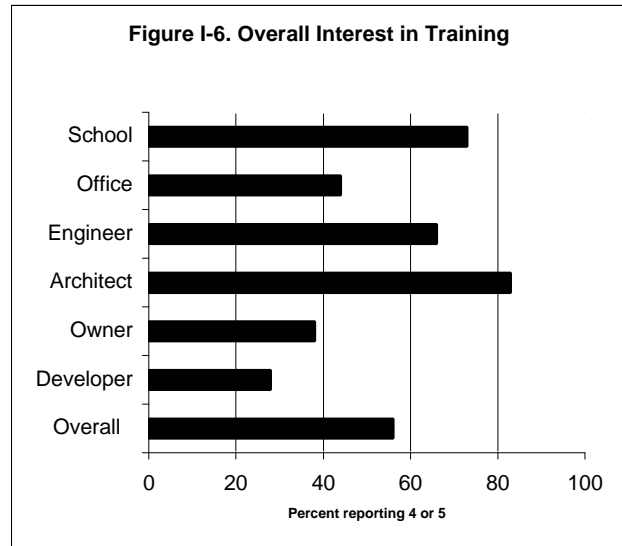
Information sources

We asked about the information sources decision makers use to investigate High Performance and efficiency topics. Owners and developers were less likely to rely on any sources for information – they tend to investigate issues less than the design professionals. When they do investigate High Performance issues, they tend to rely on architects and engineers they had worked with before (96% and 88%, respectively). About 60% of owners and developers refer to trade journals, and other sources are consulted by about 50% or fewer of the respondents. Engineers and architects also refer to colleagues with similar percentages, but more than 80% regularly refer to many different sources – a figure that is very different than owners and developers.

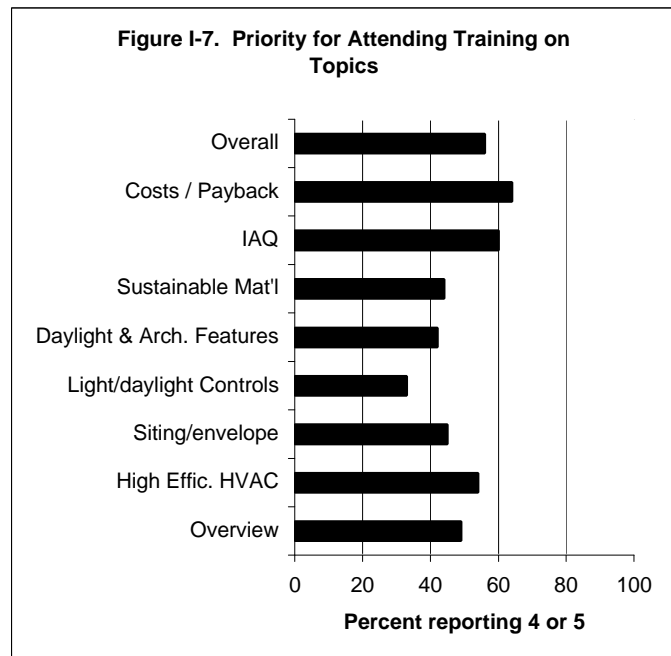


Training needs and preferences

The ECW and the in-depth interviews provided several ideas for training topics. Ranked by respondents from highest priority to lowest among the proposed topics were: costs / payback, indoor air quality, high efficiency HVAC, and overview of High Performance. Lower priorities were associated with the remaining topics (siting / envelope, sustainable materials, daylighting architectural features, and high efficiency lighting / daylighting controls). Owners and developers were much less interested in training than A&E respondents. They showed some interest in costs, and indoor air quality was of some interest to owner-occupants, but very few topics scored as high a priority as even the lowest priority for A&E decision makers.



The largest percent of respondents preferred half-day training sessions, and sessions should cost less than \$200 and be taught within 30 minutes drive of attendees' offices. It seems a mix of leaning methods is preferred – lectures were preferred by 70%, but almost 60% like hands on or case studies, and 53% like facility tours. Lectures are more popular among A&E respondents than owner / developers. Tours were more popular for owners and architects, and architects tend to prefer hands on and case studies more than other actors. Outreach about training through AIA, ASHRAE, BOMA, and the University of Wisconsin should reach the majority of attendees. Reaching owners and developers through associations would be difficult, because few belonged to any, but they expressed considerably less interest in training in any event.



C. IMPLICATIONS FOR THE PROGRAM

High Performance Branding should focus on architects and engineers: The High Performance (HP) term is not well understood by most actors – especially developers and owners – but their decisions are largely guided by the influence of architects and engineers. Therefore, the potential for crafting or improving the understanding of the HP brand may depend on advertising designed to influence the design team decision-makers. There is a good base of knowledge among A&E firms for specific features, understanding and use of the overall brand and concepts shows considerable room for improvement.

Cost and perceived performance barriers need to be addressed: First cost concerns are key in decisions about incorporating High Performance features. Although owner occupants (but not developers) are relatively receptive to higher first costs in return for lower operating costs, A&E firms tend not to include High Performance features because they fear losing the bid, or because they underestimate owner willingness to consider tradeoffs. Performance and maintenance risk were also identified as key concerns. Incentives are needed to change behavior, including potentially:

- Reducing the cost of high performance features (this may be the only option to influence developers).
- Changing the perception of costs.
- Amending A&E perceptions about owner willingness to make first vs. on-going cost tradeoffs.
- Providing credible real-world information alleviating concerns about performance, maintenance, and risks associated with High Performance equipment (particularly HVAC).

Financial interventions may be crucial for some markets: Financial incentives are reported as the intervention with the greatest potential to increase the implementation of High Performance features. They may be the only way to influence developers and designers in small firms. Training for design professionals, outreach, and no-cost plan review interventions would also increase the penetration of HP features in the state.

Training topics of interest include cost, technical and overview topics, and “softer” benefits: Training and outreach efforts should address address the (perceived or real) maintenance and cost concerns with A&E decision-makers. Another useful approach to encouraging implementation of High Performance equipment may be to emphasize the array of associated non-energy benefits recognized by owners, developers, and design professionals.

Training and outreach should also address cost concerns – one of the major barriers to implementation of HP features and practices. Barriers can be reduced by educating clients, demonstrating paybacks, developing case studies, and providing real-world examples – and of course, financial incentives were also suggested as a way to reduce the cost barrier. Newer high performance features may have difficulty taking hold among A&E decision-makers unless credible information is provided demonstrating or advertising the successful use of HP design / equipment.

Target audiences for High Performance training should focus on A&E professionals: Information on HP should be targeted to architects and engineers, because owners and developers rely on them for decisions on High Performance issues. This also assures that the

“network” of professionals that all decision-makers consult is well informed on the topics. Owners and developers place a low priority on training, are not interested in many topics (except cost and possibly overview issues) and seem unwilling to set aside the time for training on these topics.

Training topics need to be tailored to the audience: Developers and owner-occupants are not very interested in training on HP, but any training geared toward these actors should focus on an overview of HP, costs, and potentially IAQ. All A&E decision-makers were interested in training on costs, but other topics of interest tended to split along professional lines. Architects were interested in overview, siting, daylighting, and sustainability issues, and engineers put a higher priority on HVAC, indoor air quality, and payback issues. Other training topics that would help increase consideration of HP features include:

- Credible information on whether or not HP equipment requires greater maintenance re-visits.
- Feedback on the positive non-energy benefits owner-occupants (and others) recognize / report from HP buildings and features – feedback that make speak to decision-makers in terms of additional benefits that they value.
- Information on the disparity between A&E perception of owner concerns about first cost (and a few other topics), compared with owner reports (which appear to indicate a greater receptiveness to payback tradeoffs).

Training needs to be nearby and offered by organizations perceived as independent:

Training sessions need to be nearby (within a 30 minute drive), offered by a trusted, independent organization, and should cost less than \$200 to attend. A&E attendance would increase if certification credit were offered, and key associations that might be useful partners include AIA, CSI, ASHRAE, and BOMA. Training sessions should be advertised through these associations, as well as the University, and manufacturers / suppliers. Half to full-day sessions would be attractive to A&E professionals, but owners or developers would need shorter sessions (2 hour to half day). Lectures are the top preference for all but architects, who stated a receptiveness to hands-on, case studies, or tours. Tours may also have potential for owners.

High Performance must be nurtured over time: The building industry is slow to change, and the research indicates that adoption of High Performance features must largely rely on growing confidence and word of mouth by practicing architects and engineering colleagues and suppliers. It will likely take many years for the positive perceptions of HP design to penetrate the new construction industry and overcome the inertia of existing building practices. However, immediate and important progress can be achieved by:

- focusing outreach efforts on those elements to which owners and developers are most likely to respond,
- arming design professionals with knowledge of HP design and the means of conveying this information to the ultimate decision-makers.
- using architects and engineers as speakers in training and outreach events, and working with professionals involved in HP projects to share their experiences²

The remainder of the report addresses the results in detail.

² The program has been working with these HP design professionals to some extent already.

II. CONCLUSIONS

Wisconsin's Focus on Energy program and the Energy Center of Wisconsin are interested in maintaining and increasing the percentage of commercial-sector buildings that incorporate energy efficiency and high performance design. To assist with these goals, we conducted independent market research that investigated a host of questions related to energy-related decision making in offices and education facilities in Wisconsin and decision-makers' training needs and preferences. The project involved two phases:

- Detailed in-depth interviews with a total of 30 architects, engineers, and owners of office and school-related buildings across the State, and
- Telephone interviews with 148 architects, engineers, owners, and developers.

The interviews highlighted some key findings associated with each of the research goals identified for the project.

Overview

High performance (HP) is not a commonly used concept or familiar term among building decision-makers. Further, decision-makers think they are already getting high performance components in the buildings they design or build. That is good and bad news for the Focus on Energy New Construction Program, which promotes high performance. The good news is that decision-makers care about high performance features – or at least are familiar with key concepts. The bad news is that the program needs to 1) further develop the high performance “brand” (if that is the one the program will use for the foreseeable future) and 2) convince decision-makers that they are not already getting all the performance that may be available or make sense for them. Further, the program needs to sell high performance and its components based on what the decision-makers care about: energy benefits and non-energy benefits.

In practice, high-performance design is most commonly pursued for reasons of improved work environment, as opposed to lower energy bills or greener buildings. The top four reasons for implementing HP were tenant satisfaction, comfort, quality of light, and productivity. This implies that perhaps high-performance design can best be promoted by marketing its non-energy benefits—in particular, the “people” issues such as improved comfort level and quality of light, increased worker productivity, and better building aesthetics.

Overcoming the resistance to high first cost is not easy, and hanging one's hat on “lower life-cycle costs” will be a relatively ineffective method of promoting more efficient buildings. However, lower energy bills are still a vitally important goal of HP design, as well as a critical element in keeping the payback short enough not to scare off design professionals and would-be owners of HP buildings. In fact, most of the market actors surveyed agreed that financial incentives hold the greatest potential for overcoming barriers to increased use of HP design in new buildings.

Of course, overcoming barriers assumes that there is a strong interest in pursuing HP design in the first place. This requires education to make the industry more aware of the benefits of HP design, including both long-term energy/cost savings and the non-energy benefits described above. In an ideal world, owners would be more aware of and interested in HP design, but the reality is that they tend to rely on their designers for information, and so it is more effective and realistic to focus outreach efforts on architects, and to a lesser extent, engineers.

If HP design really can achieve cost savings with reasonable paybacks and provide an improved working environment, there need to be effective, unbiased case studies³ and quantitative analyses demonstrating these benefits. In some cases, design professionals themselves need to be convinced, and in many more cases they just need concrete, credible evidence with which to persuade owners and developers of the financial and non-energy benefits of high performance design elements. This should be a major element of training curriculum. It includes providing educational materials that can be used directly or indirectly with owners and developers, but it also must teach architects and engineers *how to use these materials* to effectively demonstrate the benefits. By affecting the mindset of decision-makers and creating a greater desire to consider HP design options, some of the perceived barriers to HP design (e.g., time and budget constraints, fear of new technologies) may dissipate as owners and developers elevate HP design to a higher level of priority in the planning and construction process.

High Performance must be nurtured over time: The building industry is slow to change, and the research indicates that adoption of High Performance features must largely rely on growing confidence and word of mouth by practicing architects and engineering colleagues and suppliers. It will likely take many years for the positive perceptions of HP design to penetrate the new construction industry and overcome the inertia of existing building practices. However, immediate and important progress can be achieved by:

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- using architects and engineers as speakers in training and outreach events, and working with professionals involved in HP projects to share their experiences⁴

More detailed results and implications are provided in the following sections.

³ Case studies received somewhat mixed reviews. They were not the most common sources of information nor the most credible (ranked 7 and 6, respectively); however a number of respondents brought up case studies unprompted for a question about interest levels in training topics and ranked its credibility very high. Many respondents also expressed seeing things that have worked. The most common and credible information sources were A&E professionals.

⁴ The program has been working with these HP design professionals to some extent already.