Getting to Fan-Tastic:
Overcoming Barriers to Energy Efficiency in the C&I Fan Market

Christopher Dyson, DNV
Mersiha McClaren, DNV
Ari Michelson, DNV
Christopher Cardiel, NEEA
Tamara Anderson, NEEA

ABSTRACT

Developed in 2013, the Fan Energy Index (FEI) metric is now the established metric for measuring fan efficiency in model energy codes, the Department of Energy's federal test procedure, and some state energy codes.[1] The FEI metric is designed to characterize the efficiency of a fan installed at a specific operating condition relative to the baseline minimally compliant fan. The FEI metric is the ratio of a Reference Fan Electrical Input Power (FEP) over the Actual FEP of a fan. It includes electrical power input to the fan system including the efficiency impact of motors and drives.[2] The FEI metric is a unitless efficiency metric that quickly and easily describes an installed fan's efficiency over a standardized "minimally compliant" fan installation. For example, a fan with FEI = 1.1 will save approximately 10% more power than a fan with FEI = 1.0.[3]

Fans not embedded in HVAC equipment – "stand-alone" fans – are used in many industrial, commercial, and agricultural applications (e.g., exhaust, ventilation, and manufacturing processes).[4] The U.S. Department of Energy estimates that installed fans in the industrial sector alone consume about 79 billion kilowatt-hours (kWh) annually—about 11% all U.S. motor-driven industrial electricity consumption (DOE 2003). Despite the stand-alone fan market's significant energy consumption, relatively little research has been conducted to date on this market and the barriers and opportunities for increasing its energy efficiency or on market awareness of the FEI metric.

This paper summarizes the findings from three recent (2021, 2023, and 2024) studies of the commercial and industrial (C&I) stand-alone fan market in the Northwest U.S., which was defined for this study as including the states of Idaho, Montana, Oregon, and Washington. These

[1] The Air Movement and Control Association (AMCA) and other stakeholders developed the FEI metric and the intermediary fan electrical power parameter (FEP) for use in an expected federal regulation in 2013. This represented a departure from the previous fan efficiency grade (FEG) metric, which was the established metric at the time. The FEI and FEP metrics were formalized in published ANSI/AMCA Standard 208 in 2018. The FEI metric is now the established metric in model energy codes (since ASHRAE 90.1.-2019/ASHRAE 189.1, IECC 2015), in the Department of Energy's federal test procedure (May 2023), and states codes (CA Title 20, April 2024). The FEI metric has also been included in the recent Department of Energy's Notice of Proposed Rulemaking (Dec 2023) although at the time of this writing, no final rule has been yet issued.

[2] The FEI metric is calculated for each fan installation based on design pressure and flow and is considered a "wire-to-air" metric, meaning it incorporates motor efficiency, drive type, and whether or not the fan is installed with a variable speed drive.

[3] A FEI metric of 1 would mean that the fan draws the same power as the minimally compliant fan, and fan energy use decreases as the FEI metric increases. Maximum FEI metrics vary depending on fan type and installation specifics, and typically range from 0.76 for least efficient and 1.37 for most efficient fan installations.

[4] These fans are sometimes alternatively called "non-embedded" fans because they are not embedded in HVAC equipment.

studies included in-depth interviews with dozens of fan system market actors in conjunction with a review of reports and other relevant materials providing insight into market dynamics.

The paper will explore current barriers to the adoption of energy-efficient fan system technologies in this Northwest stand-alone fan market (for example, widely-used fan selection software often does not include energy efficiency as a primary criteria for fan selection), as well as market interventions that could mitigate these barriers. The paper will also explore the degree to which the stand-alone fan market is (a) aware of the new FEI metric for fan efficiency and (b) using this metric to inform fan purchase decisions.

Research scope and methodology

The findings and recommendations in this paper are based on three studies of the C&I stand-alone fan market in the Northwest U.S conducted over the 2021-2024 period. These studies were designed to inform the Northwest Energy Efficiency Alliance's (NEEA's) Efficient Fans program. Topics covered by these studies included:

- *Market size:* The size of the Northwest stand-alone fan market;
- *Market composition:* How sales of stand-alone fans in this market were disaggregated by manufacturer, market sector, geography, and motor size;
- *Fan controls:* How frequently stand-alone fans in this market used controls such as Variable Frequency Drives (VFDs) or Electrically Commutated Motors (ECMs);[5]
- *FEI metric market penetration:* What share of stand-alone fans in this market were certified using the FEI metric;[6]
- *FEI metric knowledge and prevalence in fan selection:* The extent of knowledge of the FEI metric among Northwest fan market actors and how frequently the FEI metric in particular, or energy efficiency in general, were considered in fan selection software or fan bid solicitation packages;
- *Fan replacement drivers and decision-making:* Why end-users replace existing stand-alone fans, what factors they prioritize when selecting replacement fans, and who has influence in the fan selection decision;
- *Market barriers to EE fan adoption:* Which barriers slow market penetration of energy efficient (EE) stand-alone fans in the Northwest; and
- *Strategies to mitigate EE fan market barriers:* Which actions or policies hold the greatest promise for mitigating existing barriers to greater market adoption of EE fans.

This paper will focus on the last two research topics: 1) which market barriers to EE fan adoption exist, and 2) how these barriers can be mitigated.

Most findings in this paper come from dozens of in-depth phone interviews with fan market actors that the study team (DNV) completed for the 2024 fan market study. However, it is important to note that the 2024 findings draw upon the findings from the two earlier fan market

[5] Motor systems operating at variable load factors are good candidates for adding a VFD. Motor systems operating at constant and low load factors are good candidates for reducing the size of the motor to be commensurate with the system requirements. Several utilities in the Northwest offer VFD rebates for air-handling units or for custom projects which can include fans and/or VFDs.

[6] The 2023 fan market study estimated that 60% of the stand-alone fans in the Northwest were FEI metric certified based on a sales-weighted average of the estimates from fan manufacturers interviews as well as from analyses of manufacturer sales data. This study also observed that "there was wide variation in the percentage of FEI-certified fans that the manufacturers reported."

studies. For example, the 2021 fan market study was useful for identifying the most common barriers in the Northwest region's stand-alone fan market which laid the ground for the 2024 study asking fan market actors to rate the relative importance of these common barriers.

The 2023 fan market study, which focused on fan market size/composition estimates, had a narrower research scope than the 2021 or 2024 market studies. However, it did include in-depth interviews with the largest fan manufacturers in the Northwest region that proved invaluable for understanding this regional market. In addition, while the 2023 study did not ask these fan manufacturers directly about market barriers, they provided indirect information about market barriers when explaining why their shares of Northwest fans sales with certain attributes – e.g., FEI certifications – were not larger than they were.

The 2024 fan market study completed in-depth phone interviews with 31 fan market actors including:

- *Fan manufacturers:* These are direct producers of fan system equipment.
- *Fan manufacturers' representatives:* These companies have special agreements with fan manufacturers, sometimes including exclusive access to certain geographic markets, to promote and sell their brands.
- *Fan specifiers/installers:* These include professionals who create and/or have knowledge of the fan system design specification including design engineers, mechanical contractors and equipment installers.
- *Building maintenance managers:* These are individuals responsible for maintaining fan systems in existing buildings and also helping to select replacement fans when they are needed.
- *System integrators:* These are companies who specialize in integrating fan systems with larger energy management systems.

The 2024 fan market study used multiple sources to develop the sample frames for these fan market actor groups. These sources included B2B databases, fan vendor websites, sample frames from prior NEEA fan market studies, and information from other published fan market studies.

Despite this diversity of sources for the fan market actor sample frames, the 2024 fan market study fell short of its original goal in the work plan of completing 100 market actor interviews. Key factors contributing to the lower completion rates included:

1) *Smaller than expected sample frames:* For some fan market actor groups, the sample frames of relevant Northwest-based companies were smaller than the work plan had anticipated.
2) *An inherently difficult market to reach:* In contrast to other energy-consuming end uses, such as lighting or heating/cooling equipment, fans are often overlooked by both market actors and energy efficiency programs.
3) *For some market actor categories, it was difficult to find specific NAICS[7] codes that matched well with the target market actor groups:* This was a significant barrier for identifying the fan specifiers, system integrators, and building service providers.

[7] The North American Industry Classification System (NAICS) is a system that the U.S. federal government developed for classifying business establishments.

4) *Blind recruiting:* NEEA had requested that the study team not identify NEEA in the recruiting emails or phone calls. While this was well-intentioned for reducing possible bias, it likely reduced the chances of recruiting market actors who were familiar with NEEA and had positive attitudes towards the organization.
5) *Seasonality:* Much of the recruiting efforts occurred in late July and August which are peak vacation times for many market actors.

For the market barriers component of the 2024 fan market study, the study team asked the fan market actors to assess the significance of 10 potential barriers to purchasing high efficiency stand-alone fans in the Northwest market. Using a Likert-style response scale, the team asked the market actors to indicate the degree to which they perceived each barrier to influence fan sales.[8] To facilitate comparisons across the barriers, the team converted the verbal responses to a numerical scale where 5 signified "strongly agree," 4 signified "somewhat agree," 3 signified "neither agree nor disagree," 2 signified "somewhat disagree," and 1 signified "strongly disagree." The team also asked some fan market actor groups to additionally rate the likely degree of difficulty associated with overcoming each barrier

Using this framework, the study team asked the fan market actors to assess the following potential barriers/scenarios:

- *High first costs:* This barrier refers to the possibility that the first cost of a high-efficiency fan is higher than that of a standard efficiency fan.
- *Low ROI:* This barrier refers to the possibility that a high-efficiency fan has a lower return on investment (ROI) than a standard efficiency fan.
- *Lack of data on ROI:* This refers to the possibility that fan selection decision-makers lack data on the ROI for substituting a high-efficiency fan for a standard efficiency fan.
- *Lack of consideration due to relatively low contribution to load:* This refers to the possibility that the currently installed fan does not consume enough energy to justify the fan selection decision-makers to consider upgrading this existing fan to a high-efficiency model.
- *Lack of requests from end-users for high-efficiency:* This refers to the possibility that fan selection decision-makers do not value high-efficiency equipment enough to ask for fan efficiency information in bid purchase specifications.
- *Preferences for like-for-like replacement:* This refers to the possibility that fan selection decision-makers prefer to replace currently installed fans with fans of similar features or brands.

[8] The precise question wording was: "I am going to some list some potential barriers that may or may not inhibit the sales of high efficiency stand-alone fans. For each one, please tell me how much you agree with the following statement, "[the barrier] inhibits sales of high-efficiency equipment in the Northwest. Specifically, please tell me if you "strongly disagree, somewhat disagree, neither disagree or agree, somewhat agree, or strongly agree." It is worth noting that the team had identified most of these potential barriers from fan market actor interviews conducted during the 2021 fan market study. However, the 2021 study only asked market actors to identify market barriers in response to open-ended questions and had not asked them to respond to a broader list of potential barriers or to state their level of agreement with these barriers.

- *Prioritizing other factors such as physical size:* This refers to the possibility that other factors—such as whether sufficient space is available for a high efficiency fan replacement—outweigh considerations for energy efficiency.
- *Longer lead times for high-efficiency fans:* This refers to the possibility that high-efficiency fans take longer to become available than standard-efficiency fans possibly due to stocking practices or supply-chain problems.
- *Fan suppliers lacking specialized knowledge to help customers optimize fan efficiency in certain applications:* This refers to the possibility that the fan vendor lacks knowledge of specialized fan functions for certain businesses/industries (e.g., those different than common exhaust/ventilation applications) and therefore has difficulty specifying a high-efficiency fan that will provide the required fan functionality.
- *Customers unwilling to replace inefficient fans because they are still operable:* This refers to the possibility that, regardless of the likelihood that currently installed fans are old and inefficient, fan selection decision-makers are reluctant to replace them because they are still operable.

Findings

As context for the discussion of barriers to the market penetration of high-efficiency stand-alone fans, it is useful to understand where market opportunities for installing high-efficiency fans can be found. The 2024 fan market study asked fan manufacturers and manufacturer representatives to estimate the distribution of their company's sales of stand-alone fans in the Northwest region by project type with the options including new construction, planned replacements, early replacements, and other projects. Twelve fan manufacturers or manufacturer representatives provided estimates. Table 1 shows they estimated that two-thirds of their stand-alone fan sales were for new construction projects with planned or emergency replacements of existing fans accounting for the bulk of the remainder.

Table 1: Average stand-alone fan sales by project type for manufacturers and manufacturers' representatives

Project Type	Average Percentage of Projects (n=12)
New construction	67%
Planned replacements	21%
Emergency replacements	5%
Other project types	8%

Understanding this project mix is important for weighing the importance of the market barriers. This is because while some barriers – such as higher first costs – would be relevant for all project types, others -- such as the unwillingness of end users to replace operable fans – would only be relevant for fan replacement projects. Another implication of Table 1 is that energy efficiency programs will achieve greater market penetration of high efficiency fans if they mitigate barriers to the selection of these fans in new construction projects vs. reducing barriers to the selection of these fans in retrofit projects.

However, it is also important to understand that the relationship between market opportunities and market barriers is not a static one. For example, the small share of recent stand-alone fan sales that are going to replacement projects is partly an effect of market barriers such as the unwillingness of end users to replace operable fans or their preference for like-for-like product replacements. If these barriers could be mitigated, then the proportions of fan sales by project type shown in Table 1 would change.

It is also worth remembering that the number of stand-alone fans currently installed in existing buildings dwarfs the number of these fans installed in new buildings in any given year. Therefore, even modest changes in standard practices for replacing existing fans could have large impacts on sales of high efficiency fan simply because the pool of existing fans is so large.

The market barriers to the sales of high-efficiency stand-alone fans in the Northwest that fan market actors identified as most significant in their impact on sales included the unwillingness to replace operable fans (4.2 average rating on the 5-point scale), high first-costs (4.2), and lack of requests from end-users for high efficiency (3.8). Table 2 shows the average agreement levels for the potential market barriers included in the study with the barrier ratings of each of the 31 fan market actors receiving equal weight. It is important to note that these are average agreement ratings across all fan market actors; some differences exist among the various market actor groups, as discussed in subsequent subsections.

Table 2: Levels of agreement with market barriers across all market actors

Barrier	Average Agreement Rating
Unwillingness to replace operable fans	4.2
High first costs	4.2
Lack of requests from end-users for high efficiency	3.8
Longer lead times for high-efficiency fans	3.6
Preferences for like-for-like replacement	3.5
Low ROI	3.4
Lack of data on ROI	3.4
Prioritizing other factors like physical size	3.4
EE not considered due to low fan load	3.2
Fan suppliers lacking specialized knowledge	2.2

Unwillingness to Replace Operable Fans

The unwillingness to replace operable fans was tied for the highest average levels of agreement with regard to impact on sales across all market actors (4.2 average rating on the 5-point scale). As illustrated in Table 3, fan specifiers/installers and manufacturers/manufacturers' reps were much more likely than maintenance managers and system integrators to agree that the

unwillingness to replace operable fans was a barrier. When the study team asked manufacturers and manufacturers' reps to rate the difficulty of overcoming the various market barriers through energy efficiency program support, they cited this barrier as the most difficult to overcome.[9]

Table 3: Unwillingness to replace operable fans: levels of agreement by market actor group

Barrier	Average Agreement Rating (5= "Strongly Agree," 1= "Strongly Disagree")				
	Manufacture/ Manufacturers' Reps (n=14)	Fan Specifiers/ Installers (n=7)	Building Maintenance Managers (n=8)	System Integrators (n=2)	Overall Average
Unwillingness to replace operable fans	4.4	4.9	3.5	3.5	4.2

While building maintenance managers only gave the unwillingness to replace operable fans a 3.5 average agreement rating regarding inhibition of sales, it is worth noting that, in general, this market actor group was less likely than other market actors to assign high degrees of significance to any market barriers. In fact, the unwillingness to replace operable fans was the barrier they agreed to second most of all the 10 barriers.

Most building maintenance managers indicated that they had some stand-alone fans that dated back to the 1970s. They reported keeping these fans operable through routine replacement of fan components. Usually, these component replacements were part of scheduled maintenance programs.

Maintenance managers mentioned saving money as one motivation for keeping these old fans operable. "Just because the cost is less, I do still replace bearings, pullies," said one manager. "Most of the parts that these [old fans] need are old automotive parts, so they're just not that expensive," said another manager. "The last set of bearings I put in the squirrel cage [fan] upstairs cost me $22."

Another reason for keeping old fans running is a concern that new replacement fans might not be as reliable as the older existing fans. The reliability of the new fans was the most important consideration for fan selection among building maintenance managers (average importance rating of 5 out of 5).

The fact that several managers reported successfully maintaining fans that dated to the 1970s likely reinforced their belief that the older fans had better quality manufacturing and that newer fans might not prove as reliable. "Stuff nowadays really isn't made that well," one maintenance manager claimed. "We typically didn't replace [the fans]. We just rebuilt them and kept going," said another manager. "The ones that were there seemed to last fairly well. So, we weren't going to go with some random, off-the-shelf thing and hope that it works."

[9] The precise phrasing of this question was: "How easy or difficult would it be for an organization to overcome the [BARRIER] barrier in the Northwest market through programs offering incentives, trainings, consumer education, marketing support, or other support. Please tell me if you think it would be "very difficult," "somewhat difficult," "neither difficult or easy," "somewhat easy," "very easy"."

High First Costs

The belief that the first cost of a high-efficiency fan is higher than that of a standard-efficiency fan was tied as the top barrier across all market actors (4.2 average rating on the 5-point scale). As illustrated in Table 4, system integrators, fan specifiers/installers, manufacturers/manufacturers' reps were much more likely than maintenance managers to agree that the high first cost of a high-efficiency fan was a significant barrier.

The specifiers/installers estimated the first cost differential between high efficiency and standard efficiency fans as ranging from 10% to 50%. In addition, when asked to rate the difficulty of overcoming the various market barriers through energy efficiency program support, the manufacturers/manufacturer reps cited the high first cost barrier as the second most difficult to overcome.

Table 4: High first costs: levels of agreement by market actor group

Barrier	Average Agreement Rating (5 = "Strongly Agree," 1 = "Strongly Disagree")				
	Manufacture/ Manufacturers' Reps (n=14)	Fan Specifiers/Installers (n=7)	Building Maintenance Managers (n=8)	System Integrators (n=2)	Overall Average
High first costs	4.3	4.6	3.5	5.0	4.2

The building maintenance manager interviews revealed two reasons why this market actor group did not consider high first costs to be a significant barrier:

- *For certain fan applications, cost is a secondary consideration.* Two maintenance managers worked in hospitals and three worked in industrial facilities. Both the hospital maintenance managers said that having reliable fan systems to serve critical hospital spaces, such as operating rooms, meant that fan cost was not an important consideration. Two industrial maintenance managers also mentioned that finding the right fan system for facilitating a production process outweighed any cost considerations. However, it is important to also point out that these companies/organizations also have many fan systems that perform more routine exhaust and ventilation functions where cost considerations would be assumed to be more significant.
- *Maintenance manager influence was greatest with smaller fan projects:* While all but one of the eight building maintenance managers said they have influence over the fan selection process, they also acknowledged that when fan projects get bigger and more expensive, the pool of project decision-makers widens and often includes people in the company/organization with more of a bottom-line focus. When the team asked maintenance managers about the factors their company/organization valued in new fan selection, some drew a distinction between what they themselves valued and the priorities of others in their company.

Lack Of Requests from End-Users for High Efficiency

Lack of requests from end-users for high-efficiency equipment was the third most important barrier across all market actors (3.8 average rating on the 5-point scale).[10] As illustrated in Table 5, fan specifiers/installers and maintenance managers were more likely to view this barrier as important.

Table 5: Lack of requests from end-users for high efficiency: levels of agreement by market actor group

Barrier	Average Agreement Rating (5 = "Strongly Agree," 1 = "Strongly Disagree")				
	Manufacture/ Manufacturers' Reps (n=14)	Fan Specifiers/ Installers (n=7)	Building Maintenance Managers (n=8)	System Integrators (n=2)	Overall Average
Lack of requests from end-users for high efficiency	3.6	4.5	3.8	3.0	3.8

This barrier has multiple causes including:

- *Lack of awareness of the FEI metric:* Over half (52%) of the fan market actors interviewed during the 2024 study indicated that they were unaware of the FEI metric. As shown in Table 6, self-reported awareness of the FEI metric was highest among fan specifiers/installers (86%) and lowest among the building maintenance managers (25%) and system integrators (0%). While the fan specifier/installer group reported the highest levels of awareness of this FEI metric, when the study team asked them how frequently they use this metric when helping clients select a fan, most specifier/installers said none of the time and one said only 5% of the time.

Table 6: Awareness of the FEI metric across fan market actors

	Manufacturers	Manufacturers' Representatives	Building Maintenance Managers	Specifier/ Installers	System integrators	Total
Aware of FEI metric	3	4	2	6	0	15
Not aware of FEI metric	3	4	6	1	2	16
Total responses	**6**	**8**	**8**	**7**	**2**	**31**

- *Lack of inclusion of the FEI metric and operating cost information in fan selection software:* Many fan market actors use fan selection software to identify fan options capable of meeting requirements specified by end users. However, interviews with fan manufacturers who produce fan selection software revealed that these software platforms rarely highlight information regarding the FEI metric or long-term fan operating costs.

[10] Of the 8 building maintenance managers the study team interviewed, 7 worked for the companies or organizations that owned the buildings and paid the energy bills. Therefore, the split incentive barrier – a scenario where the entity purchasing the energy-using equipment is not the same one paying the energy bills – was not a major barrier for the interviewees in this sample.

- *Lack of other tools for calculating fan operating costs:* Several building maintenance managers interviewed for the 2024 fan study indicated a desire for tools they could use to explore the financial implications of purchasing standard-efficiency vs. high-efficiency fans in terms of long-term operating costs. One maintenance manager explained the ideal features for such a tool:

  Make an online calculator. so, if I go in and say: 'Alright, here's my existing fan. Here's its ratings. And here's my new fan.' And you could even do horsepower-to-efficiency ratings, and then it would pop up a little number saying hours of operation… and it would pop up a number on how much it would save you in kilowatt-hours.

Solutions

Based on the market barriers described above, the team developed the following recommendations for improving the penetration of high-efficiency fans in the Northwest region.

1. **Code requirements can drive use of the FEI metric in fan selection**. Recent versions of both the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) 90.1-2019, 90.1-2022 and the International Energy Conservation Code (IECC 2021) energy codes have incorporated the FEI metric, replacing the legacy Fan Efficiency Grade (FEG). While three states in the four-state region have adopted building codes which reference the FEI metric, the fan market actors only mentioned the Washington building code as a driver of the FEI metric as a consideration in fan selection. This may be because the Washington code changes were adopted earlier (e.g., early 2021) than those in Oregon (late 2021) or Montana (mid 2022) and therefore there has been more time for the market to become familiar with the new code changes. This suggests there are opportunities for more fan market actor education about recent code changes.

2. **Support market education both broadly for fan efficiency and for the FEI metric specifically**. Primary and secondary research identified a lack of awareness of fan efficiency and the FEI metric across all but one of the market actor groups. Further, first cost is one of the most influential factors reported in fan selection, and this is a metric that does not account for the lifetime benefits of efficient fans. One part of NEEA's planned market transformation strategy is the development of ROI/lifetime cost-of-ownership calculation tools.

   Education targeted at market actors throughout the distribution channel provides an opportunity to influence the narrative and selection process for fans, highlighting total cost of ownership and how to use efficiency metrics -- such as the FEI metric -- to compare performance across products. Furthermore, all the building maintenance managers expressed interest in learning more about fan efficiency.

3. **Engage with key manufacturers to showcase the FEI metric in fan selection software**. Most manufacturers leverage in-house or third-party fan selection software to assist in fan selection. These software products are used by manufacturers themselves, manufacturers' representatives, and other market actors who select fans, such as engineers and installers.

While some manufacturers indicated that the FEI metric is available in their software, others indicated that the FEI metric is not included or indicated that it is not highlighted by default in the software. There is an opportunity to work with manufacturers to promote the FEI metric by featuring it prominently in software default settings and encouraging its use in fan selection.

4. **Provide downstream rebates for energy-efficient fans, potentially in collaboration with utilities or other agencies.** Several building maintenance managers and other market actors recommended rebates for encouraging sales of high efficiency fans. These interviewees also cited examples where utility rebates had encouraged them to select higher efficiency fans.

5. **For retrofit scenarios, consider promoting the non-energy benefits of efficient fans such as noise reduction.** Some of the market actors mentioned that noise reduction benefits were a selling point for new fans, especially in certain subsectors such as commercial kitchens or libraries. While promoting the energy saving benefits of new efficient fans should still be the primary focus, it is often helpful to cite additional non-energy benefits for these products. A similar approach has been used recently by HVAC contractors promoting heat pump technologies where noise reduction benefits were promoted alongside energy savings benefits.

6. **Highlight the benefits of integrating fans with controls.** While the market penetration of controls is growing, and fan market actors generally believe they provide many benefits, there are still opportunities for increasing the prevalence of controls. Interviews with fan manufacturers for the 2023 and 2024 fan market studies found that an average of 43% of the stand-alone fans sold in the Northwest region had VFDs and another 26% of fans were sold with ECMs, for a total average of 69% with some fan control. While several manufacturer representatives reported that all, or nearly all, of their fans were sold with some type of fan control, others reported only selling 40%–55% of their fans with controls. In addition, these percentages only reflect new fan sales, and the opportunities for VFDs in existing fans are much greater.

Conclusions

Several conclusions emerge from this examination of barriers to fan efficiency and awareness of the FEI metric.

- *Understanding project mix is important for weighing the relative importance of market barriers.* For example, while some barriers – such as higher first costs – would be relevant for all project types, others -- such as the unwillingness of end users to replace operable fans – would only be relevant for fan replacement projects.

- *The relationship between market opportunities and market barriers is not a static one.* Fan manufacturers estimated that 67% of their stand-alone sales occurred in new construction projects with only 21% occurring in planned replacement projects and only 5% occurring in emergency replacement scenarios. This suggests that energy efficiency programs will achieve greater market penetration of high efficiency fans if they mitigate barriers to the

selection of these fans in new construction projects vs. reducing barriers to the selection of these fans in retrofit projects.

However, it is important to understand that the small share of recent stand-alone fan sales that are going to replacement projects is partly an effect of market barriers such as the unwillingness of end users to replace operable fans or their preference for like-for-like product replacements. If these barriers could be mitigated, then the proportions of fan sales by project type would change.

It is also worth remembering that the number of stand-alone fans currently installed in existing buildings dwarfs the number of these fans installed in new buildings in any given year. Therefore, even modest changes in standard practices for replacing existing fans could have large impacts on sales of high efficiency fan simply because the pool of existing fans is so large.

- *Many of the causes of the fan market barriers are interrelated:* For example, if more building maintenance managers had tools for comparing the long-term operating costs of high-efficiency vs. standard-efficiency models, they likely would be more willing to include fan energy efficiency as one of the key requirements in their bid packages. Similarly, if maintenance managers were more knowledgeable regarding the FEI metric, they would likely be more inclined to include it in their bid packages. Finally, if manufacturers who develop fan selection software perceive growing demand from end users regarding energy efficiency in general or the FEI metric in particular, they may be more likely to add this information to their software.

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