AIR-CONDITIONING, HEATING, & REFRIGERATION INSTITUTE
we make life better™

2111 Wilson Boulevard Suite 500 Arlington VA 22201-3001 USA
Phone 703 524 8800 | Fax 703 562 1942
www.ahrinet.org

February 25, 2015

Ms. Brenda Edwards
U.S. Department of Energy
Building Technologies Program, Mailstop EE-2J
1000 Independence Avenue SW
Washington, DC 20585

Re: Department of Energy's (DOE) Notice of Data Availability (NODA) for Energy Conservation Standards for Commercial and Industrial Fans and Blowers *[Docket Number EERE-2013-BT-STD-0006]*

Dear Ms. Edwards:

These comments are submitted by the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) in response to the U.S. Department of Energy's (DOE) notice of data availability (NODA) regarding energy conservation standards for commercial and industrial fans and blowers appearing in the *Federal Register* on December 10, 2014.

AHRI is the trade association representing manufacturers of heating, cooling, water heating, and commercial refrigeration equipment. More than 300 members strong, AHRI is an internationally recognized advocate for the industry, and develops standards for and certifies the performance of many of the products manufactured by our members. In North America, the annual output of the HVACR industry is worth more than $20 billion. In the United States alone, our members employ approximately 130,000 people, and support some 800,000 dealers, contractors, and technicians.

AHRI urges DOE to consider a negotiated rulemaking

As discussed in detail below, AHRI has concerns with the regulatory approach of the proposed rule. There are significant issues in the analysis and the current direction of this rulemaking will place a substantial burden both on industry and on end users of heating, ventilation and air conditioning (HVAC) equipment including, but not limited to air-cooled water-chilling packages; air-to-air energy recovery ventilators; central station air-handling units; cooling towers; commercial furnaces; datacom cooling equipment; dedicated outdoor air system units; packaged terminal air-conditioners and heat pumps; room fan-coils; single packaged vertical units; transport refrigeration equipment; unit coolers; unit ventilators; unitary large equipment; variable air volume terminals (VAV); and variable refrigerant flow multi-split air conditioning and heat pump equipment. Without properly accounting for fans in original equipment manufacturer (OEM)

products, the DOE stands to implement an energy conservation standard which is neither economically justified, nor technologically feasible. We believe that a final rule for commercial and industrial fans and blowers can be developed more quickly and more efficiently through a negotiated rulemaking process. We request that a commercial and industrial fans and blowers working group be established through the Appliance Standards and Rulemaking Federal Advisory Committee (ASRAC) to negotiate an efficiency standard for these products.

Fans that are a component in regulated commercial products should be excluded from the scope of this rulemaking

In the Framework Document for commercial and industrial fans and blowers published in the Federal Register on February 1, 2013, DOE noted that it was "not considering standards for fans that are a component in regulated commercial products in this rulemaking."[1] AHRI concurs with DOE's determination, and notes that the exclusion of such equipment from this rulemaking is in accordance with EPCA's statutory framework regarding covered commercial equipment, as set forth in 42 U.S.C. 6311, since DOE has not made the requisite showings of separate energy use as a component. The current standards applicable for covered equipment capture the total energy use of this equipment, and AHRI supports DOE's focus on commercial and industrial fans that are not currently subject to such requirements as components of regulated products.

Double regulation would result in a misalignment with the implementation of efficiency standards of OEM products. There is no way to align this for all of the regulated products which use fans including, but not limited to commercial furnaces; datacom cooling equipment; packaged terminal air-conditioners and heat pumps; single packaged vertical units; unit coolers; unitary large equipment; and variable refrigerant flow multi-split air conditioning and heat pump equipment. This would result in catastrophic complications with regard to the redesign cycle of products. The introduction of fan efficiency standards for fans in these products will lead to exorbitant design and testing costs for development without real improvement efficiency.

Double regulation is counter-productive. Manufacturers optimize the efficiency of their products by making trade-offs between various options taking into consideration the energy conservations standards for the complete product and the performance required by consumers. Among the trade-offs, manufacturers can use specific fans subject to component regulation, but can also choose different options not subject to such regulations such as improved thermodynamic cycles. Imposing specific components through double regulation narrows the manufacturer's choices to optimize complete and complex products. It will lead to an overall higher cost without providing any energy saving. This undermines the very principle of the life cycle cost analysis of complete products that DOE performs to prove that an efficiency standard is technologically feasible and economically justified.

[1] http://www.regulations.gov/#!documentDetail;D=EERE-2013-BT-STD-0006-0001 at page 2

Fans that are a component in original equipment manufacturer products have not been accounted for the analysis

As this proposed regulation currently stands, OEM's will be responsible for meeting fan efficiencies for fans that are components in HVAC equipment; however, DOE has not accounted for this in its analysis. Unless DOE is able to account for the technological feasibility and economic justification involved with considering fans in these products within the scope of the regulation, such as cost, testing, implementation time frame, spare part availability and other issues, DOE must not regulate these fans.

The cost associated with a fan design to meet a new efficiency standard is not limited to the fan manufacturer. Original equipment manufacturers will also incur costs to redesign products to incorporate new fan designs. As an example, when an integral component to an HVAC product, such as a fan, is changed the OEM manufacturer is required to conduct performance and safety testing for most, if not all, models in the equipment line.

Regulating fans incorporated into OEM products will represent a significant burden to OEM's as well as an enforcement burden as additional testing at component level would be required. Adding such testing obligations will hamper effective compliance and enforcement. For example, to test two options the fans integrated in HVAC products. Option one is to remove the fan (motor, impeller and housing/nozzles) from the product and test. In most cases, for HVAC equipment this is practically impossible because the housing/nozzle of the fans is an integral part of the end product. Only in some limited cases when the fan has a separate housing, which is not part of the casing of the unit, the housing/nozzles can be extracted with the rest of the fan. The second option would be to test the efficiency of the fans inside the unit. For HVAC equipment, this requires removal of all the other components inside the equipment to mitigate the effect of additional external static pressure. The integration of controls in these products compounds the complexity as the fans and compressors may be controlled by the same printed circuit board. It is not likely that the product would be able to function after removing these other components. This option would not provide an effective way to either establish fan performance ratings, or to conduct certification and enforcement testing.

Regulation of return fans (RAF) and exhaust fans (EAF) requires special consideration. These fans are often required to properly control building pressure. Poor building pressure control causes many problems including wasted energy. RAFs and EAFs must handle approximately the same air flow as the supply fan (SAF) but at a much lower external static pressure. Therefore RAFs and EAFs cannot be selected at the same efficiency as the SAF unless they are much larger diameter, or a more efficient type, which conflicts with the space constraints in the air handler. At the end of the day, RAFs and EAFs consume all the available space in the air handler such that any fan change likely requires a larger cabinet.

Fans that are components in central system auxiliary equipment (heat rejection products such as condensers and cooling towers) should be excluded from the scope of this rulemaking

Based on a DOE-funded study, the contributions of fans in central system auxiliary equipment (cooling towers, air-cooled chillers, and a portion of the condenser fans) are relatively modest because (1) their power input per ton of cooling is very low and (2) central systems represent less than one third of commercial building floor space. Some of this equipment also has very low utilization values due to its operating characteristics – it is used at full power very infrequently.[2] It is inappropriate to include fans in products that lack the potential for energy savings in the scope of this rulemaking. More relevant energy efficiency metrics, such as kW/ton, are widely used to express the energy use for much of this equipment. Additionally, there exists the potential for unintended increases in system energy use to accommodate a fan efficiency standard which drive fans to be larger and operate at slower speeds. The design challenges and costs associated with accommodating larger, slower, or different types of fans have not been included in DOE's analysis. The utility burdens of imposing separate fan efficiency regulations are likely extreme for these heat rejection devices.

Separate regulation of fans as a component will likely introduce utility issues for heat rejection equipment. Heat rejection products are frequently installed outdoors and subjected to severe service conditions including heat; humidity; solar impacts such as thermal expansion of fan and housing materials; and material degradation from UV radiation; wind impacts; and in some cases seismic impacts. These installation factors frequently require fans to be installed with a high tip clearance which reduces peak efficiency potential, but is necessary for proper and safe operation. Fans used for these applications are often custom designed for the application and are limited in peak efficiency in order to meet the physical demands for severe service application.

Heat rejection products are space constrained, especially for shipment. Accommodating larger, slower, compliant fans in the same equipment footprint will lead to a reduction in heat transfer surface and could increase actual net energy consumption, negating the intent of the rulemaking.

Heat rejection equipment faces similar fan-testing issues as most fan housings are built into the cabinet. Based on preliminary analysis, very few existing condenser fans comply with proposed efficiency levels (EL) 1 or EL2.

AHRI urges DOE to exclude all fans used in all heat rejection products, including air-cooled products, evaporatively-cooled products, and hybrid products from the DOE fan efficiency rulemaking.

[2] Energy Consumption Characteristics of Commercial Building HVAC Systems Volume II: Thermal Distribution, Auxiliary Equipment, and Ventilation, Arthur D. Little Reference No. 33745-00, October 1999, http://apps1.eere.energy.gov/buildings/publications/pdfs/commercial_initiative/hvac_volume2_final_report.pdf

Difficult to comment on NODA without test procedure

AHRI's members have encountered extreme difficulty analyzing the impact of this rule without an established test procedure. Another facet which complicates our analysis is that a wire-to-air test procedure and alternate metric are being developed by the Air Movement and Control Association (AMCA). It is necessary to review both DOE's proposed test method and the alternate approaches to determine the most logical path for this regulation with respect to fans in HVAC equipment.

Issues with Engineering Analysis

Due to the lack of a test method and that fans in OEM products are not properly accounted for, the analysis used to project national energy savings resulting from new energy conservation standards is seriously flawed. Without a test procedure it is unclear how total pressure was used for plenum fans and how the outlet area was defined.

DOE's analysis fails to correctly account for fan energy use in HVAC equipment and the proposed metric is not applicable to these products. Best efficiency point (BEP), and the related points, is completely irrelevant for fans integrated into HVAC equipment, because the equipment operation is not directly related to fan operation. The engineering analysis incorrectly assumes all fans are running at full flow and static during the complete operating period with no consideration for speed adjustments due to air balancing or the use of variable speed control, thus the project national energy savings is overstated.

AHRI urges DOE to exclude fans 1 hp and under from the scope of the rulemaking as the analysis only conducted on fans over 1 hp. DOE's analysis also needs to include the cost for product category switching.

AHRI questions the validity of the equipment life and operating hours DOE has assumed in this analysis. Both lifetime and operating hours seem to be significantly overstated.

Issues on Which DOE Seeks Comments

AHRI appreciates the opportunity to comment on issues in which the DOE has expressed interest.

1. DOE generated formulae for manufacturer production cost (MPC) as a function of subgroup and diameter (which DOE believes can be used as a general proxy for airflow). DOE requests comments on whether there are any other parameters, such as pressure, construction class, rating RPM, etc., which DOE should use as inputs in calculating the MPC, in addition to or instead of diameter. If so, DOE encourages stakeholders to submit data illustrating the relationship of MPC with these parameters.

AHRI Response: The *fan* manufacturer production cost (MPC) is impacted by several factors in addition to subgroup and diameter. Design differences within any series of fans can affect the MPC. Differences in drive type (belt versus direct drive); the presence of variable speed; speed control feedback; range of speed; vibration isolation, including seismic isolation; fan operating duty point (pressure rise, flow rate); construction class, as an extension of pressure; materials; flammability and smoke construction; and sound attenuation all impact MPC. Production volume can also greatly influence the cost. More data is required to understand such complex relationship between many factors. It is also not clear how DOE determined the appropriateness of extending data using just five physical teardowns to all fan subgroups while excluding details on all parameters other than diameter.

Additionally, there are production costs that original equipment manufacturers will face as a result of this regulation that DOE did not take into account. We urge the Department to consider the production cost impact to original equipment manufacturers as part of this rulemaking. Most, if not all, of the same types of production costs impact the OEMs as they face the challenges of integrating new fans into their products. Any change to fan size, fan operating range, fan type will increase *original equipment* manufacturer production cost.

2. DOE assumed that the cost to redesign multiple fan models was equal to the number of models times an estimated cost to redesign one fan model. DOE recognizes that manufacturers may be able to share resources between redesigns in the same company, or in the same product line (i.e., different diameters). If this is current practice or possible, DOE requests comments on the scenarios in which resource sharing can occur and to what extent.

   AHRI Response: DOE's assumption that the fan manufacturer cost to redesign multiple fan models is equal to the number of models times an estimated cost to redesign one fan model is fairly reasonable, but it does not account for the likelihood that many new models will need to be introduced to meet utility a single fan model fills today. It is AHRI's understanding that the proposed approach limits the speed range for which a fan may be used. As a result, there are cases where fan manufacturers will be required to design multiple fans to replace an existing fan.

   The cost associated with a fan designed to meet a new efficiency standard is not limited to the fan manufacturer. OEM's will also incur costs to redesign products to incorporate new fan designs. As an example, when an integral component to an HVAC product, such as a fan, is changed the OEM manufacturer is required to conduct performance and safety testing for most, if not all, models in the equipment line. There may some ability to leverage this across a small range of similar products, but this is very limited.

DOE needs to include the cost of the OEM products redesign in its analysis or remove the fans in these products from the scope of the regulation.

3. DOE estimated the cost to redesign a fan as a function of the subgroup of fan resulting from the redesign. There may be other parameters, such as the fan's diameter, RPM properties, FEI or efficiency, construction class, or the properties of the fan before it was redesigned, that DOE should take into consideration. If so, DOE requests information on which parameters should be taken into consideration and how each affects the cost to redesign a fan.

   AHRI Response: AHRI does not agree that DOE is correct in estimating the cost to redesign a fan solely as a function of the subgroup of fan resulting from the redesign. This oversimplification ignores parameters such as speed of operation, space available, sound, environment, construction class, type of service (indoor or outdoor installation), and class of operation which can all affect the cost of a fan redesign.

   The cost of the redesign of these fans, while significant, is only a portion of the cost. DOE's analysis needs to include the cost of the redesign of the units in which these fans will be installed, which can be several times greater in magnitude in terms of both time and money. Equipment redesign parameters need to be established and included in the analysis.

   Redesign costs for equipment with energy efficiency requirements based on electrical energy consumed per the amount of heat rejected by the equipment not only include the impact of a new fan but also cost resulting from changes in the heat exchanger design. Each unit must be re-optimized to meet product efficiency requirements.

   Take commercial furnaces for example: furnace and electric heat safety testing is required for every fan and heater combination. One manufacturer offers three fan options, two furnaces, and five electric heaters in one cabinet. It would take approximately 1,500 to 2,000 hours and at a cost of $8,000 to $32,000 to test the 30 combinations offered in that cabinet. An additional 400 to 600 hours of engineering supervision is required for testing. This manufacturer's line includes six such cabinets as well as three cabinets with enough furnace and electrical heat options to double the test time and cost previously mentioned. On the high end of the estimate, this one furnace line of nine cabinets would cost $384,000 and take 24,000 hours to test, and require 7,200 hours of engineering supervision.

   AHRI urges DOE to include the impact on the OEMs in its analysis or remove the fans in these products from the scope of the regulation.

4. DOE used a redesign time of 6 months per fan model in its calculation of redesign costs. DOE requests comment on this assumption and whether this time period is sufficient for prototyping and revising marketing materials.

   AHRI Response: Six months is likely not enough time to redesign each fan and certainly is not enough time to redesign the units in which these fans are installed. As stated in the above example for a furnace line, the performance and safety testing can take a significant amount of time and this cannot be done in parallel with the fan redesign effort. Time must be accounted for tooling, process and repeatability testing. After tooling and process, reliability considerations follow. Developing, testing and completing fatigue life curves can last a year. Considering these factors, it might be more appropriate to consider a redesign time of 18 to 24 months per *fan* model. None of these elements take into account time to redesign the units into which these fans are installed. The time and effort to redesign affected OEM units is at least three to five years, depending on the type of equipment the fan is installed. For regulated products, such as furnaces, it is likely impossible to be able to accommodate such a substantial change to an integral component of product lines in even five years.

5. DOE did not explicitly consider fan noise performance in its analyses. DOE requests comment on whether noise considerations provide barriers to increased fan efficiency.

   AHRI Response: Noise considerations do constitute a significant barrier to increased fan efficiency. As an example, forward-curve and axial fans are often selected for use in OEM equipment because they are relatively quiet and compact compared to other fan types. Issues related to sound will be particularly significant in air-handling units, room fan-coils, unit ventilators, VAVs, and other equipment ducted into or installed in occupied spaces. The acoustic signature of a product is a key customer requirement for many products and is often specified in codes and standards. DOE omitting acoustics in the analysis overlooks an important performance aspect of fans and the units in which they are installed. Indeed, fan acoustics and efficiency are inextricably linked.

6. DOE requests information on the number of models and number of shipments of forward curved fans.

   AHRI Response: AHRI agrees that DOE does not have sufficient information on the number of models and number of shipments of forward curved fans to properly analyze these products. DOE's analysis does not include the hundreds of fan models, a significant portion of which are forward curve, which are installed in AHRI member's equipment. These fans are also not included in AMCA's database of fans which has been supplied to the DOE.

7. DOE requests comment on its use of a database of over 2500 fan models as approximately representing all fan models in the scope of this rulemaking currently available in the United States today.

   AHRI Response: It is AHRI's understanding that DOE's database of over 2500 fan models does adequately represent most of the fans used in packaged air handlers, rooftop units, energy-recovery ventilators, chillers and the like. Many of these units can include two or more fans. If DOE does not have the data necessary to regulate fans in HVAC equipment and it should not regulate fans in this application. As stated above, the number of outstanding questions about how to implement such a complex rule is a prime motive in AHRIs request that this rule be negotiated by an ASRAC working group.

8. DOE used current subgroup distributions of fan models within each fan group at each efficiency level analyzed to weight the total conversion cost per model regardless of the efficiency level or the subclass of the fan model before redesign. In other words, DOE assumed that fan model impeller distributions at a given efficiency level would not change as a result of standards. DOE requests comment on this assumption.

   AHRI Response: AHRI disagrees with DOE's assumption that fan model impeller distributions at a given efficiency level would not change as a result of standards. Depending on the final standards level, the distributions could change significantly as subgroup designs are found to be insufficient to meet the proposed standard. Costs also would not follow a simple scaling model. AHRI is concerned with the efficacy of any proposal which regulates applied efficiency because fan manufacturers often are not aware of the specific application in which the fan will be applied.

9. DOE requests comment on the inclusion of tube axial and vane axial fans into a single fan group separate from centrifugal inline and mixed flow fans. DOE requests information regarding whether these two groups of fans provide distinct utility that justifies the separation and resulting different FEIs for the same rated flow and pressure.

   AHRI Response: There is some confusion over the current definition of axial fans in the rulemaking. At this time, it is unclear if the axial fans DOE has defined are the same as those used in air-cooled and evaporative condensers. If this interpretation is correct, tube axial and vane axial fans should be separated from centrifugal inline and mixed flow fans.

10. DOE requests comment on the cost drivers included in the engineering analysis (e.g., aerodynamic redesign, impeller type, and presence of guide vanes).

    AHRI Response: The aerodynamic redesign costs of the fan are only one element of the total redesign of the HVAC equipment into which the redesigned

fan will be installed. Size, sound, tooling, process and repeatability of design, as well as suitability of the materials and configuration for the purpose intended are also of importance. Reliability, system internal flow distribution, heat exchanger design, safety, controls, structural integrity over time, service life, acoustical signature, and design requirements for severe service applications all need to be considered. OEM equipment space constraints and regulatory approval for human safety and performance requirements must be part of any engineering analysis. All of these costs and time constraints, which are significant, must be considered in DOE's analysis.

11. DOE requests information on the design and manufacturing differences between commercial and industrial fans.

    AHRI Response: AHRI does not have any information on the design and manufacturing differences between commercial and industrial fans.

12. DOE requests information on how forward curved impeller manufacturing differs from the manufacturing of other impeller types. DOE also requests comment on how other fan components differ between forward curved models and non-forward curved models, such as component materials and material gauges.

    AHRI Response: Fans are manufactured from materials and processes to meet the application needs from a cost and performance standpoint. Application needs dictate fan construction regardless of fan type. Manufacturing processes are typically volume dependent, and subject to the physical application design constraints, which are often considered "severe service" for fans.

13. DOE requests comment on its MPC calculation as a function of diameter equation and multipliers.

    AHRI Response: AHRI is concerned with DOE's MPC calculation as a function of diameter equation. As noted in the response to question one, above, there is not enough data to support the conclusions DOE has drawn. The database does not include a significant population of fans used in AHRI member's products. It is not clear how DOE has curve-fit polynomials with only two data points and it is inappropriate to extrapolate curves beyond test data points. In addition, why has the same curve been applied to all fan types?

14. DOE did not consider variable pitch blades in its analysis. DOE requests information on the effect variable-pitch blades have on efficiency in the field, the mechanism of that effect, and how testing can be conducted to capture any benefit from variable-pitch blades.

    AHRI Response: Variable pitch blades are applied primarily in axial flow fans in order to enable a wide range of high efficiency operation as a function of volume flow coefficient. Each blade angle setting produces a particular fan performance

characteristic with a unique peak efficiency point. Variable pitch fans are generally very expensive, fulfill a specific industry utility, and should not be considered within the scope of this rulemaking.

15. DOE requests comment on any of the industry financials (working capital rate; net property, plant, and equipment rate; selling, general, and administrative expense rate; research and development rate; depreciation rate; capital expenditure rate, and tax rate) used in the GRIM (located in the "Financials" tab of the GRIM spreadsheet).

    AHRI Response: The answer to this question needs to take into account the definition of a fan. If OEM equipment manufacturers are required to redesign their units to accommodate redesigned fans, and comply with the fan regulation then both their fan and unit redesign costs must be included in the analysis as they are not separable. It is AHRI's understanding that these financial impacts are not included in DOE's analysis at this time. AHRI urges DOE to consider the impact of this regulation on HVAC equipment manufacturers and include all relevant costs in the analysis or exclude the products from the scope of regulation.

16. DOE requests comment on the use of 11.4 percent as the real industry manufacturer discount rate (also referred to as the weighted average cost of capital) for commercial and industrial fan manufacturers (located in the "Financials" tab of the GRIM spreadsheet).

    AHRI Response: Again, the impact on HVAC equipment manufacturers needs to be considered and included this in the analysis.

17. DOE requests comment on the use of 1.45 as a manufacturer markup (this corresponds to a 31 percent gross margin) for all fan groups and efficiency levels in the base case (located in the "Markups" tab of the GRIM spreadsheet). DOE requests information regarding manufacturer markups and whether they vary by fan efficiency, fan group, fan subgroup, or any other attribute.

    AHRI Response: The use of 1.45 as a manufacturer markup is insufficient for complex, lower volume products and for products which require significant R&D or capital investments for development. The manufacturer markup of 1.45 should not be used for all fan groups and efficiency levels. Additionally, this markup does not include the full distribution chain. DOE's analysis should include OEM costs and mark-ups related to equipment redesign and qualification required by new fan and blower standards.

18. DOE requests comment on both its methodology of calculating total industry capital and product conversion costs and the specific industry average per model capital and product conversion cost estimates for each fan subgroup (located in the Conversion Cost spreadsheet).

AHRI Response: AHRI urges DOE to include total capital and product conversion costs equipment manufacturers incur related to redesign and qualification of new fans required by new efficiency standards.

19. DOE assumed that every fan model that did not meet a candidate standard level being analyzed would be redesigned to meet that level. DOE requests comment on this assumption and on what portion of fan models that do not meet a standard level would be redesigned to meet the level as opposed to being eliminated from the American market.

    AHRI Response: AHRI has no information regarding DOE's assumption that every fan model that did not meet a candidate standard level being analyzed would be redesigned to meet that level.

20. DOE seeks inputs on its characterization of market channels for the considered fan groups, particularly whether the channels include all intermediate steps, and estimated market shares of each channel.

    AHRI Response: With regard to characterization of market channels for the considered fan groups, in most of the cases, when fans are incorporated into final products, such as air conditioners, these fans are often parts produced by fan manufacturers and sold to original equipment manufacturers without the fan being placed on the market. The final HVAC equipment manufacturer typically sells to a distributor who then sells the equipment to a contractor who sells to a building owner. For fans not produced under OEM agreements, an issue related to placing a fan on the market twice could arise. The fan will be first placed on the market by the fan manufacturer when sold to the equipment manufacturer and then placed on the market a second time by the manufacturer of the final product. When a manufacturer buys a compliant fan, they cannot always foresee when the fans will be integrated into the appliance and placed on the market once more. The issue of placing a product on the market twice, compliant at the first point of sale and possibly not compliant in the final product creates significant additional burden for manufacturers.

21. DOE seeks inputs and comments on the estimates of flow operating points used in the energy use analysis (expressed as a function of the flow at best efficiency point).

    AHRI Response: Preliminary analysis shows that the selected operating points of the fan are not representative of the operating points at which the fans in AHRI member's products are applied.

22. DOE seeks inputs and comments on the estimates of annual operating hours by sector and application and on the estimated distributions of fans across sectors and applications.

AHRI Response: DOE has overestimated of annual operating hours for fans in HVAC systems in commercial buildings and modeled the fans to run 68 to 76-percent of all available hours at full speed operation. Systems that modulate do run more continuously than those that do not modulate, but they do not operate at full capacity the entire time. DOE must consider building demand profiles from all climates and all types of buildings in its analysis. Filling that demand will depend on the instantaneous capacity need and ability to modulate the capacity of the fan/system. AHRI urges DOE to model hours of operation and energy consumed based on the aforementioned factors. DOE energy consumption calculations should also consider that most fans in HVAC equipment have speed control and "typical" speed is about 60-percent of full load. At 60-percent fan speed, the power draw is only 22-percent of the design power requirement which significantly reduces the estimated energy savings benefits of more efficient fans.

Fan lifetimes of 27 to 30 years are overly optimistic. HVAC equipment, and by proxy the fans installed within, has a shorter life which varies significantly from product to product.

23. DOE seeks comments on its proposal to use a constant price trend for projecting future commercial and industrial fan prices.

AHRI Response: AHRI does not have any comments on DOE's proposal to use a constant price trend for projecting future commercial and industrial fan prices.

24. DOE requests comment on whether any of the efficiency levels considered in this analysis might lead to an increase in installation, repair, and maintenance costs, and if so, data regarding the magnitude of the increased cost for each relevant efficiency level.

AHRI Response: Any efficiency levels considered in this analysis might lead to an increase in installation, repair, and maintenance costs if the higher efficiency fans are larger and heavier than their pre-regulation equivalent. If the raw product costs of the redesigned fan are higher, this will impact the cost of maintenance if replacement parts are required. As product complexity and efficiency increases, the need for more exacting installation and on-going maintenance will also increase. Additionally, the potential tighter clearances for the more efficient fans could lead to higher maintenance costs.

25. DOE seeks comments on a potential compliance date of three years after the publication of a final rule establishing energy conservation standards for commercial and industrial fans and blowers.

AHRI Response: AHRI doubts the fan-manufacturing industry can achieve compliance within three years of the publication of a final rule establishing energy conservation standards for commercial and industrial fans and blowers. The

impact on the OEMs is likely as great as or greater than the impact to the fan manufacturers and the OEMs will not be able to start their redesign work until the fan manufacturers have made significant progress in their conversion efforts. DOE has not accounted for any of the impact of implementing this regulation on fans in HVAC products. Therefore AHRI recommends that the regulation initially only apply to stand-alone fan applications and exclude all fans in HVAC products.

26. DOE seeks comments on the use of constant efficiency trends in the base case and in the standards cases.

AHRI Response: DOE's assumption of a constant efficiency trend is flawed. Market forces will continue to evolve and drive the trend more efficient products. This will happen naturally without regulator pressures driven by every company's desire to provide their respective customers the best value proposition. Operating costs driven by total product and system efficiency is one of these drivers. DOE's assumptions regarding the standards cases are based on a database which does not include fans in HVAC products.

AHRI appreciates the opportunity to provide these comments. If you have any questions regarding this submission, please do not hesitate to contact me.

Sincerely,

Laura Petrillo-Groh, PE
Engineering Manager, Regulatory Affairs
Direct: (703) 600-0335
Email: LPetrillo-Groh@ahrinet.org