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AMCA Comments to the Title 20 Phase II Pre-Rulemaking, Commercial and Industrial Fans and Blowers

AMCA comments provided as PDF file.

Additional submitted attachment is included below.

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California Energy Commission
1516 Ninth Street
Sacramento, California 95814-5512
Docket Unit, MS-4: Docket No. 17-AAER-06
Title 20 Phase II Pre-Rulemaking, Commercial and Industrial Fans and Blowers

Dear California Energy Commission:

AMCA is please to submit the comments attached to this letter in response to the request for input to the Commercial and Industrial Fans and Blowers docket for the Title 20 Phase II Pre-Rulemaking.

AMCA International was initiated 100 years ago by 11 commercial and industrial fan manufacturers, and today represents over 200 fan manufacturers worldwide among its 375 member companies. AMCA has an established Certified Ratings Program for certifying fan ratings among 181 companies, which is supported by AMCA's international laboratory network for fan testing. AMCA also maintains a growing library of ANSI-accredited fan-testing standards, and participates in fan standards committees administered by ISO and ASHRAE. AMCA has been proactively involved with fan efficiency regulation since 2007, and is working with electric utilities and energy-efficiency advocates to develop incentive programs for commercial and industrial fans.

One thing stands out from its decade of fan-efficiency regulatory activity: AMCA cannot overstate the complexity of regulating fans, as illustrated by the difficulty of U.S. Dept. of Energy to set a fan efficiency standard, a rulemaking which began in June 2011. Since then, AMCA and AMCA members have been highly responsive to requests for information; invested in considerable research, staff time, travel resources, and public negotiations. However, despite our efforts and those of other stakeholders, the net results thus far are a partially completed recommendation (ASRAC term sheet), which was published in September 2015, toward a federal rule, followed by a *third* Notice of Data Availability (NODA) showing DOE analysis tools and results, which was published in November 2016.

Since September 2015, while awaiting DOE to publish a draft test procedure and draft energy standard, AMCA has refined its test standard (ANSI/AMCA 210/ASHRAE 5.1); published a calculation standard (ANSI/AMCA 207); and is nearing completion of an efficiency-metric rating standard (AMCA 208).

AMCA and many of its members will contribute this body of work, as well as their expertise and experience, to the California Energy Commission for consideration to its rulemaking.

Respectfully,

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AMCA COMMENTS TO THE CALIFORNIA ENERGY COMMISSION
17-AAER-06 – COMMERCIAL AND INDUSTRIAL FANS & BLOWERS

June 16, 2017

ABOUT AMCA INTERNATIONAL

The Air Movement and Control Association (AMCA) International Inc. is a not-for-profit trade association with more than 370 member companies worldwide representing more than $3 billion in annual revenue. Now in its 100th year of existence, AMCA's mission is, and always has been, to advance the health, growth and integrity of the air movement and control industry.

AMCA serves members and industry through, programs such as certified ratings; development of international product-rating standards; education and training; contributing to the development of codes, standards, and regulations; and maintaining a U.S.-based reference laboratory that is the apex of a global network of AMCA-accredited labs among members and independent agencies.

For more than 75 years, AMCA's primary program has been the AMCA Certified Ratings Program (CRP). AMCA tests participating companies' products in its laboratory to make sure manufacturer's product-rating data is within a prescribed tolerance. AMCA also ensures that ratings data are correctly used in calculations and other representations that appear in manufacturers' catalogs, and that the data are presented in prescribed formats, tables, and charts. AMCA also ensures tests were conducted in accordance with applicable standards. These measures ensure buyers can rely on the ratings data to be accurate, and facilitate comparison of like products across manufacturers.

Currently, the AMCA CRP covers 387 companies and 3,677 product models. Of these, 181 are fan manufacturers accounting for 2,172 certified fan models. In California, AMCA has 16 total members, 14 of which are participating in the AMCA CRP; of these, three are California fan manufacturers that certify a total of six fan models.

AMCA AND THE HISTORY OF FAN EFFICIENCY REGULATION

AMCA has been proactively involved in fan efficiency regulation since 2007, which is when ASHRAE 90.1 and AMCA began co-development of a 90.1 measure explicitly covering fans. This work led to AMCA publishing a fan-efficiency rating standard in 2010, ANSI/MCA Standard 205 *Energy Efficiency Classification for Fans*. AMCA 205 defined a metric called Fan Efficiency Grade (FEG). FEG and AMCA 205 were incorporated into ISO Standard 12759-2010, *Fans – energy efficiency classification for fans.* ISO Standard 12759 also defined another fan-efficiency metric, Fan Motor Efficiency Grade (FMEG), which became the basis for the European Commission's energy efficiency fan regulation EC 327-2011.

Since the publication of AMCA 205 in 2010, and, with AMCA assistance on ASHRAE and International Construction Code committees, AMCA 205 has been referenced in new fan-efficiency provisions added to all U.S. model codes and standards for energy efficiency and green construction since 2012, i.e., International Green Construction Code; ASHRAE 90.1, ASHRAE 189.1, and International Energy Conservation Code, or International Green Construction Code. Currently, by adopting an applicable model energy or construction code or standard and retaining the appropriate language, at least 10 states have FEG-based fan efficiency provisions that reference AMCA 205, i.e.:

Alabama	Maryland	Vermont
Florida	New Jersey	Washington
Hawaii	New York	
Illinois	Utah	

FEG is a fan-only metric based on fan total pressure, which treats only the aerodynamic qualities of the fan without considering the influences of motors and drives. FEG ratings are applied to an entire fan model across its size range to account for the inherent lesser efficiency of a fan in its smaller sizes because of bearings, manufacturing tolerances, and other factors. For FEG to be effective, a "sizing and selection window" needs to be applied to a FEG-based fan-efficiency provision to prohibit system designers from selecting smaller, less efficient fans to meet a minimum FEG level. In ASHRAE 90.1, fans must be selected to operate within 15 percentage points of the fan's peak total efficiency. This sizing/selection artifact, however, cannot be used in an appliance standard of the type administered by the DOE Appliance and Equipment Standards Program, which seek to regulate at the point of manufacture.

For a description of AMCA 205 and Fan Efficiency Grades; a description of the FEG-based provisions in model codes and standards; a comparison of FEGs to FMEGs, and a comparison of the U.S. versus European approaches to fan-efficiency regulation, consult "Comparison of U.S. and European approaches to regulating fan efficiency," by Ivanovich and Jones.

In June 2011, DOE's Appliances and Equipment Standards Program initiated a rulemaking on commercial and industrial blowers. The first concrete development of the rulemaking occurred

in February 2013, when DOE published the *Framework Document*. The *Framework Document* stated DOE's preference for a wire-to-air fan efficiency metric, which now requires the work that had been done to date resulting in FEG, AMCA 205, and fan efficiency provisions in model codes and standards to be further developed and improved.

AMCA and its members then developed a new metric resulting in the Fan Energy Index (FEI). During the DOE ASRAC process the intermediary metric of Fan Electrical Power (FEP) was also developed.

FEI is very different from FEG in many important ways, and by its nature, FEI could revolutionize how fans are regulated. Unlike FEG, FEI is a wire-to-air metric similar to the regulatory approaches being taken for other motor-driven loads, such as pumps and air compressors. However, unlike the metrics for pumps and air compressors, and unlike FEG's sizing/selection window, FEI has "sizing and selection" incorporated in the metric in a manner acceptable to DOE.

AMCA is currently developing a rating standard for FEI and FEP, which will eventually be published as AMCA Standard 208. AMCA 208 will define how to calculate FEI and FEP using data taken during rating tests conducted in accordance with either ANSI/AMCA 210/ASHRAE 5.1 *Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating.* It is worth noting that AMCA 210 was agreed upon by stakeholders in the ASRAC fan working group to be the basis of the DOE test procedure.

An intermediary calculation standard, ANSI/AMCA 207 *Fan System Efficiency and Fan System Input Power Calculation*, was published in 2017. AMCA 207 is important because it provides default loss component for motor, VFD, and belt efficiencies when electrical input test data are not available. These default losses factor into the calculation of FEI and FEP. AMCA 207 provides a standard method to estimate the ielectrical nput power and overall efficiency of an extended fan system. An extended fan system is composed of a fan and an electric motor but may also include a transmission and a motor controller. While direct measurement of fan system performance could result in a more precise estimate of power consumption, the large number of fan system configurations makes testing every possible configuration impractical. AMCA 207 offers a standardized method to estimate fan system performance by modeling commonly used components. Calculations reported in accordance with this standard offers fan users a tool to compare alternative fan system configurations in a consistent and uniform manner. AMCA 207 was not complete at the time of the ASRAC negotiations. As a result, different default values appear in the ASRAC term sheet.

The DOE rulemaking still has not yielded published preliminary and final determinations; however, intermediary meaningful developments are in the DOE public docket. One such development is a "term sheet" yielded by a working group of more than 20 fan-regulation stakeholders under the direction of the Appliance Standards and Rulemaking Federal Advisory Committee (ASRAC) in September 2015. Leading up to and after publication of the ASRAC term sheet, DOE published three Notices of Data Availability (NODA), which documented and

published DOE's understanding of the fan industry, fan industry data, and tools for analyzing potential regulatory outcomes. Of the three NODAs, the third, published in October 2016, is the most significant because it discussed and modeled what stakeholders had agreed upon in the ASRAC term sheet.

When the third NODA was published, AMCA and many other stakeholders published comments to the docket into January 2017, the collection of which represents the most recent publicly available developments of the DOE commercial and industrial fans rulemaking. Among these comments are those from AMCA that advise DOE of the publication of AMCA 207, and support for having AMCA 207 default values be substituted for the ASRAC default values.

Since the third NODA, DOE has not commented or communicated any regulatory activity on the commercial and industrial fans rulemaking. With California now taking up the task of creating an appliance regulation for fans, AMCA stands ready to contribute as we have contributed to fan efficiency regulation going back to 2007.

RESPONSES TO REQUESTS FOR INPUT TOWARD CALIFORNIA TITLE 20

California has announced that it will initiate a rulemaking under Title 20 to regulate the energy efficiency of commercial and industrial fans and blowers.

AMCA stands ready to help California in any way possible. We are providing copies of our published standards, AMCA 210 and AMCA 207, and we have invited Mr. Alejandro Galdamez to the AMCA 208 committee meetings, so he will have access to the working drafts and be party to discussions.

Additionally, AMCA will seek to develop a new database of fan shipments among members to the California market. Pending development of the database, AMCA submits the following responses to the items of information requested by California in the California Energy Commission Webinar on May 11, 2017.

Answers to questions from the PowerPoint presentation:

Regarding trends on fan sizing and selection, AMCA notes that fans are often undersized and that where more efficient types are available, they are often not selected if they are more expensive. Thus, regulations that seek to regulate fan efficiency by focusing solely on peak efficiency are likely to get undermined by picking less efficient types or smaller sizes.

Therefore, AMCA supports use of the Fan Energy Index as a regulatory metric, as FEI has sizing/selection criteria built into the calculation.

Regarding benefits of FEI vs FER, AMCA submits that FEI emerged as the metric of choice by DOE and industry stakeholders after many months discussions and analysis by the preeminent

fan engineers and industry leaders, and we recommend that California continue to focus on FEI and FEP.

Responses to information categories present in the Webinar slides:

Product Definition & Scope
AMCA recommends that California keep to the regulatory scope per the ASRAC Term Sheet including "what's in" and "what's out" with respect to standalone fans. Specifically, AMCA supports that California exclude air curtains, crossflow fans, circulating fans, and induced-flow fans. We also agree that fans intended to be operated only during emergencies, and during testing of such fans on a periodic basis, should be excluded from this regulation. Also, AMCA supports the scope remaining at covering fans >= 1 hp and fans < 150 air horsepower because of the availability of regulated motors in this range.

Because this rulemaking is seeking to cover commercial and industrial fans, AMCA does not support including residential fans in this rulemaking.

Existing Test Procedures and Test Procedures Under Development
AMCA agrees that AMCA 210 should be used as the basis for the test standard, per ASRAC term sheet. AMCA 210 will be provided under confidentiality as it is sold in the AMCA bookstore.

Sources of Test Data
Test reports are confidential and will be provided by manufacturers as per their own initiative.

Existing Standards & Standards under Development
AMCA 207 will be provided under confidentiality as this document is sold by the AMCA bookstore.

For FEI and FEP calculations, AMCA requests California await the publication of AMCA 208, which is scheduled for completion in 2017. When completed, AMCA 208 will be provided to California under confidentiality as this document will be sold by the AMCA bookstore.

Product Lifetime
Individual manufacturers to contribute as per their own initiative.

Product Development Trends
Individual manufacturers to contribute as per their own initiative.

Operations
AMCA does not have operational trend data.

Energy-consuming Features
Individual manufacturers to contribute as per their own initiative.

Energy-saving Features & Technologies
Individual manufacturers to contribute as per their own initiative.

Control Features
Individual manufacturers to contribute as per their own initiative.

Market Characteristics
Installed Base Characteristics
Market Competition
AMCA is in the process of developing a fan shipment database for California to the extent AMCA members will participate.

Appendix 1: Chronology of DOE Rulemaking for Commercial and Industrial Fans and Blowers

Note: This is an annotated distillation of the significant events of the DOE commercial and industrial fans rulemaking as of March 2017. It is based primarily on this "history" section of DOE NODA 3, which was published in November 2017.

Most documents associated with the rulemaking are online at http://www.regulations.gov/docket?D=EERE-2013-BT-STD-0006

Date & Federal Register Reference	Action	Significance
Jun 28, 2011 76 FR 37678	DOE published a notice of proposed determination of coverage to initiate the energy conservation standards rulemaking for fans, blowers, and fume hoods.	This notice of intent to regulate fans came after AMCA and ISO had published rating standards in 2010 for fan efficiency that defined Fan Efficiency Grade (AMCA Standard 205; ISO Standard 12759). DOE sought input from stakeholders.
Feb 1, 2013 78 FR 7306	DOE published a notice of public meeting and availability of the Framework document for commercial and industrial fans and blowers.	In the Framework Document, DOE requested feedback from interested parties on many issues, including the engineering analysis, the manufacturer impact analysis (MIA), the life-cycle cost (LCC), payback period (PBP) analyses, and the national impact analysis (NIA). A total of 110 questions were asked in the document. By this time, ICC wrote a fan-efficiency provision based on FEG in the 2012 International Green Construction Code and 2015 International Energy Conservation Code; ASHRAE used FEG in the 2013 ASHRAE 90.1 and ASHRAE 189.1. All codes and standards referenced AMCA Standard 205 for FEG. Subsequent editions also have and continue to use FEG based on AMCA 205. Click here for ASHRAE Journal on ASHRAE 90.1 FEG provision.

Date & Federal Register Reference	Action	Significance
		Click here for peer-reviewed article by Ivanovich/Jones discussing US vs European fan efficiency regulations, which explains FEG provisions in ASHRAE and ICC publications. AMCA 205 is available for purchase at www.amca.org/store.
Feb 21, 2013	DOE's held the first public hearing on the fan regulation in Washington DC at DOE headquarters.	DOE presented a PowerPoint presentation that described the Framework Document and sought feedback to most of the 110 questions in the Framework Document.
Oct 2014	Representatives of fan manufacturers and energy efficiency advocates1 (Joint Stakeholders) presented DOE with an alternative metric approach called "Fan Efficiency Ratio," (FER) which included a fan efficiency only metric approach (FERH) and a wire-to-air metric approach (FERW).	Stakeholders represented the Air Movement and Control Association (AMCA), New York Blower Company, Natural Resources Defense Council (NRDC), the Appliance Standards Awareness Project (ASAP), and the Northwest Energy Efficiency Alliance (NEEA). Supporting documents from this meeting, including presentation slides are available at: http://www.regulations.gov/document?D=EERE-2013-BT-STD-0006-0029. Click here for 2015 Trane Engineers Newsletter article discussing and comparing different fan efficiency metrics, including Performance Based Efficiency Ratio – the first iteration of FEI.
Dec 10, 2014 79 FR 73246	**NODA 1:** DOE published a notice of data availability (December 2014 NODA) that estimated the potential economic impacts and energy savings that could result from promulgating energy	NODA analysis used a "wire-to-air" fan electrical input power metric, the fan energy index (FEI), to characterize fan performance. FEI is the ratio of the weighted-average fan electrical input power of a minimally compliant fan to the weighted-average fan electrical input power of a given fan, at three specified operating points. The FEI metric relied on an equation describing fan efficiency as a function of airflow and pressure in order to set the minimum fan efficiency of each considered

Date & Federal Register Reference	Action	Significance
	conservation standards for fans.	efficiency level (EL) analyzed in the December 2014 NODA. Both the FEI approach, presented in the December 2014 NODA, and the FER approaches relied on an equation to determine required fan efficiency as a function of the fan's airflow and pressure The main differences between the December 2014 NODA FEI and the FER approaches were the form of the equation used for the fan efficiency, and the operating conditions at which the metric was evaluated. While in the December 2014 NODA, the FEI was calculated as a weighted average of the fan performance at three specific operating points, the FER was calculated at all manufacturer-declared operating points.
Apr 1, 2015 80 FR 17359	In 2015, DOE initiated Appliance Standards Rulemaking Federal Advisory Committee (ASRAC) to discuss negotiated energy conservation standards and test procedure for fans On, DOE published a notice of intent to establish a negotiated rulemaking Working Group for fans.	Twenty-five nominees were selected to serve as members of the Working Group in addition to one member from ASRAC and one DOE representative. Members of the Working Group were selected to ensure all stakeholders' interests and areas of expertise were represented: AMCA Team: • [1]Dan Hartlein, Twin City Companies, Ltd • [1]David Johnson, Berner International Corp • [1]Geoff Sheard, AGS Consulting LLC • [1]Mark Bublitz, The New York Blower Company • [1]Michael Wolf, Greenheck • [1]Steve Dikeman, AcoustiFLO LLC • [1]Wade Smith, AMCA International • [2]John Magill, Howden • [2]Tim Mathson, Greenheck Fan • [2]Tom Catania, Consultant to AMCA • [2]Tony Corners, Carnes Company • [2]Trinity Persful, Clarage Fan

Date & Federal Register Reference	Action	Significance
		Other Representatives • [3]Armin Hauer, ebm-papst Inc • Aniruddh Roy, Diakin/Goodman • Ashley Armstrong, U.S. Department of Energy • Diane Jakobs, Rheem Manufacturing Company • Donald McNeil, Buffalo Air Handling Company • Duane Daddis, United Technologies/Carrier • Gary Fernstrom, California Investor Owned Utilities • Gregory Wagner, Morrison Products • Joanna Mauer, Appliance Standards Awareness Project • Larry Burdick, SPX Cooling Technologies / CTI • Laura Petrillo-Groh, Air-conditioning, AHRI • Louis Starr , Northwest Energy Efficiency Alliance • Mark Fly, AAON, Inc. • Meg Waltner, Natural Resources Defense Council • Nicholas Howe, Carnes Company • Paul Lin, Regal Beloit Corporation • Stephen R. Wiggins, Newcomb & Boyd • William Smiley, Smiley Engineering LLC representing Trane/IR [1] Primary representative of AMCA or AMCA member [2] Alternate representative of AMCA or AMCA member [3] AMCA member, but represented company on ASRAC Information on the ASRAC, the commercial and industrial fans Working Group, and meeting dates is available at:

Date & Federal Register Reference	Action	Significance
		http://energy.gov/eere/buildings/appliance-standards-and-rulemaking-federal-advisorycommittee.
May 1, 2015 80 FR 24841	**NODA 2:** Based on the additional information received and comments to the December 2014 NODA, DOE published a second NODA (May 2015 NODA) that announced the availability of data from DOE analyses conducted using a modified FEI metric.	The modified FEI metric used in the May 2015 NODA is like the FERW metric presented by the Joint Stakeholders.
Sep 3, 2015	The Working Group negotiations comprised 16 meetings and three webinars and covered scope, metrics, test procedures, and energy conservation standard levels for fans. The Working Group concluded its negotiations with a consensus vote to approve and publish a term sheet containing recommendations for DOE on scope, energy conservation standards analysis methodology, and the test procedure for fans.	The term sheet, document No. 179, is posted on the docket for the energy conservation standards rulemaking at: http://www.regulations.gov/docket?D=EERE-2013-BT-STD-0006 Details of the negotiation sessions can be found in the public meeting transcripts that are posted to the docket at: http://www.regulations.gov/docket?D=EERE-2013-BT-STD-0006
Sep 24, 2015	ASRAC subsequently voted to approve the	This made the Term Sheet "official" in the eyes of DOE and the Working Group participants. The

Date & Federal Register Reference	Action	Significance
	recommendations of the Working Group during the webinar meeting.	Term Sheet was thus ingested by DOE as a negotiated agreement among industry stakeholders for regulation development.
Oct 19, 2016 FR Doc. 2016–26341	**NODA 3:** Since the negotiations, DOE had revised its analysis to reflect the term sheet recommendations regarding the metric and energy conservation standards. DOE published the NODA to inform on impacts of potential energy conservation standards for fans based on term sheet recommendations and to request feedback on specific issues.	The most significant changes included: 1) The augmentation of the AMCA sales data used in the May 2015 NODA to better account for fans made by companies that incorporate those fans for sale in their own equipment (see section III.G); 2) the augmentation of the AMCA sales data used in the May 2015 NODA to represent additional sales of forward curved fans, which AMCA stated were underrepresented in the original data AMCA provided. (AMCA, Public Meeting Transcript, No. 85 at p. 91); and 3) the inclusion of OEM equipment conversion costs. Note that 125 comments were submitted to this NODA. The comments can be accessed at http://tinyurl.com/lqcj5o4 AMCA comments to the third NODA are Appendix 2.
Jan 20, 2017	President Trump issues executive order placing hold on new regulations. As early as one month prior to the presidential election, stake holders were anticipating a test-procedure NOPR soon after the expiration of the NODA 3 comment period.	There has been no official word from DOE regarding the future publication of a test procedure NOPR or any other activity on the fan regulation. https://www.whitehouse.gov/the-press-office/2017/01/20/memorandum-heads-executive-departments-and-agencies
Feb 2017	California has communicated to	The docket for the California

Date & Federal Register Reference	Action	Significance
	AMCA and other stakeholders of their intent to regulate fans as an “appliance” under the 2022 edition of California Title 20.	2017 Appliance Efficiency - Phase 2 Pre-Rulemaking Commercial and Industrial Fans and Blowers: http://www.energy.ca.gov/appliances/2017-AAER-06-13/17-AAER-06.html

Ms. Ashley Armstrong
Office of Energy Efficiency and Renewable Energy
Building Technologies Program
Room EE-5B
U.S. Department of Energy
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Re: AMCA Comments on DOE's NOPR #3 for Energy Conservation Standards for Commercial and Industrial Fans and Blowers: Availability of Provisional Analysis Tools; Docket No. EERE-2013-BT-STD-0006; RIN: 1904-AC55

The Air Movement and Control Association International, Inc. (AMCA) respectfully submits these comments regarding the U.S. Department of Energy's (DOE) Availability of Provisional Analysis Tools (NODA #3) pertaining to a regulatory energy conservation standard for commercial and industrial fans and blowers ("fans").
These comments are submitted as three sections. Section 1 makes requests of DOE on matters not specifically covered by the NODA, but which are important to consider ahead of releasing the test procedure NOPR. Section 2 provides comments stemming from AMCA's analysis of the NODA content and spreadsheets. Section 3 provides direct responses to DOE's feedback items.

Section 1:
AMCA respectfully requests two important considerations germane to the test procedure.

1. AMCA requests that a 360-day waiting period be granted for compliance to the test procedure. This request is founded on the need to work with International Code Commission (ICC) and ASHRAE to find solutions to the fan efficiency requirements in the International Energy Conservation Code (2015, 2018) and ASHRAE 90.1 (2013, 2016). These editions of IECC and ASHRAE 90.1 use fan efficiency grade (FEG) as the regulatory metric for commercial fan efficiency, and we are aware of at least 11 states that have adopted such provisions. The International Green Construction Code and ASHRAE 189.1 also have FEG provisions.

   It will take some time to work around the issue of not only switching metrics, but facilitating education and training for application and enforcement. Granting waivers on a company-by-company basis will not solve these issues, and we cannot even begin to affect a resolution until the test procedure NOPR is published. Not only must the metric be replaced, but some corresponding minimum efficiency

Additionally, given the revolutionary nature of the new metric(s), we believe it will take more resources than the industry is equipped to handle to become familiar with and compliant with the metric and test procedure, especially for those companies that have not been involved in their development.

There is some precedence for DOE granting 360 days for test-procedure waiting periods, such as the recent NOPR and Final Rule for commercial boilers:

- NOPR: https://www.regulations.gov/document?D=EERE-2014-BT-TP-0006-0030
- Final Rule: https://www.regulations.gov/document?D=EERE-2014-BT-TP-0006-0049

2. In the NODA, DOE used the default values for motor and drive efficiencies as agreed to in the Term Sheet resulting from the ASRAC working group for this rulemaking. However, AMCA proposes that the default values used in draft AMCA Standard 207/ISO 12759:Part 2, Fan System Efficiency and Fan System Input Power Calculation. Work on this draft has been underway for several years and is undergoing AMCA committee ballots. As indicated, draft ISO 12759 is currently under revision, and draft AMCA 207 has been incorporated into ISO 12759 as draft ISO 12759:Part 2. This will provide a universal understanding and representation of belt, motor, coupling and drive default values for regulatory purposes. If DOE continues to use the default values stemming from the ASRAC negotiation, there will be a problematic lack of harmonization with the International standards.

   Further, while the losses predicted by draft AMCA Standard 207/ISO 12759:Part 2 are slightly lower than those predicted by the term sheet, the losses predicted by draft AMCA Standard 207/ISO 12759:Part 2 are more accurate, and are a better indicator of fan electrical input power. Even so, the losses predicted by draft AMCA Standard 207/ISO 12759:Part 2 are conservative. That is, draft AMCA Standard 207/ISO 12759:Part 2 predict higher losses than what would occur in actual use.

   Finally, while draft AMCA Standard 207/ISO 12759:Part 2 calculations would predict a slightly more efficient fan than the term sheet, this does not mean a necessary reduction in compliant selections because the target efficiency can be adjusted such that the percentage of noncompliant selections, and hence the total energy saved, would be the same using either the term sheet losses or the losses from draft AMCA Standard 207/ISO 12759:Part 2.

Section 2:
AMCA has the following comments material to the content of the NODA and the rulemaking in general, apart from the feedback items requested by DOE.

- Losses at Design Point for FEP_{Fan}: According to Recommendation 29, the load losses at design point equation are valid up to a limit to be validated (e.g. x_i =1.2). Above that limit, the losses shall be capped.

  Remark: The term sheet says the losses should be capped, the spreadsheet does not cap the losses. It is not clear why we agreed to cap the losses in the term sheet, but this was agreed on and is not in the spreadsheet.

- Losses at Design Point for $FEP_{Standard}$: Maximum allowed motor input power (BHP) is used to calculate in the following equation:

$$x_i = \frac{BHP_i}{\eta_{T,i}} \times \frac{1}{MotorHP}$$

  Remark: The term sheet only has a single symbol for BHP_i, yet it is used to refer to both the fan shaft BHP and the maximum allowed shaft BHP (standard). Any clarification would be appreciated. Motor Size for FEP_{Fan} : Nameplate HP of default motor is equal (or to the next highest) to 120% of fan shaft input power at a given operating point. Belt loss was NOT considered.

  Remark: To be consistent, AMCA recommends adding Belt Loss in the motor sizing.

- Transmission Efficiency at Design Point for $FEP_{Standard}$: Maximum allowed shaft input power in BHP is used to calculate Transmission Efficiency.

  Remark: The term sheet is not clear as to what shaft power is to be used for calculating transmission efficiency for $FEP_{Standard}$. AMCA prefers Transmission Efficiency for $FEP_{Standard}$ to be calculated based on max allowed shaft power (BHP) at ηstd. This is consistent with NODA spreadsheet and we think this is consistent with Termsheet even though $BHP_{Standard}$ is not defined in Termsheet.

- Motor Size for $FEP_{Standard}$: Nameplate HP of default motor is equal (or to the next highest) to 120% of fan shaft input power at a given operating point. Belt loss was NOT considered.

  Remark: AMCA prefers to use max allowed fan shaft power (BHP) at EL level to size motor. It also make sense to use the corresponding belt loss which is not in the term sheet.

- NODA-3 calculation is only for Bare Shaft (standalone) fans.

  Remark: Any clarifications or expansion of the Engineering Analysis to include the items listed below would be appreciated.
  1. Motor sold with fan
  2. VFD/Control
  3. Wire-to-Air tested fan (kW in)

- Reference Table III-1, what is a safety fan? If the answer is "refer to the ASRAC Final Term Sheet, September, 2015, Appendix D" (see below), then who determines, and can make valid claim, that a fan satisfies the requirement of section (d.)? Is it the manufacturer? Is it DOE? If DOE, by what process does the manufacturer apply for this definition?

ASRAC Term Sheet from Fan Working Group, September 3, 2015
Appendix D—Definitions

Safety Fan Definition

The definitions presented in this appendix are subject to potential edits necessary to accomplish the same intent.

Safety fan:

The current working definition is based on the European definition:

Fans designed for use in applications requiring extra safety measures, such as:

a) those designed to operate in potentially explosive atmospheres (ATEX fans);

b) those designed for emergency use only, at short-time duty, with regard to fire safety requirements (e.g. smoke extraction fans, emergency reversible tunnel fans);

c) those designed specifically to operate where the temperature of gases being moved exceed 200ºF; or

d) those designed for use in toxic, highly corrosive, or flammable environments with abrasive substances (e.g. NQ-1).

- General question: For fans that are not included in the NODA and pending rule, must the manufacturer use the methods set forth in the rule to calculate and express efficiency in the U.S. marketing of the excluded fan product?

Section 3:
DOE has requested feedback of 17 specific items as identified in NODA #3. AMCA expresses their thanks to the DOE for seeking and considering feedback pertaining to this NODA. Comments from AMCA follow to items 1, 2, 4, 7, 15, 16, and 17.

1. DOE requests feedback on the calculation of the FEP_{STD} and FEI. (pg. 9-12)

AMCA recommends adopting FEI as the primary metric. By proposing FEP_{REF}, DOE has made this a feasible approach. A detailed explanation with supporting documentation can be found in the Greenheck comments submitted for NODA #3.

Specifically, AMCA supports:

Proposal #1 – Correct the H_{REF} calculation so the metric is defined at zero static pressure.

Proposal #2 – Change the transmission efficiency calculation from:

$$\eta_{STD,i} = 0.96 * (1 - exp(-275 * BHP)^{0.19})$$

to

$$\eta_{STD,i} = 0.96 * \left(\frac{BHP}{BHP + 2.2}\right)^{.05}$$

Proposal #3 – Change the basis for reference motor efficiency to enclosed motors rather than the minimum value for enclosed and open motors.

The result of these proposals simplifies the computation of FEI significantly while not losing an of the integrity of the data or the analysis and does not create any new loopholes or weaken the regulatory approach. The resulting simplification in FEI calculation is shown below:

Proposed Calculation of FEP_{REF}

1. Ref Shaft Power	$\mathrm{H_{REF}} = \frac{(\mathrm{Q_i} + \mathrm{Q_0})(\mathrm{P_i} + \mathrm{P_0})}{6343 \times \eta_{\mathrm{target,REF}}}$
2. Transmission Effic	$\eta_{\mathrm{T,REF}} = 0.96 * \left(\frac{\mathrm{H_{REF}}}{\mathrm{H_{REF}} + 2.2}\right)^{.05}$
3. Motor PL Efficiency	$\eta_{\mathrm{M,PL}} = \mathrm{A}\left[\log\left(\frac{\mathrm{H_{REF}}/\eta_{\mathrm{t,REF}}}{0.746}\right)\right]^3 + \mathrm{B}\left[\log\left(\frac{\mathrm{H_{REF}}/\eta_{\mathrm{t,REF}}}{0.746}\right)\right]^2 + \mathrm{C} \cdot \log\left(\frac{\mathrm{H_{REF}}/\eta_{\mathrm{t,REF}}}{0.746}\right) + \mathrm{D}$
4. Total FEP_{REF}	$\mathrm{FEP_{REF}} = \mathrm{H_{REF}}\left(\frac{1}{\eta_{\mathrm{T,REF}}}\right)\left(\frac{1}{\eta_{\mathrm{M,PL,}}}\right)$

Source: Greenheck's comments submitted to DOE on NODA #3.

2. DOE seeks comments on the equipment classes used in this notice. (pg. 13-21)

AMCA has substantive comments being developed for this item, however we are unable to complete our work under the timeline for the review period. We will comment when this work is complete.

4. DOE seeks comments on the use of a compliance date of five years after the publication of the final rule. (pg. 21-23)

AMCA supports the use of a five-year compliance date as measured from the publication date of the final rule.

7. DOE requests feedback on the quantity of redesigns, methodology, and results used to calculate the total industry conversion costs by equipment class and EL, as presented in the engineering analysis and conversion cost spreadsheet.

DOE Reg. Comm. – Axial fans are more expensive to redesign than centrifugal fans. In general, it is not believed that each increase in EL level has the same incremental cost (more for higher EL levels).

15. DOE seeks feedback and inputs on the fan operating hours.

AMCA requests that the DOE incorporates operating hours specific to equipment classes into their analysis.

16. DOE seeks feedback and inputs on the fan load profiles used in the energy use calculation and on the percentage of fans used in variable load applications.

Operating hours and load points seem reasonable to the AMCA Membership

17. DOE seeks feedback and inputs on the fan lifetimes

DOE Reg. Comm. – AMCA Membership is interested in understanding this issue and is requesting a workshop in order to better understand this issue.

In general, AMCA has been unable to complete our analysis during the 30-day comment period, and our request for a 30-day extension was not granted. AMCA will submit additional or refined responses when our analysis is complete.
Respectfully Submitted,

Mark Stevens
Executive Director
Air Movement and Control Association, International, Inc.