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## NEEA's comments on Draft Staff Report

*Additional submitted attachment is included below.*

September 28, 2018
Via Electronic Mail

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Re: Docket Number 17-AAER-06, Publication Number: CEC-400-2018-014-SD

The following comments are submitted for the record of the Commission's 2017 Appliance Efficiency Pre-Rulemaking Docket Number 17-AAER-06 regarding Publication Number: CEC-400-2018-014-SD, "Analysis of Efficiency Standards and Test Procedures for Commercial and Industrial Fans and Blowers." They are submitted on behalf of the Northwest Energy Efficiency Alliance.

The Northwest Energy Efficiency Alliance is a non-profit organization working to encourage the development and adoption of energy-efficient products and services. NEEA is supported by the region's electric utilities, public benefits administrators, state governments, public interest groups and efficiency industry representatives. This unique partnership has helped make the Northwest region a national leader in energy efficiency.

*Comments*

**Overview**
We are grateful that the Commission is moving forward to cost effectively capture energy savings for California estimated at 74 gigawatt-hours (GWh) in the first year the standard goes into effect, with a long-term estimate of 1,800 GWh per year. We expect that this standard will play a role in achieving California's goal of carbon neutrality no later than 2045, established in Executive Order B-55-18.

To put these savings into perspective, according to US Energy Information Administration's 2012 Commercial Buildings Energy Consumption Survey (CBECS) total national electricity usage for cooling in commercial buildings is approximately 185 billion kWh, which is roughly equal to electricity usage for ventilation, estimated at 196 billion kWh[1]. Commercial electricity usage for heating is estimated at 25 billion kWh. Total commercial electricity usage is estimated at 1,243 billion kWh, suggesting that ventilation represents approximately 16% of commercial electricity usage, and approximately 48% of commercial electricity usage for space conditioning (406 billion kWh). Long-term annual savings from this standard represent an important step towards decreasing overall ventilation and commercial HVAC energy consumption longterm.

1. **Test procedure**

We recommend referencing AMCA Publication 211-13, "Certified Ratings Program – Product Rating Manual for Fan Air Performance[2]" to include sampling and rating requirements, as well as acceptable test tolerances. Following AMCA 211 could be mandatory or optional. That is, CEC could specify that

[1] https://www.eia.gov/consumption/commercial/data/2012/c&e/cfm/e5.php

[2] https://www.amca.org/assets/crpdocument/amca_211-13.pdf

manufacturers could either submit to CEC using CEC's traditional certification procedures *or* certify based on AMCA 211 certified fan performance ratings, which would reduce reporting burden for manufacturers and potentially allow AMCA to certify equipment on behalf of manufacturers. We do not believe this would reduce, and may even enhance, the rigor of CEC's regulations, since the AMCA certified ratings program, as specified in AMCA 211, includes mandatory enforcement procedures and tolerances as part of the program.

**2. Regulation of embedded fans**

We support the Commission's proposal to regulate embedded fans and believe it is an important component of overall savings from this regulation. As noted in the staff report, the Term Sheet developed by the ASRAC Commercial and Industrial Fans and Blowers Working Group on September 3, 2015 and edited September 24, 2015[3], defined the scope of covered fans to include both stand-alone and embedded fans, with a consensus of 24 votes in the affirmative, 0 votes in the negative, 0 abstention votes, and 1 absent vote. Furthermore, the staff report estimates first year savings from regulation of embedded fans at 24 GWh, with annual savings after stock turnover at almost 300 GWh, which represents approximately 32% of total first year savings and approximately 57% of annual savings after stock turnover. Regulating embedded fans on par with stand alone fans will not only increase the energy savings from the regulation, it will also, importantly, create and even playing field for fan manufacturers that may sell the same fan into both stand alone and/or embedded applications and prevents loop holes that may circumvent savings from the established standards.

Regarding concerns about energy savings and alternative approaches, we are skeptical that regulation of embedded fans would raise any technical concerns related to system effects and overall energy savings. The performance curves of many fan selections would be unaffected by any CEC regulation and, similarly, fans exist that can serve the same duty points and performance ranges that are currently employed in this equipment. As such, increased fan efficiency should not affect overall equipment performance. We recognize that manufacturers have to consider overall equipment costs along with equipment performance. However, we believe, that trading off increased fan efficiency for decreased efficiency in other areas, as some manufacturers have suggested, is hypothetical and would likely not be required to overcome the nominal incremental cost of the higher efficiency fan in most cases.

Regarding suggestions that embedded fan performance would be better addressed through individual equipment regulations, we believe that CEC should only consider such an option if it would provide similar or more energy savings than the embedded fan regulation and would be more cost effective. In this analysis, CEC should consider:

- the increased equipment cost associated with the fan against the incremental cost of other efficiency options that would achieve similar performance and
- the scope of embedded fans covered by either proposal.

There are likely pros and cons associated with either approach, but our assessment suggests that regulating embedded fans through equipment specific regulations and/or building codes would likely not be as comprehensive and therefore would not result in commensurate energy savings as regulating all embedded fans, as CEC has proposed. In addition, if some embedded fans are left unregulated, this presents a potential loophole in the fan regulation, since many fans can be sold in either stand-alone or embedded applications, and may skew the market based on this gap. These risks must be weighed against any potential issues associated with regulated embedded fans. For these reasons, we continue to believe that CEC's original proposal to include embedded fans in the scope of the regulation presents the greatest opportunity for energy savings and supports the most equitable solution for fan and OEM equipment manufacturers alike.

[3] https://www.regulations.gov/document?D=EERE-2013-BT-STD-0006-0179.

Further, we reviewed the CEC analysis outlined in the staff report and DOE's underlying NODA3 analysis for embedded fans in particular to understand the technical basis and validity of any concerns related to the accuracy of the existing embedded fan analysis. DOE's analysis in our review appears to be conservative in its treatment of redesign costs for OEM manufacturers and still shows significant cost effective energy savings from embedded fans. We conclude that DOE and CEC's analysis are sound and any technical concerns regarding their accuracy are unfounded. DOE and CEC's assessment of potential energy savings and cost effectiveness of embedded fans appear to be robust, including accounting for conservative redesign costs for fan and OEM equipment manufacturers.

Finally, regarding labeling and certification of embedded fans, we acknowledge the challenges surrounding certification and enforcement of these regulations for embedded fans sold in California, when fan manufacturers may not be aware or have control over how their fan is installed or where it is sold in the final piece of equipment. As such, one potential solution could be to regulate embedded fans at two levels. That is, manufacturers of embedded fans would be required to ensure compliance of any fans distributed to original equipment manufacturers (OEMs) *in California* and OEMs would then, in turn, be required to only distribute equipment with compliant fans *in California.* OEMs could meet this requirement by either purchasing already certified fans from a fan manufacturer or certifying the embedded fan themselves, if the fan was not already listed. We believe this would provide the most robust protection against loop holes in the regulation, if it is within CEC's authority to pursue.

In conclusion, in our view, there does not appear to be a technical reason to not pursue regulation on embedded fans on par with stand alone equipment. There are significant and reliable cost-effective energy savings available, even when accounting for manufacturer impacts, as in DOE's analysis. As such, we urge to maintain embedded fans in the scope of this fan rulemaking. However, to help alleviate testing and certification burden, CEC could consider a delayed compliance date for embedded equipment.

## 3. Recommended regulatory framework for embedded fans

Embedded fans present a more difficult regulatory problem than standalone fans. There is saving opportunities associated with regulating embedded fans but also a large loophole is created for standalone fans by not regulating embedded fans. It appears that 28% of the standalone fan shipments are sold into "embedded" applications as indicated in DOE's NODA 3 NIA analysis. An approach to regulating embedded fans is indicated below:

**OEM equipment with embedded fans where the design operating point is known and the standalone fan performance is known we recommend the following:**
**Refer to Figure 1**

1. Manufacturer to report the fan rpm at design operating point ***B***.
2. If the equipment has several operating modes, then the highest fan RPM and the airflow rate (Q) for that mode are relevant for the FEI determination.
3. Look up the fan alone performance map for the design operating point RPM.
4. From the fan alone performance map determine ***A*** read fan static pressure (P) and the FEP for the RPM and Q.
5. Calculate $FEI_s$ from P, Q, FEP.
6. If FEI < 1.00, then select a more suitable embedded fan.

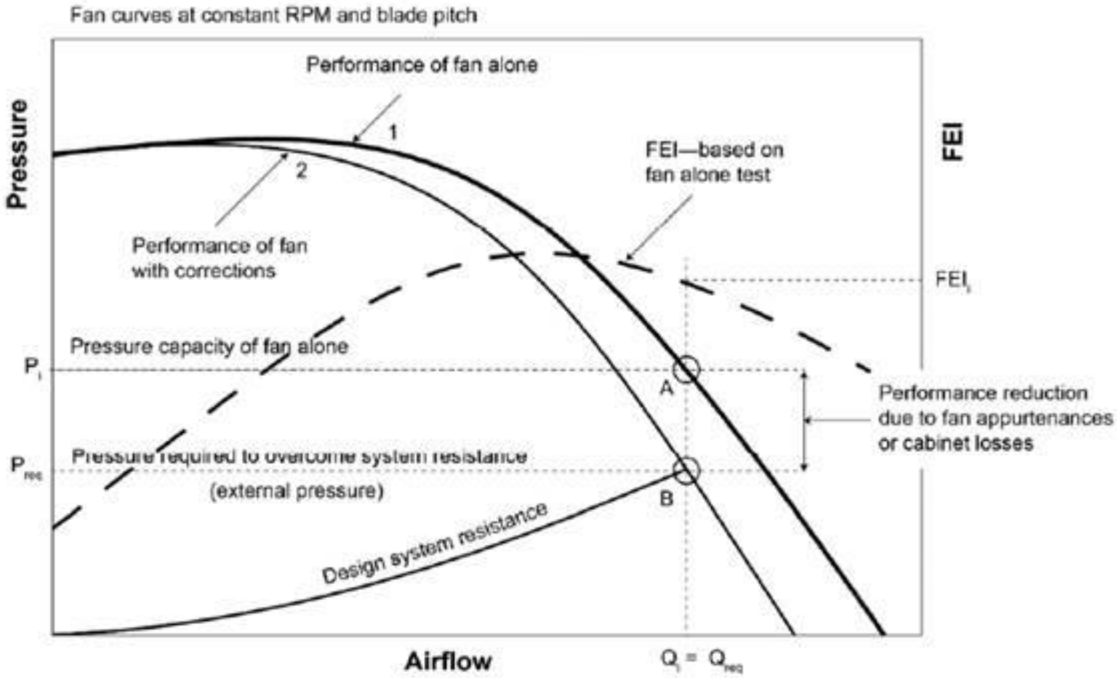


Figure 1—Fan Curves at Constant RPM and Blade Pitch

**OEM equipment with embedded fans where the design operating point is known and the standalone fan performance is not known.** Manufacturers have reported that they purchase fan wheels and don't know the standalone performance of the wheel with a scroll or in the equipment housing. The lack of knowledge of this performance would lead to the question of how are manufacturers are optimizing the embedded fan design in the equipment, which one may conclude they are not. We would recommend that fan wheels must have a AMCA 210 test performed by either providing a scroll for the wheel or testing of the entire equipment less any appurtenances. With an AMCA 210 test for the standalone fan we recommend the following:
**Refer to Figure 1**.

1. Manufacturer to report the fan rpm at design operating point ***B***.
2. If the equipment has several operating modes, then the highest fan RPM and the airflow rate (Q) for that mode are relevant for the FEI determination.
3. Look up the fan alone performance map for the design operating point RPM.
4. From the fan alone performance map determine ***A*** read fan static pressure (P) and the FEP for the RPM and Q.
5. Calculate $FEI_s$ from P, Q, FEP.
6. If FEI < 1.00, then select a more suitable embedded fan.

**OEM equipment with embedded fans where the design operating point is not known.** We acknowledge that this condition does occur but very infrequently. When replacing a failed roof top unit, an owner may need a new one to be installed by a contractor on their store within a few days rather than ordering one and waiting 60 days for one to be made at a factory. When a unit is replaced by unit that is in stock the contractor often can determine the operating design point of the failed equipment and provide that information to the distributor such that the resulting efficiency of the embedded fan could be determined. For those cases that the design operating point cannot be determined we recommend the following:
**Refer to Figure 1**.

1. The design cfm will be determined by using the nominal cfm rating based upon the capacity of equipment. Equipment cfm nominal rating is typically based upon the heat transfer characteristic of the heat exchanger and is readily available in equipment catalogs. Roof top units have a nominal rating for dx cooling coils of 400 cfm per ton for example. A 5-ton roof top unit has a nominal cfm rating of 2000 cfm.
2. Manufacturer to report the fan rpm at the average of the maximum and minimum external static pressure the equipment can produce at the nominal operating cfm. We will use point ***B*** as this indicated average on Figure 1.
3. If the equipment has several operating modes, then the highest fan RPM and the airflow rate (Q) for that mode are relevant for the FEI determination.
4. Look up the fan alone performance map for the design operating point RPM.
5. From the fan alone performance map determine ***A*** read fan static pressure (P) and the FEP for the RPM and Q.
6. Calculate $FEI_s$ from P, Q, FEP.
7. If FEI < 1.00, then select a more suitable embedded fan.

The use of use of the average of the maximum and minimum external static pressure the equipment can produce at the nominal operating cfm will result in a conservative rating for the FEI. A fair compromise for an embedded fan not optimized to a design operating point.

Thank you for considering our comments.

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