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*Comment Received From: Home Ventilating Institute  
Submitted On: 11/17/2020  
Docket Number: 19-BSTD-03*

**HVI Comment - Docket No 19-BSTD-03; Response to CEC's Nov 3  
Proposal to Establish Minimum Capture Efficiency for Range  
Hoods**

*Additional submitted attachment is included below.*



17 November 2020

Building Standards Office  
California Energy Commission  
1516 Ninth Street  
Sacramento, California 95814

Re: Docket No. 19-BSTD-03, 2022 Energy Code Pre-Rulemaking; *Response to CEC's November 3<sup>rd</sup> Proposal to Establish Minimum Capture Efficiency (CE) for Range Hoods*

Dear CEC Staff:

The Home Ventilating Institute (HVI) appreciates the opportunity to submit comments regarding CEC's proposal to establish minimum range hood capture efficiency (CE) presented on November 3, 2020. As stated in HVI's comment submitted to CEC on October 16 (TN235280), HVI is aligned with CEC's objective of supporting healthier homes through specification of better ventilation systems. In that comment, HVI advocated for one CE target to be applied to all installations (regardless of fuel type and dwelling unit size) to improve product selection, compliance, and enforcement while providing for healthier indoor environments. While the position submitted in that comment is still the preference of HVI, it has become clear that CEC has a strong preference to differentiate CE on the basis of cooking fuel. Assuming that CEC will proceed with differentiating CE requirements on the basis of cooking fuel, and in response to CEC's staff questions presented within the November 3<sup>rd</sup> workshop, this comment makes the following recommendations to CEC:

1. **CE:** Establish the following rating metrics and values to be referenced for range hood compliance:
  - a. Electric cooking: CE at 65% or NIA/field-verified airflow  $\geq$  160 cfm;
  - b. Gas cooking: CE at 80% or NIA/field-verified airflow  $\geq$  250 cfm.
2. **Airflow verification:** Introduce NIA as an alternative compliance path to Title 24's prescriptive duct sizing requirements for range hoods.
3. **Sound:** Maintain the current Title 24 sound requirement (i.e.,  $\leq$  3 sones) and exception to provide the sound rating at working speed.
4. **Auto operation:** Do not require at this time, but introduce incentives if CEC would like to see the industry provide this feature more widely.
5. **Dedicated oven exhaust:** Consider developing additional requirements for dedicated oven exhaust when ovens are separated from cooktops.
6. **Makeup air:** Maintain the current Title 24 makeup air requirements established within ASHRAE 62.2 Section 6.4.2.

Rationale supporting these recommendations is provided below.

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## **Establishing the CE Metric**

As HVI noted in comment TN235280, “cooking events are dynamic and complex, and pollutant exposures resulting from cooking are a function of many variables, such as the two that CEC has highlighted (i.e., cooking energy source and dwelling unit size), but also variables such as range hood height, duration of hood operation, airflow, kitchen layout (e.g., enclosed or open), cook activity, cooking temperature, cooking medium, cooking duration, etc.”

To avoid marketplace confusion that could result with introducing a dozen or more targeted CE values that are highly precise but perhaps not relevant for individual applications, HVI recommended within comment TN235280 that CEC establish one CE target across all cases. Since submitting that comment, LBNL has released additional data in Tech Memo TN 235477 suggesting that cooking fuel could have a greater effect on the required CE than first posited by Chan et al.<sup>1</sup> In consideration of LBNL’s revised recommendations, HVI recognizes that differentiating CE requirements according to cooking fuel may be warranted. However, HVI still believes that limiting the number of compliant CE targets will promote better selection, compliance, and enforcement.

If CEC moves forward with differentiating CE requirements according to cooking fuel, HVI requests that the CEC specify a CE target at the higher end of those recommended by LBNL and CEC for each fuel type. Selecting a value towards the upper end of each of these ranges will promote equivalent protection for individuals located within the immediate vicinity of the cooktop during cooking events (e.g., cooks, guests, children doing homework, etc.), regardless of the size of the home that they are located in. Further, reduction of the number of CE performance tiers required will promote better selection, compliance, and enforcement. The CE value recommended by HVI for range hoods serving electric cooking appliances is 65%, which is the highest value recommended by LBNL and CEC for this application and is likely a value that could be achieved by a wide array of affordable range hoods. The CE value recommended by HVI for range hoods serving gas cooking appliances is 80%, which is very close to CEC/LBNL’s maximum target of 85% but is expected to be achievable by far more range hoods than an 85% CE and represents a reasonable compromise between affordability and performance. For example, selecting a CE target of 85% versus 80% could add another ~\$200 the incremental cost of compliant range hoods beyond the incremental costs identified by CASE in Table 18 of their final report and would significantly reduce<sup>2</sup> the number of compliant models available to consumers. All considered, an 80% CE target for range hoods serving gas cooking appliances will promote consumer access to a wider range of models at a more affordable cost with minimum impact on CE.

## **Validating CE**

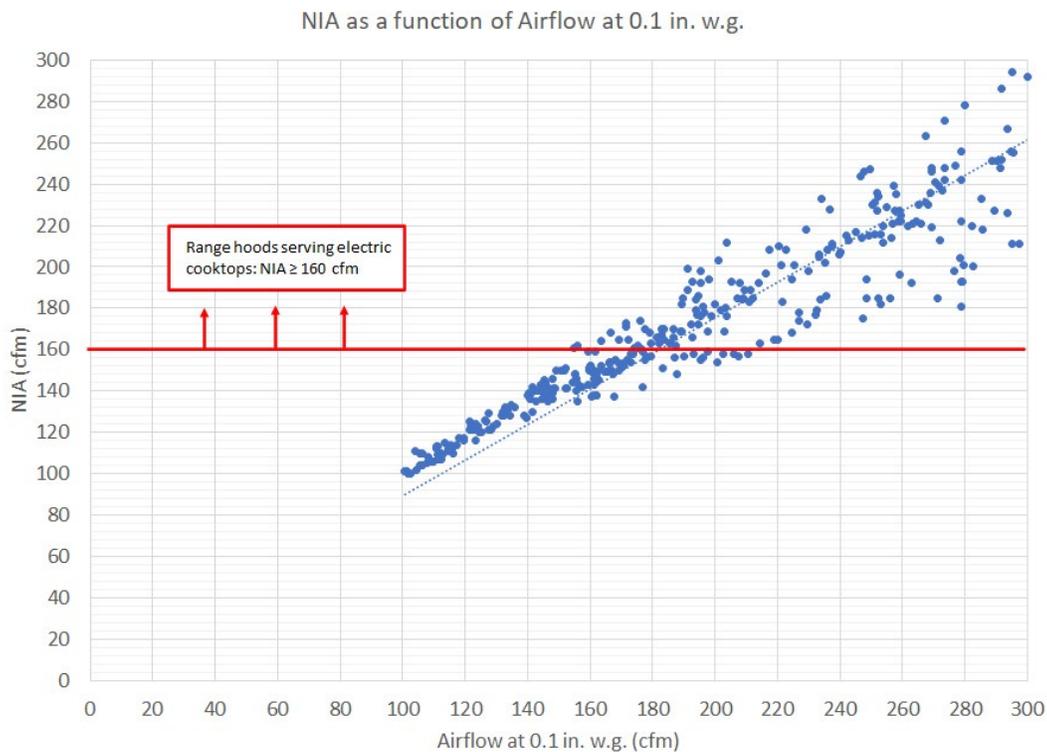
As HVI noted in comment TN235280, the industry supports CEC’s transition to a requirement for CE. However, more work is needed to ensure that laboratory test results in accordance with HVI 917: Range Hood Capture Efficiency Testing and Rating Procedure (based on ASTM E3087) are repeatable. Until the time that CE ratings are listed in accordance with HVI 917, CEC should permit CE to be verified using an airflow rate as a proxy. And, until better data are available, HVI supports the proxy airflow rates recommended in LBNL’s Tech Memo TN235477: 160 cfm “as installed” to achieve 65% CE, and 250 cfm “as installed” to achieve 80% CE.

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<sup>1</sup> Chan WR, Kumar S, Johnson A, Singer BC. 2020. Simulations of short-term exposure to NO<sub>2</sub> and PM<sub>2.5</sub> to inform capture efficiency standards. Berkeley, CA: Lawrence Berkeley National Laboratory.

<sup>2</sup> Decreasing the targeted CE for range hoods serving gas appliances from 85% to 80% should increase the percentage of compliant rating points in HVI’s Certified Product Database (CPD) having a rated flow less than 400 cfm at 0.1” w.g. by 34%.

The rating metric that provides the closest approximation of a range hood’s “as installed” airflow is the nominal installed airflow (NIA), as defined in HVI 920. HVI developed NIA in 2020 at the recommendation of the ASHRAE Range Hood Rating Metrics Workgroup as a better representation of installed airflow than the range hood’s traditional airflow rating at 0.1” w.g. NIA is calculated from the intersection of a range hood’s fan curve and a system curve that is considered “typical” (i.e., 10 feet of smooth duct, two elbows, a termination fitting, and a duct diameter that is equivalent to the range hood’s duct take-off). Because NIA can be calculated from existing test data, no additional testing is required to produce the rating. As a point of comparison, HVI has performed an initial analysis<sup>3</sup> of over 840 range hoods listed in HVI’s CPD to determine the relationship between NIA and rated airflow at 0.1” w.g. The analysis shows a good correlation between NIA and airflow at 0.1” w.g. on the dataset as a whole (see Figure 1); however, there is significant deviation across individual products of rated airflows at 0.1” w.g. for any given NIA. As such, and because HVI expects to publish NIA ratings in the CPD no later than Q2 2021 (well in advance of Title 24-2022 becoming effective), HVI recommends that beginning with Title 24-2022, CEC references NIA wherever a rated airflow is required for range hoods (and eliminates any references to range hood rated flow at 0.1” w.g.). HVI proposes that the “as installed” airflow either be verified by a HERS rater using the range hood’s rated NIA or using the Field Verification and Diagnostic Testing of Mechanical Ventilation Systems procedures in the Reference Appendices (i.e., RA3.7 or NA2.2, as applicable).



**Figure 1.** NIA as a function of rated airflow at 0.1 in. w.g. (estimated based on preliminary calculations). This chart shows an excerpt of the full range of range hoods listed in HVI’s CPD database; hoods with airflows beyond the maximum values shown in the figure are not included here. This figure is provided

<sup>3</sup> HVI’s initial analysis does not include the derating of NIA that would result from products that have a normalized curve ratio. In other words, the analysis is likely to slightly underestimate the rated airflow at 0.1” w.g. that is likely to be associated with a targeted NIA.

to illustrate the range of rated airflows at 0.1" w.g. that can be expected to be associated with an "as installed" or NIA airflow. For example, an NIA of 160 cfm (CEC's proposed upper-end target for electric cooktops) is likely to be associated with a rated airflow of 155-220 cfm at 0.1" w.g. If CEC were to reference 0.1" w.g. instead of NIA to verify an "as installed" airflow, then CEC would need to select the upper airflow rate of 220 cfm at 0.1" w.g. to have good confidence that the product would achieve an "as installed" airflow of 160 cfm. This could result in over-ventilation, as some products that are rated at 220 cfm at 0.1" w.g. are likely to deliver up to 215 cfm "as installed", which is well beyond the targeted, "as installed" airflow of 160 cfm for electric ranges.

### **NIA Rating for Airflow Verification**

Title 24 (and ASHRAE 62.2) requires prescriptive duct sizing of range hoods in accordance with Table 5-3 unless compliance is demonstrated using manufacturers' design or a field-verified airflow. Recently, and at the recommendation of the ASHRAE 62.2 Range Hood Rating Metric Workgroup (which included CEC staff representation), HVI developed the range hood NIA rating as a better approximation of the airflow and associated static pressure that are likely to be experienced during range hood operation within a typical installation. NIA should be recognized as a valid alternative to prescriptive duct sizing when the duct system conforms with the assumptions used in developing NIA (i.e.,  $\leq 10$  ft,  $\leq 2$  elbows, diameter  $\geq$  the listed diameter for the range hood's rated NIA).

### **Sound**

HVI supports CEC's proposal to retain current Title 24 sound requirements and the exception to provide the sound rating at working speed. See TN235280 for more information in support of this recommendation.

### **Auto Operation**

In the November 3<sup>rd</sup> workshop, CEC staff requested feedback from industry related to introducing auto operation requirements for range hoods. HVI recognizes that range hood auto operation could be useful in reducing occupants' exposure to pollution generated during cooking events. However, at this time, the number of products in the U.S. market that have this feature is extremely limited; so, introducing a requirement for auto operation within Title 24-2022 is premature. To spawn development of range hoods with auto operation, CEC could incentivize this feature within Title 24-2022. HVI welcomes dialogue with CEC staff on this issue.

### **Dedicated Oven Exhaust**

In the November 3<sup>rd</sup> workshop, CEC staff requested feedback from industry on the following question: "Should ovens that are in a different location than the cooktop have dedicated exhaust?" HVI supports the concept of providing separate, dedicated exhaust ventilation for separate cooking appliances where warranted. HVI also recognizes that in some cases, specifying a single range hood may be sufficient to address the contaminants generated by multiple and separate cooking appliances. For example, the effectiveness of a range hood at addressing contaminants generated by an oven that is separated from the cooktop will depend on variables like proximity and operation. More research is likely needed to determine the conditions that warrant a requirement for additional exhaust systems.

### **Makeup Air**

In the November 3<sup>rd</sup> workshop, CEC staff requested feedback from industry on the following question: "Should makeup air be provided in kitchens when range hoods are operating?" CEC has established makeup air requirements for kitchen exhaust appliances via adoption of ASHRAE 62.2 (within Section 6.4.2). The makeup air requirements in 62.2 are limited to situations where atmospherically vented

combustion appliances or solid-fuel burning appliances are located within the dwelling units' pressure boundary and when the combined exhaust airflow of the two largest exhaust appliances exceeds 15 cfm/100 ft<sup>2</sup> of occupiable space. Without seeing an alternative proposal from CEC, HVI recommends that CEC maintain the current Title 24 makeup air requirements as established within ASHRAE 62.2 Section 6.4.2.

Thank you for the opportunity to provide these comments and for your consideration.

Sincerely,

A handwritten signature in blue ink that reads "Jacki Donner". The signature is fluid and cursive, with the first name "Jacki" and last name "Donner" clearly legible.

Jacki Donner, CEO