R.13-11-005
Order to Show Cause Against Southern California Gas Company Issued December 2, 2019

Sierra Club Exhibit
Exhibit SC-23

SoCalGas technical comments Attachment CEC 2022 Energy Code 082120 final,

filed in CEC Docket 19-BSTD-03

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SoCalGas technical comments Attachment CEC 2022 Energy Code 082120 final

Additional submitted attachment is included below.

ATTACHMENT A:

Comments on Indoor Air Quality Arguments Presented in Written Comments in Response to the March 26, 2020 Pre-Rulemaking Workshop for the California 2022 Energy Standard, Title 24
Docket No. 2019-BSTD-03

The Joint Comments submitted by Rocky Mountain Institute and Redwood Energy make several assertions about indoor air quality (IAQ) and gas cooking.[1] Sierra Club supports these comments.[2] These parties have made assertions that are not supported by the research and should not be considered by CEC staff.

There were key statements made by the authors of the Joint Comments that are incorrect. The following are issues with the research and conclusions drawn:

- No new nitrogen oxides (NO_X) data were presented and data for source emissions from ranges were not documented;
- Operation times of 1 hour and 2 hours with the range top and oven burners on were used in the study, which differs greatly from typical operations. According to U.S. Department of Agriculture, a family spends an average of 38 minutes on meal preparation per day.[3] This includes food prep, cooking, and serving time;
- The death rate is based on PM 2.5 emissions where 40% of NOx is assumed converted to Nitric PM 2.5. Justification or substantiation of this method is not included in the report;
- Like previous reports, it identifies that proper ventilation greatly improves IAQ but focuses on electrification as the solution;
- The report does not include any data on PM 2.5 generated by electric cooking;
- The value of electrification includes the monetized health benefits, but no estimates of the cost of electrification;
- All electric power in the study is assumed to be from non-fossil fuel sources; and
- The Mean Emission Factor used in the study only calculates improvements based on replacing natural gas with electric and does not include estimation of how emissions could be reduced by using advanced burner systems with improved efficiency and emissions.

Specifically, this attachment refutes the following:

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[1] Rocky Mountain Institute & Redwood Energy comments on 2022 Energy Code. Docket # 19-BSTD-03. Available at: https://efiling.energy.ca.gov/GetDocument.aspx?tn=232712&DocumentContentId=64784
[2] Sierra Club comments on 2022 Energy Code. Docket # 19-BSTD-03. Available at: https://efiling.energy.ca.gov/GetDocument.aspx?tn=232716&DocumentContentId=64785
[3] Amber Waves. Karen Hamrick. *Americans Spend an Average of 37 Minutes a Day Preparing and Serving Food and Cleaning Up*. November 07, 2016.

1. Claim that gas cooking emissions exceeding outdoor standards for health-related pollutants is not justified by the cited literature.
2. Claim of relationship of IAQ to childhood risk of asthma, the percentage risk increases cited, and the contribution of gas cooking is not justified by the cited technical literature.
3. Claim that "communities may be at higher risk of harms resulting from exposure to pollution from gas stoves" is not supported by the cited materials.
4. Claims misrepresent technical consensus processes at CARB and U.S. EPA, the successes of California ventilation requirements in mitigating negative IAQ, and the protective importance of National Ambient Air Quality Standards in the face of "grey literature" purporting insufficiency of these Standards.
5. The claim, "[t]he indoor air quality guidelines that the CEC relies upon are outdated and not sufficiently protective of the public, especially vulnerable communities" is not supported by the literature.
6. Health and welfare-based air quality standards are set through a process prescribed by California standards and U. S. law and, furthermore, should not be set by an energy standard.

The CEC must support robust and broad technical research and analysis that is fully analyzed by the research community before it begins to entertain high building electrification as a future pathway. Additionally, the CEC should not consider policy, such as within the California 2022 Energy Standard Title 24 proceeding, that is based on analysis that has not been fully vetted by the research and public health communities and agencies, and which contradicts agency norms and numerous studies. **SoCalGas urges the CEC to review our comments and adopt a holistic view of the energy system to affordably achieve California's climate and air quality goals and in following with traditional health standards and guidance procedures.**

1. **Claim that gas cooking emissions exceeding outdoor standards for health-related pollutants is not justified by the cited literature**

"Burning gas in homes can release more NO_2 and carbon monoxide inside than the U.S. Environmental Protection Agency allows outdoors.[15] According to a study by the Lawrence Berkeley National Laboratory, 12 million Californians in homes with gas stoves are breathing levels of NO2 that would be illegal outdoors, while 1.7 million Californians are breathing levels of carbon monoxide that exceed outdoor limits.[16]"[4]

[15] Jennifer M Logue et al., *Pollutant Exposures from Natural Gas Cooking Burners: A Simulation-Based Assessment for Southern California*, 122 ENVIRONMENTAL HEALTH PERSPECTIVES 43 (2014), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3888569/.
[16] Jennifer M Logue et al, *Pollutant Exposures from Natural Gas Cooking Burners: A Simulation-Based Assessment for Southern California*, 122 ENVIRONMENTAL HEALTH PERSPECTIVES 49 (2014), *available at* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3888569/.

[4] *Id.* At 4.

The Logue, et. al., study did not measure exposures in California households. The conclusions of the study are wholly dependent upon modeling methods and assumptions concerning source rates, the mass balance approach used, occupancy patterns, cooking appliance operation patterns, and occupant response (i.e., lack of response) to both cooking effluent and combustion products accumulation. These modeling methods cannot be reproduced by stakeholders.

Use of emission rates from an earlier Lawrence Berkeley National Laboratory (LBNL) study are cited but are not documented in the Logue, et. al., study.[5] Use of emission factors from this 2010 study, presented for a variety of fuel gases and gas cooking appliance operating modes, cannot be discerned from the Logue, et. al. study, making their alleged support for the conclusion regarding emission characteristics for gas cooking products highly ambiguous. Critical behavior-related variables associated with residential cooking appear to be lacking from the model, most notably kitchen temperature rise and response of occupants to increased temperature from cooking appliance operation, which includes behavior options of reducing appliance operation or increasing ventilation to the outdoors or to the rest of the occupancy. Both responses effectively reduce buildup of kitchen concentrations of combustion products. The association of combustion product accumulation from cooking appliances and kitchen temperature rise has long been the basis for limiting combustion emissions from these product, specifically CO, which was used in 1921-23 to set the CO emission limit for the residential cooking appliance Standard Z21.1, 'Household Cooking Appliances," and reaffirmed in 1997 under updated assumptions of air exchange rates, tolerable CO concentrations, and other underlying assumptions supporting the Standard's CO emission rate (i.e., managing CO concentration development before kitchen temperatures become intolerable). The Logue, et. al., study treats air change rates as a function of ventilation and infiltration and contributes no occupant response to rising kitchen temperature, which would mitigate concentration development.

Further with respect to the 2010 LBNL study and the Logue, et. al., modeling studies, it is unclear how LBNL is using measured concentrations and whether the emission factors used in the modeling study represent peak emission rates (particularly for NO_2), time averaged emission rates, or a hybrid of these measurements. The LBNL study and use of its data is not clear on this point, although procedures promulgated within the State of California make clear the requirements for such data.

The modeling methods used by Logue, et. al., to estimate exposures are opaque and cannot be reviewed for technical accuracy and precision for the source conditions modeled. It appears that the overall modeling approach used conjoint modeling methods, which themselves can introduce uncertainties in the reliability of the results. As a result, these modeling results cannot be reproduced by stakeholders or tested for sensitivities to the LBNL assumptions.

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[5] Singer BC, Apte MG, Black DR, Hotchi T, Lucas D, Lunden MM, et al. 2010. Natural Gas Variability in California: Environmental Impacts and Device Performance—Experimental Evaluation of Pollutant Emissions from Residential Appliances. CEC-500-2009-099-APE. Sacramento, CA: California Energy Commission

2. Claim of relationship of IAQ to childhood risk of asthma, the percentage risk increases cited, and the contribution of gas cooking is not justified by the cited technical literature

> *"Living in a home with a gas stove increases the risk of asthma in children, relative to those children who live in homes with electric stoves. A gas stove in the home increases the risk of experiencing asthma symptoms by 42%.*[17] *Meanwhile, having a gas stove increases the risk of being diagnosed with asthma by a doctor by 24%.*[18]*"*[6]

[17] Weiwei Lin et al., *Meta-Analysis of the Effects of Indoor Nitrogen Dioxide and Gas Cooking on Asthma and Wheeze in Children,* 42 INTERNATIONAL JOURNAL OF EPIDEMIOLOGY 1724 (2013), *available at* https://doi.org/10.1093/ije/dyt150.
[18] *See id*

These quantitative statements of childhood asthma risk are based upon "meta-analysis" of 1,064 papers covering asthma, gas cooking, and related interactions of these conditions, expanding upon a 1992 meta-analysis covering 58 sources by Hasselblad, et. al.[7] No discernable differences are identified between the Weiwei, et. al. meta-analysis and that of Hasselblad, so even while the claimed rates are different, the criticisms of the Hasselblad are expected to be fully applicable to the cited work.

Hasselblad, *et. al.* was reviewed in detail and largely dismissed in the 1990's because of deficiencies identified at that time, including an over-emphasis on meta-analysis techniques at the expense of critical review of the studies considered and common errors of indirect association of respiratory problems with the "presence" of natural gas cooking appliances without analytical control for the effects of other airborne agents known to produce these problems, notably asthma development and exacerbation.

The study communicates meta-analysis results only and does not present reviewable fundamental scientific knowledge that could be used in deliberations on appropriate air quality standards or their reconsideration on new evidence.

Fifty of the 58 literature citations in the meta-analysis of Hasselblad, *et. al.*, were reviewed as it directly addresses natural gas cooking appliances (the remaining eight citations addressing meta-analysis techniques), and it was **found that none of citations presented sufficient causative associations that would link use of these appliances to asthma or other respiratory illnesses.** The citations fail this test for one or more of the following reasons:

- Natural gas cooking appliance emissions of NO_2 were not measured.
- Incremental contribution of natural gas cooking appliance emissions were not controlled relative to other sources of NO_2, chiefly involving outdoor air concentrations.

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[6] Joint Comments, at 4
[7] Hasselblad, V. I., D. M. Eddy, D. J. Kotchmar, "Synthesis of Environmental Evidence: Nitrogen Dioxide Epidemiology Studies," *Journal of Air and Waste Management,* 42(5), May 1992, pp. 662-71.

- Other known asthma or respiratory illness agents were not measured or controlled.
- Cooking activity patterns were not included in emissions associations and concentration data, typically relating to 24-hour exposure durations and longer.
- Potential exposures of subjects, specifically kitchen exposures during cooking events, were not counted.
- Comparisons to electric cooking did not account for covariant factors affecting either airborne contaminants or health effects, which would have required controlling for socio-economic status, location background air quality, and other factors including other known agents of asthma development and respiratory illness, as discussed above.
- Cooking process emissions, most notably concentrations of fine and ultra-fine particulates known for causing respiratory distress, were not measured or otherwise included in the studies.
- Underlying health conditions (absent of the influence of cooking activities) and symptoms were not diagnosed by qualified professionals but were self-reported.

The meta-analysis conclusions of Hasselblad, et. al., relating to elevated respiratory health concerns do not need to be debated in detail since the actual contribution of gas cooking emissions to IAQ were not evaluated in the studies considered. The claimed asthma frequencies as the relate to gas cooking appliances are, as a consequence, unjustified. 'Exposure to a gas stove' is not exposure to emission products from combustion. The elevated NO_2 levels over extended periods of time using the 30 $\mu g/m^3$ threshold may exacerbate asthma symptoms and cause other respiratory problems; however, the contribution of combustion emissions from gas cooking appliances was not studied.

This claim (asthma associated with gas cooking emissions) is unfounded in the consensus public health literature. According to the 2000 text produced by the National Institute of Medicine, "Clearing the Air: Asthma and Indoor Air Exposures," gas combustion emission, including those listed in the claims and others, are listed as IAQ agents for which "Inadequate or Insufficient Evidence to Determine Whether or Not an Association Exists" in causing development of asthma.[8] The classification of asthma agents (dealing with both development or "exacerbation" of asthma, the latter pertaining to asthma attacks among individuals with pre-existing diagnosed asthma) are as follows:

- "Sufficient Evidence of a Causal Relationship,"
- "Sufficient Evidence of an Association,"
- "Limited or Suggestive Evidence of an Association,"
- **"Inadequate or Insufficient Evidence to Determine Whether or Not an Association Exists," or**
- "Limited or Suggestive Evidence of No Association."

[8] National Institute of Medicine, *Clearing the Air: Asthma and Indoor Air Exposures*, Washington, DC: National Academy Press, 2000, pp. 8-11.

With respect to development of asthma, a clearer picture of natural gas combustion products in comparison to other biological and chemical agents causing development of asthma is shown in Table 3 of "Clearing the Air:"[9]

TABLE 3 Summary of Findings Regarding the Association Between Indoor Biologic and Chemical Exposures and the *Development* of Asthma

Biologic Agents	Chemical Agents
Sufficient Evidence of a Causal Relationship	
House dust mite	(no agents met this definition)
Sufficient Evidence of an Association	
(no agents met this definition)	ETS (in preschool-aged children)
Limited or Suggestive Evidence of an Association	
Cockroach (in preschool-aged children)	(no agents met this definition)
Respiratory Syncytial Virus (RSV)	
Inadequate or Insufficient Evidence to Determine Whether or Not an Association Exists	
Cat	NO_2, NO_x
Cow and horse	Pesticides
Dog	Plasticizers
Domestic birds	VOCs
Rodents	Formaldehyde
Cockroaches (except for preschool-aged children)	Fragrances
Endotoxins	ETS (in school-aged and older children, and in adults)
Fungi or molds	
Chlamydia pneumoniae	
Chlamydia trachomatis	
Mycoplasma pneumoniae	
Houseplants	
Pollen	
Limited or Suggestive Evidence of No Association	
Rhinovirus (adults)	(no agents met this definition)

Since the publication of "Clearing the Air," no new contradicting conclusions regarding development of asthma and exposure gas combustion products has been proposed by the cognizant public health community and through its various consensus processes. The National Institute of Medicine has not supplemented or updated its findings over this time period. Likewise, review of health and guidance literature from the responsible public health agencies, ranging from simple agency guidance to detailed technical analysis of specific combustion product exposures and health effects, have not contradicted the 2000 National Institute of Medicine's findings. For example, the U.S. EPA Indoor Environments Division's "Asthma Facts" fact sheet, updated through May 2018, outlines indoor asthma triggers as follows:

> "Reducing exposure to environmental factors, such as indoor asthma triggers, is important for asthma management.
> - On average, Americans spend about 90 percent of their time indoors.
> - Indoor environmental factors called asthma triggers - such as dust mites, mold, cockroaches, pet dander and secondhand smoke - can exacerbate asthma symptoms.

[9] *Id.*, page 9 (Note: permission for reprinting of Table 3 is pending)

- With an asthma action plan that includes medical treatment and control of environmental triggers, people with asthma can lead healthy, active lives."[10]

Noteworthy is that unvented combustion of gas, from either cooking appliances or other gas-fired appliances, are not mentioned in this guidance, which is supported with documentation from 14 technical sources including 10 studies from the U.S. Center for Disease Control. U.S. EPA's Indoor Environments Division presents a wealth of other related information regarding airborne agents affecting human health and sensitive populations, but a **review of the Division's electronically available materials shows that U.S. EPA's information, taken as a whole or in part, does not support the claims in the Joint Comments.**

It is noteworthy that the Federal Interagency Committee on Indoor Air Quality (CIAQ),[11] chaired by U. S. EPA and including most federal agencies addressing indoor environments, does not recognize gas combustion as an issue for development or exacerbation of asthma in children or other populations or other claimed issues of respiratory health. CIAQ retains regular and in-depth focus upon asthma as part of its regular agendas and technical meetings.

As with other combustion products, CO is not associated with development of asthma according to the National Academy of Medicine nor the U.S. EPA, as discussed for the sources mentioned above. While respiratory responses of diagnosed asthmatics are discussed in the most recently completed CO Criteria Document,[12] technical focus is upon potential asthma exacerbation, not development of asthma.[13] A review of the Criteria Document studies considered demonstrates that focus is placed upon long-term exposures (in excess of 24 hours and up to a full year) for consideration of health effects. These exposure durations are significantly longer than exposures that could be attributed to operation of unvented gas combustion appliances. As well, the claim of IAQ-related health effects is not accompanied by information nor data on concentration levels, which are key to consideration of health effects, including both asthma exacerbation and other respiratory symptoms.

A more direct response to claims regarding formaldehyde and its relationship to gas appliances and IAQ is provided by U.S. EPA's web-based formaldehyde information.[14] Even a cursory review of this information demonstrates IAQ concerns associated with formaldehyde relating to building products and furnishings as sources of exposure, not residential gas combustion appliances. Protections against formaldehyde exposure cited by U.S. EPA do not include

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[10] U.S. EPA. Asthma Facts. Accessed on 5/14/20 from: https://www.epa.gov/sites/production/files/2018-05/documents/asthma_fact_sheet_0.pdf

[11] U.S. EPA. Indoor Air Quality (IAQ) Federal Interagency Committee on Indoor Air Quality. Accessed on 5/21/20 from: https://www.epa.gov/indoor-air-quality-iaq/federal-interagency-committee-indoor-air-quality

[12] U. S. EPA. "Integrated Science Assessment for Carbon Monoxide," EPA/600/09/019F, January 2010.

[13] Note: AGA communications with U.S. EPA over recent years have revealed that Clean Air Scientific Advisory Committee has not updated the CO Criteria Document since 2010 due to a paucity of relevant new studies to justify convening the process.

[14] U.S. EPA. Formaldehyde. Accessed on 5/14/20 from: https://www.epa.gov/formaldehyde

concerns about gas combustion appliances,[15] even while U.S. EPA identifies unvented fuel burning appliances as a source of formaldehyde as a "byproduct of combustion."[16]

3. Claim that "communities may be at higher risk of harms resulting from exposure to pollution from gas stoves" is not supported by the cited materials

> *"Asthma rates are higher in low-income communities and communities of color; consequently, these communities may be at higher risk of harms resulting from exposure to pollution from gas stoves, as some of the most susceptible populations are those with existing asthma.[19] Additionally, lower income homes may be at a higher risk of exposure to gas stove pollution in the first place, as factors that contribute to higher levels of NOx in homes are more common in low-income multifamily housing. These factors include: smaller unit size, more people per home, and inadequate ventilation.[20]"*

[19] *See, e.g.*, Michael Guarnieri & John R. Balmes, *Outdoor Air Pollution and Asthma*, 383 LANCET 1581 (2014), *available at* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4465283; Christina M. Pacheco et al., *Homes of Low-Income Minority Families with Asthmatic Children Have Increased Condition Issues*, 35 ALLERGY AND ASTHMA PROCEEDINGS 467 (2014), *available at* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4210655/#!po=78.0000; Cheryl Katz, *People in Poor Neighborhoods Breathe More Hazardous Particles*, SCIENTIFIC AMERICAN (Nov. 2012), https://www.scientificamerican.com/article/people-poor-neighborhoods-breate-more-hazardous-particles; Hatice S. Zahran et al., Vital Signs: Asthma in Children – United States, 2001 – 2016, Centers for Disease Control and Prevention Morbidity and Mortality Weekly Report (Feb. 9, 2018), http://dx.doi.org/10.15585/mmwr.mm6705e1; Centers for Disease Control and Prevention, Summary Health Statistics: National Health Interview Survey: 2015 at tbl. C-1 (2017), http://www.cdc.gov/nchs/nhis/shs/tables.htm.

[20] Gary Adamkiewicz et al., *Moving Environmental Justice Indoors: Understanding Structural Influences on Residential Exposure Patterns in Low-Income Communities*, 101 Am. J. Public Health S238 (2011), *available at* https://www.ncbi.nlm.nih.gov/pubmed/21836112#.

The association of socio-economic factors to asthma and other respiratory illness and gas cooking is, more often than not, missing from the cited sources. Where covered, sources lack control of science-based causes of asthma at work in these populations and makes the error of using the "presence" of gas cooking appliances or general ambient air quality sources of contaminants as a proxy for exposure to combustion products from indoor sources. While one study set out to develop an analytical basis for understanding the role of combustion emission from gas cooking appliances, the study is too opaque to develop firm conclusions of any kind.

- The Guarnieri and Balmes paper is a literature review covering a five-year period prior to publication on overall airborne contaminants associated with respiratory illness and asthma development and exacerbation, but it makes no reference to IAQ issues in isolation from overall ambient air quality. The paper makes no observations nor conclusions regarding indoor sources of contaminants of health concern, including use of unvented combustion appliances

[15] U.S. EPA. How you can protect yourself and your family form formaldehyde exposure. Accessed on 5/14/20 from: https://www.epa.gov/formaldehyde/protect-against-exposures-formaldehyde#protect

[16] U.S. EPA. Where is formaldehyde found?. Accessed on 5/14/20 from: https://www.epa.gov/formaldehyde/facts-about-formaldehyde#whatcontains

- The Pacheco, et. al., study reviewed a broad range of asthma exacerbation factors but did not include even the presence of gas cooking appliances as a causative factor. Where gas cooking appliances were installed, simple recommendations for performing maintenance were given, but these were not associated with the asthma triggers by the investigators. No airborne emissions from combustion (from either outdoor or indoor sources) were measured or inferred.
- The Katz article focuses upon racial disparities among the population of citizens subjected to respiratory illness and asthma exacerbation associated with particulate emissions and discussed in other articles but states no observations regarding indoor air or combustion appliances as sources.
- The Zahran, et. al., study presents a detailed review of childhood asthma in 2016 but presents no information nor conclusions about cooking appliances nor combustion appliances operation as a "trigger" for asthma development or asthma attacks.
- The Adamkiewicz, et. al., study refers to gas cooking among a number of indoor and outdoor sources contributing to low-income population "exposures" to $PM_{2.5}$ and NO_2, but without a description of specific respiratory system impacts. "Literature" values for source rates of pollutants were used to model steady-state exposure concentrations using a simplistic box model for single-family occupancies and the National Institute of Standards and Technology CONTAM model for multi-family structures, but none of this modeling or initial conditions are provided in the study itself. Gas cooking appliance and smoking results are conflated in observations of particulate matter concentrations from indoor sources while the use of gas cooking appliances for supplemental space heating (a practice specifically identified as to be avoided by the U.S. Consumer Product Safety Commission and other organizations) is identified as a source of elevated NO_2 levels. Much of the study identifies additional analytical and research needs, the study itself being highly opaque in developing qualitative statements. **More detailed review of the methods used and quantitative results is warranted before policies regarding gas cooking can be extrapolated.**

Claims misrepresent technical consensus processes at CARB and U.S. EPA, the successes of California ventilation requirements, and the protective importance of National Ambient Air Quality Standards

"The indoor air quality guidelines that the CEC relies upon are outdated and not sufficiently protective of the public, especially vulnerable communities. The California Air Resources Board ("CARB") has not updated its indoor air quality guidelines for NO_2 emissions since 1994.[21] Meanwhile, the CEC's ventilation standards working group is proposing to apply the U.S. Environmental Protection Agency's ("EPA") 2016 outdoor NOx standards for use indoors.[22] Numerous scientific studies have shown that EPA's outdoor NOx standards are not sufficiently protective of health indoors, especially for the most sensitive populations. As a result, government officials in Canada and at the World Health Organization have adopted significantly more stringent guidelines for both indoor and outdoor air quality than EPA's outdoor standards.[23]"

[21] California Air Resources Board, Combustion Pollutants in Your Home (1994), *available at*

https://ww3.arb.ca.gov/research/indoor/combustf.htm; see California Air Resources Board, Report to the California Legislature: Indoor Air Pollution in California 136-37, 144 (2005), *available at* https://ww2.arb.ca.gov/sites/default/files/classic//research/apr/reports/l3041.pdf.

[22] Marian Goebes et al., 2022 California Energy Code (Title 24, Part 6), Multifamily Indoor Air Quality – Kitchen Range Hood Capture Efficiency Requirement (Mar. 23, 2020), *available at* https://title24stakeholders.com/wp-content/uploads/2020/01/T24-2022-Submeasure-Summary_KITCHENRANGEHOOD.pdf.

[23] Health Canada, Residential Indoor Air Quality Guideline: Nitrogen Dioxide (2015), *available at* https://www.canada.ca/en/health-canada/services/publications/healthy-living/residential-indoor-air- quality-guideline-nitrogen-dioxide.html; World Health Organization (Regional Office for Europe), WHO Guidelines for Indoor Air Quality: Selected Pollutants (2010), *available at* https://apps.who.int/iris/handle/10665/260127.

These claims misrepresent technical consensus processes at both CARB and U.S. EPA as well as the successes of California's ventilation requirements in mitigating negative IAQ, and the protective importance of National Ambient Air Quality Standards in the face of "grey literature" purporting insufficiency of these Standards.

4. The claim, "[t]he indoor air quality guidelines that the CEC relies upon are outdated and not sufficiently protective of the public, especially vulnerable communities" is not supported by literature submitted to CEC for consideration

The Joint Comments further state,

> "*[t]he CEC should base its ventilation standards on indoor air quality guidelines that reflect the latest science to protect public health, including for the most vulnerable populations. Specifically, the CEC should align its ventilation standards with the most up-to-date and most protective indoor air quality guidelines issued by air quality regulators."*

No specific evidence has been offered that the CEC has not done this, having analyzed the impact of current Title 24 ventilation requirements in mitigation accumulation of indoor air contaminants against prevailing air pollutant standards. The claim infers that the current requirements are not the "most protective," but this is a matter for CARB to review, not CEC.

5. Health and welfare-based air quality standards are set through a process prescribed by California standards and U. S. law and, furthermore, should not be set by an energy standard

> *"Health Canada has set more stringent NO_2 standards, both indoors and outdoors. According to Health Canada, a "long term" indoor air concentrations of nitrogen dioxide should not exceed 11 parts per billion ("ppb"), which they say could be measured over a 24-hour period. They also set a guideline of 90 ppb over a 1-hour period specifically designed to accommodate gas stove pollution, but found that in order to fully protect sensitive populations a 1-hour standard of 27 ppb would be necessary.*[24]"

[24] *See* Health Canada, *supra* note 23. The guideline of 27 ppb for short term exposure is based on Health Canada's short-term lowest observed adverse effect level (50 !g/m). For long term-exposure (at least 24- hour sampling) the maximum limit of 11 ppb was set as above this level, asthmatic children may experience a higher frequency of days with respiratory symptoms and/or medication use. Health Canada, Residential Indoor Air Quality Guideline: Nitrogen Dioxide (2015), *available at* https://www.canada.ca/en/health- canada/services/publications/healthy-living/residential-indoor-air-quality-guideline-nitrogen- dioxide.html

The Joint Comments claims ignore national and California processes established by law for setting and revising public health- and welfare-based air quality standards in the U.S. This issue is not directly germane to the revision of Title 24.

> *"According to guidelines from CARB and the World Health Organization, indoor carbon monoxide levels should not exceed 9 parts per million ("ppm") during an 8- hour period,[26] 20 ppm during a 1-hour period,[27] or 87 ppm for a 15-minute period.[28] Additionally, in order to protect against chronic exposure, carbon monoxide should not exceed 6 ppb (7 mg/m3) over a 24-hour period.[29]"*

[25] California Air Resources Board, Carbon Monoxide and Health, https://ww2.arb.ca.gov/resources/carbon-monoxide-and-health (Apr. 10, 2020); World Health Organization, *supra* note 23.
[26] California Air Resources Board, *supra* note 25.
[27] World Health Organization, *supra* note 23.
[28] World Health Organization, supra note 23.
[29] World Health Organization, supra note 23.

The Joint Comments neither make a claim nor support a view that current source emission performance or requirements, coupled with Title 24 ventilation requirements, do not already provide protection from development of pollutant concentrations exceeding these limits.

For all the reasons above, we urge CEC not to consider the unsupported IAQ and gas cooking claims made by Rocky Mountain Institute and Redwood Energy (and supported by Sierra Club).