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**PG&E Comments on Workshop on Quantifying Indoor Air
Pollutants in MF Homes that Cook with Gas Stoves or Alternatives**

Additional submitted attachment is included below.



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California Energy Commission
Docket Unit, MS-4
Docket Number 19-ERDD-01
715 P Street
Sacramento, California 95814

Re: Pacific Gas and Electric Company Comments on the Staff Workshop on Quantify Indoor Air Pollutants in Multifamily Homes that Cook with Gas Stoves or Alternatives (Docket Number 19-ERDD-01)

Pacific Gas and Electric Company (PG&E) appreciates the California Energy Commission (CEC) for supporting research to quantify and document impacts to indoor air quality from natural gas appliances and the potential technically feasible improvements and potential risks to indoor air quality that could be achieved from fuel blending or electrification.

PG&E provides brief comments to support the direction of this proposed research. PG&E's comments address three questions posed by the CEC in their workshop notification:

- Question one (d) on how the study should approach and the sample design should be structured to provide insights on the understanding of the differences in potential health impacts of cooking generated PM_{2.5} in homes that burn gas relative to alternatives.
- Question five on other research study areas or programs that could inform or be leveraged to fulfill the goals and requirements of this research effort.
- Question seven on the confounding variables/factors (such as contribution of outdoor air) that the study design should consider or be aware of for measuring actual exposure to indoor pollutants.

PG&E provides the following brief comments to address the questions indicated above:

- While it is important to measure emissions from gas and electric stoves, it is also essential to distinguish the emissions from the food being cooked. Indoor air quality studies have found that emissions from the cooking process include various classes of pollutants such as particulate matter, aerosols such as oleic acids, and polycyclic aromatic hydrocarbons (PAHs) which can remain in the atmosphere for days.¹ For this study to identify the difference in impacts between electric and gas stoves, the contributing factor of emissions from food must be quantified properly. Many factors

¹ [The persistence of a proxy for cooking emissions in megacities: a kinetic study of the ozonolysis of self-assembled films by simultaneous small and wide angle X-ray scattering \(SAXS/WAXS\) and Raman microscopy - Faraday Discussions \(RSC Publishing\)](#)

can affect the amount of emissions from food including type of food, doneness of food, cooking method, level of heat used, cleanliness of the cookware. It may not be possible to consider the impact of all of the various factors, but it is important to compare the relative contribution of food emissions versus emissions from the energy source (electric, gas stoves).

- In addition to nitrous oxides, particulate matter, and volatile organic compounds, the study that the CEC proposes also needs to consider the impact of water vapor from the cooking process. Water vapor is a potential hazard, especially in homes with minimal ventilation, because a damp environment and condensation can lead to mold growth and the subsequent release of mold spores and mold fragments. Inhalation of mold spores in turn have been shown to cause respiratory tract symptoms in healthy people. Studies have suggested a potential link between early mold exposure and development of asthma in some children.²
- Finally, in page five of the workshop notification, the CEC acknowledges that: “Unlike Nitrogen Dioxide (NO₂), which is generated by the combustion of fossil gas, particulate matter (PM) is typically generated by cooking events regardless of cooking fuel (e.g., gas vs. electric) since the interaction of heat, water, oil, and food can create particles (Buonanno et al. 2009).”³ PG&E recommends that cooking emissions should be characterized and differentiated from appliance emissions.

PG&E appreciates the time and effort of the CEC to organize and present at the workshop on this forthcoming solicitation regarding quantification indoor air pollutants in multifamily homes that cook with gas stoves or alternatives. We look forward to continued engagement and providing input on these efforts. Please do not hesitate to contact me if you have any questions.

Sincerely,
Licha Lopez

² Centers for Disease Control and Prevention. [Basic Facts about Mold and Dampness | CDC](#)

³ CEC Notice of Staff Workshop. [March 4, 2022 - Staff Workshop: Quantify Indoor Air Pollutants in Multifamily Homes that Cook with Gas Stoves or Alternatives \(ca.gov\)](#)